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Field of science: Social Sciences
Scientific discipline: Economics and Finance

Business cycles in the banking systems of Central European countries and their stability.

PhD dissertation prepared under the supervision of

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Gdańsk, 2024

Streszczenie

Cykle koniunkturalne w systemach bankowych krajów Europy Środkowej a ich stabilność

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Tło i cele: Cykle koniunkturalne od setek lat wpisane są w rzeczywistość gospodarczą i oddziałują one w pozytywny lub negatywny sposób na niemal wszystkie składowe otoczenia wewnętrznego i zewnętrznego współczesnego przedsiębiorstwa. Turbulentne i niepewne otoczenie gospodarcze wpływa również na przebieg cykli koniunkturalnych, który staje się coraz trudniejszy do przewidzenia i jednoznacznej oceny. Głównym celem niniejszej rozprawy jest zbadanie wpływu cykli koniunkturalnych na poziom bezpieczeństwa systemów bankowych w czterech krajach Europy Środkowej, gdyż systemy te stanowią jedne z najważniejszych filarów bezpieczeństwa systemu finansowego tych państw.

Materiały i metody: Badanie zostało zaprojektowane i przeprowadzone w oparciu o krytyczną analizę literatury przedmiotu oraz analizę ilościową i statystyczną szeregów czasowych oraz danych gospodarczych i danych pochodzących z sektora bankowego każdego z badanych państw.

Wyniki: Badania wykazały, że inflacja, bezrobocie oraz PKB są jednymi z najważniejszych wskaźników gospodarczych wykorzystywanymi w procesie oceny cykli koniunkturalnych. Kraje Europy Środkowej wykazują się dużą adaptacyjnością i odpornością w obliczu globalnych wyzwań gospodarczych. Istnieje silna korelacja między aktywnością w sektorze bankowym a dynamiką gospodarczą, więc stabilność systemu bankowego jest ściśle powiązana z kondycją gospodarek badanych państw. Polityka pieniężna, prowadzona przez banki centralne krajów środkowoeuropejskich jest narzędziem wpływającym na aktywność gospodarczą oraz stabilność systemu bankowego. Kolejnymi istotnymi wskaźnikami stabilności systemów bankowych w badanych krajach okazały się wskaźnik samofinansowania i zadłużenia oraz wykorzystania dźwigni finansowej przez banki, a różnorodność ich wartości przekładała się na ich różną odporność na potencjalne kryzysy. Wszystkie badane kraje wykazały się dobrą odpornością na negatywne oddziaływanie cykli koniunkturalnych, a Czechy, ze względu na najniższą zmienność głównych wskaźników ekonomicznych, okazały się być krajem o najbardziej stabilnym systemie bankowym w regionie.

Practical implications: Wyniki badań przyczyniają się do pogłębienia wiedzy na temat przebiegu cykli koniunkturalnych w gospodarkach rozwijających się oraz ich wpływie na systemy bankowe krajów Europy Środkowej. Unikalną wartością badania jest możliwość prześledzenia sposobu kształtowania się i wpływu cykli koniunkturalnych na gospodarki przechodzące systemową transformację z modelu socjalistycznego na wolnorynkowy oraz na poziom stabilności ich systemów bankowych.

Wnioski i podsumowanie: Sektory bankowe w krajach Grupy Wyszehradzkiej odgrywają kluczową rolę w procesie finansowania gospodarki, stanowiąc jednocześnie dla niej wsparcie w okresach dekoniunktury. Cykle koniunkturalne mają duży wpływ na strukturę finansowania i stabilność systemów bankowych w badanych krajach, zmuszając je do redukcji kosztów i ustawicznego zwiększania poziomu efektywności w celu utrzymania przewagi konkurencyjnej. Systemy bankowe w badanych krajach uznać należy za bezpieczne i stabilne, aczkolwiek występują miedzy nimi znaczące różnice w odniesieniu do wspomnianych obszarów.

Słowa kluczowe: cykle koniunkturalne, system bankowy, stabilność systemu bankowego, ryzyko.

Abstract

Business cycles in the banking systems of Central European countries and their stability.

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Background and objectives: Business cycles have been part of the economic reality for centuries, affecting almost all components of both the internal and external environments of modern enterprises in either a positive or negative way. The turbulent and uncertain economic environment also influences the course of business cycles, which are becoming increasingly difficult to predict and evaluate clearly. The primary goal of this dissertation is to examine the impact of business cycles on the safety levels of banking systems in four Central European countries, as these systems are among the most crucial pillars of financial system security in these states.

Materials and methods: The study was designed and conducted based on a critical analysis of the literature on the subject and quantitative and statistical analysis of time series, economic data, and data from the banking sector of each country studied.

Results: The research showed that inflation, unemployment, and GDP are among the most important economic indicators used in the evaluation of business cycles. Central European countries demonstrate high adaptability and resilience in the face of global economic challenges. There is a strong correlation between activity in the banking sector and economic dynamics, thus the stability of the banking system is closely linked to the economic condition of the countries studied. The monetary policy conducted by the central banks of Central European countries is a tool that influences economic activity and the stability of the banking system. Other important indicators of banking system stability in the studied countries turned out to be the self-financing and debt ratios, and the use of financial leverage by banks, and the diversity of these values translated into their varying resilience to potential crises. All the studied countries showed good resilience to the negative effects of business cycles, with the Czech Republic, due to the lowest volatility of major economic indicators, proving to be the country with the most stable banking system in the region.

Practical implications: The research findings contribute to deepening knowledge about the course of business cycles in developing economies and their impact on the banking systems of Central European countries. A unique value of the study is the ability to track the formation and impact of

business cycles on economies undergoing systemic transformation from a socialist model to a market economy and on the level of stability of their banking systems.

Conclusions and Summary: The banking sectors in the countries of the Visegrad Group play a crucial role in the process of financing the economy, while simultaneously providing support during periods of downturn. Business cycles have a significant impact on the financing structure and stability of banking systems in the studied countries, forcing them to reduce costs and continuously increase the level of efficiency in order to maintain a competitive advantage. The banking systems in the studied countries are considered safe and stable, although there are significant differences between them in relation to the mentioned areas.

*Keywords***:** *business cycles, banking system, stability of the banking system, risk.*

List of publications

1. Selwent M., Witkowski W. Wróblewski J. (2023) *Finansowanie portugalskich startupów w latach 2017-2022.* Chapter in the monograph: *Nowe trendy w naukach o społeczeństwie – wyzwania i perspektywy*, Tygiel sp. z o.o.

2. Tyński A., Witkowski W., Wróblewski J. (2023) *Financialization as one of the sources of contemporary economic crises.* Catallaxy, Instytut Badań Gospodarczych

3. Selwent M., Witkowski W. Wróblewski J. (2023) *Diagnosis of the level of motivational risk in polish pharmaceutical company – case study,* Research on Enterprise in Modern Economy – Theory and Practice, Wydawnictwo Politechniki Gdańskiej

4. Kasprzak P., Witkowski W., Wróblewski J. (2023) *Zarządzanie bezpieczeństwem społeczeństw w dobie kryzysów* (monograph) – *Zwalczanie przestępczości skarbowej jako aktywny sposób minimalizacji ryzyka podatkowego – case study.* Praca zbiorowa „Zarządzanie bezpieczeństwem społeczeństw w dobie kryzysu (monografia)", Wydawnictwo Wyższej Szkoły Administracji i Biznesu w Gdyni, Wydawnictwo Bernardinum sp. z o.o.

Table of contents

Introduction

Justification of topic choice

In the entire economy, as well as in its individual sectors, including the banking system, one can observe cyclical changes taking place. These are particularly highlighted under conditions of progressing liberalization and deregulation, processes that remove restrictions on the functioning of financial markets. The accompanying processes of globalization cause the integration of domestic financial markets into one global market. Changes occurring in one of them can, by a domino effect, pass from one economy to another, as in the case of the subprime crisis.

The transformation of the economies of Central European countries, both systemic and economic, has laid the foundation for the restructuring and transition of the economy from centrally controlled to market-based mechanisms. Marketization has resulted in the appearance of attributes typical of the market, such as private ownership, competitiveness, and cyclical changes induced by market mechanisms.

Business cycles, a natural element of economic operation, have long been of interest to economists. They are often the subject of analysis and debates concerning the impact of business cycle fluctuations on various economic sectors. This becomes particularly important in the context of the banking sector, which plays a key role in the functioning of every modern economy.

However, the views of theorists and practitioners on the occurrence of business cycles in the banking system vary. Analyzing the functioning of the economy based on accepted measures, one observes decreasing and increasing trends in economic activity. Similar trends are observed in the banking system, which is an integral part of the economy. Thus, it can be noted that the functioning of the banking system in this changing environment causes its activities to resemble the prevailing market trends.

Identifying phases of the business cycle allows for determining the banking system's response to economic fluctuations. This contributes to reducing risks and exploiting opportunities associated with the ability to adapt to a changing environment. As business conditions change, banks, in order to maintain their competitive position, set directions for changes in strategy and operational activities. Thus, one can define the impact of the business cycle on the financing structure of the banking sector. Banks' reactions to business cycle changes determine bank behaviors in the downturn and upturn phases. Therefore, analyzing the activity of the banking sector in various phases of the business cycle is crucial. The environment of the banking sector is very diverse. Analyzing the reactions of this environment to cyclical changes in economic activity will show their impact on the banking sector.

Financial stability of the financial system is understood as the system's ability to maintain financial liquidity and solvency. Its basis is therefore a solid and properly functioning banking system, mainly due to its dominant share in most financial systems worldwide, especially those bank-oriented. The stability of the entire financial system is thus determined by the stability of the banking system. The scale of operation of the banking system is still incomparably greater than other segments of the financial system, as it plays a key role in the functioning and financing of the economy and in payment settlements. Therefore, the stability of the banking system is crucial for the functioning of the financial system and for the economy, which in the event of instability in the financial sector, may undergo negative changes reducing its efficiency.

The impact of business cycles on the stability of banking systems is poorly recognized in both theoretical and practical terms. In the literature, there are only a few works dedicated to this issue, comprehensively describing the impact of business cycles on the safety of the banking system, and a few attempts at empirical understanding of the mentioned issue. The reasons for this situation should be primarily seen in the fact that business cycles are difficult to anticipate and study, and that there is still a deficit of research tools enabling their comprehensive analysis and evaluation, not to mention the lack of agreement on the effectiveness of the mentioned methods and tools. This dissertation attempts to fill this gap. For this purpose, a descriptive analysis was conducted based on selected literature on the approach to business cycles and their impact on the stability of the banking system in Central European countries, as well as an empirical measurement and an attempt to evaluate the level of the mentioned impact.

Subject and Object of Research

In the dissertation, four banking systems of Central European countries, specifically Poland, Hungary, Slovakia, and the Czech Republic, were examined. The selection of banking systems in Central Europe as a research area is not coincidental. The mentioned countries have diverse experiences in terms of economic transformation, accession to the European Union, and management of financial crises, as well as a similar level of development of the financial system, including the banking system. The analysis focused on the business cycles in the banking systems of Central European countries and examined their impact on the stability of these systems. The result of the theoretical and empirical research conducted is an assessment of the stability of the banking systems in the countries studied in the context of the fluctuations in the business cycle.

The research period adopted in the dissertation is varied. The analysis was conducted:

- from 1993 (the division of Czechoslovakia into the contemporary Czech Republic and Slovakia) to 2021, in terms of identifying phases of business cycles in the economies of

Central European countries and the reactions of the banking sector and its environment in these countries in terms of their stability,

- from 2000 to 2021, in terms of assessing the stability level of the banking systems of Central European countries against the backdrop of economic business cycle fluctuations.

Purpose of the Dissertation, Hypotheses, and Research Methods

Based on the formulated research problem, the objectives of the dissertation were defined.

The main goal of the dissertation is to assess the stability of the banking systems of Central European countries during business cycles.

The main objective of the dissertation requires the achievement of the following subsidiary goals, namely:

1. To define the essence of the business cycle, as a key element of economic functioning, its mechanism, and phases of progression,
2. To present approaches to the business cycle in the aspect of financial stability and social welfare,
3. To identify and select methods for measuring business cycle fluctuations,
4. To discuss the economic concept of the stability of the banking system as a public good, determine its determinants and metrics,
5. To determine the phases of the business cycle in the countries of Central Europe during the studied period,
6. To identify activities in the banking systems during various business cycles in the countries of Central Europe,
7. To assess the reaction of the banking sector environment to business cycle changes in the countries of Central Europe,
8. To assess the impact of the business cycle on the financing structure of the banking sector and its level of efficiency in the countries of Central Europe,
9. To evaluate the level of stability of the banking system during business cycles in the countries of Central Europe.

The main goal of the dissertation became the basis for formulating the main research hypothesis, which is as follows:

The stability of the banking systems of Central European countries is related to the economic cycles in the economy.

The following auxiliary hypotheses detail the main hypothesis:

1. The banking sectors of Central European countries play a key role in financing the economy and can provide support during periods of business cycle fluctuations.
2. Banks strive to reduce costs and increase operational efficiency in order to maintain their competitive position, which also impacts the stability of banking systems in Central European countries.
3. The economic business cycle has a significant impact on the financing structure and stability of banks in Central European countries.
4. The ability of banks to maintain profitability, liquidity, and capital resilience under diverse market conditions is crucial for the functioning of the economies of Central European countries.
5. Banks in Central European countries have varied abilities to absorb losses, thereby differing in their resilience to potential crises.

To verify the posed research hypotheses, the following research methods were used. In the theoretical part of the thesis, a critical analysis of selected literature was conducted. The work utilized over 280 bibliographic items and financial institution reports, supplemented by data from 170 online sources. Indicator analysis, causative-effect analysis, and comparative analysis were conducted. The analysis included GDP, unemployment, and inflation in identifying business cycles in Central European countries and 17 indicators that allowed for the assessment of the stability of banking systems in these countries. In the statistical data analysis, elements of three basic groups of descriptive statistics were used, i.e., measures of distribution location (measures of central tendency) - mean and median; measures of dispersion - range, variance, standard deviation; measures of distribution shape - skewness and kurtosis.

The research methodology adopted in the dissertation assumes the integration of quantitative and qualitative methods. Its basis is grounded theory, assuming a departure from aprioristic judgments at the beginning of the research (conducting research through an exploration of the internal functioning of the examined banking systems). The conclusions of the research are not generalizing - they only concern the studied countries. One may possibly, but with great caution, infer similarities between them.

Characteristics of individual chapters of the dissertation

The dissertation consists of five chapters, the content of which arises from the subjective and objective scope of the dissertation and the research problems analyzed, as well as the hypotheses verified.

In the first chapter, the theoretical aspects of the business cycle, which is a key element in the functioning of market economies, are presented. This chapter showcases the diversity of theories

and definitions of the business cycle presented by various authors over the years, from classical to contemporary approaches. It also explores the mechanisms and phases of the business cycle, highlighting their importance in economic dynamics. External and internal factors of the economic system dynamics, which are crucial for generating cyclicality in economic activity, are presented. Various methods and indicators used to analyze the economy are also discussed.

The second chapter focuses on understanding the economic concept of banking system stability in the context of dynamic changes in the global economy, the impact of globalization, technological advancement, and financial market liberalization. The importance of an appropriate level of safety and financial stability, both nationally and internationally, necessary for ensuring the efficiency of financial markets and protection against collapses and crises, is emphasized. The determinants of banking system stability and methods of its measurement and assessment that can be used by the central bank and other financial institutions are defined.

In the third chapter, both opportunities and risks arising from business cycle fluctuations that may contribute to the growth of financial stability and the development of the banking sector and the economy as a whole are identified. The author analyzes the dynamics of GDP, the unemployment rate, and inflation in Central European countries (Poland, Hungary, Slovakia, and the Czech Republic) to understand how these countries managed economic transformation after the fall of communism, integration into the European Union, and other economic challenges such as the global financial crisis and the COVID-19 pandemic. The impact of activity in the banking sector on economic development dynamics is also examined, aiming to better understand the interrelations between the banking sector and the economy's condition.

The fourth chapter is dedicated to analyzing the impact of economic business cycles on the financial behaviors of households and businesses and their influence on the banking sector. The author analyzes how different phases of the business cycle affect the propensity to save and borrow by both households and businesses and how these behaviors translate into the dynamics of deposits and loans in the banking sector. Actions taken by these institutions to maintain the financial stability of the banking system are also shown, with particular emphasis on changes in interest rate policy conducted by central banks. This chapter also indicates how increasing competitiveness affects the efficiency of banks through the introduction of innovative solutions and changes in interest margins, which in turn impacts the entire economy.

The fifth chapter presents the impact of different phases of the business cycle on the basic indicators of financial performance assessment of the banking sector in Central European countries. It shows how profitability ratios like Return on Equity (ROE) and Return on Assets (ROA) change depending on the economic cycle, as well as how the cost-income ratio is shaped against these changes. Also significant in this chapter is the assessment of the stability level (safety) of the

banking system in the context of various economic and financial indicators in Central European countries during the studied period. It is demonstrated that the stability of the banking system is closely linked to the condition of the economy, as evidenced by the correlation between various financial indicators of banks (such as the solvency ratio, loan-to-deposit ratio, share of non-performing loans, Z-score) and GDP dynamics.

1. Business cycles

1.1. Theoretical approach to the business cycle.

Short and medium-term business cycles have existed and continue to exist in highly developed market economies. These oscillations were also a feature of centrally managed systems. Also, in countries undergoing transformation from a centralized to a market system, there are changes in economic activity that are more or less regular.

Business cycles are a commonly observed phenomenon in economies and have been the subject of many studies and analyses over the years. The development of business cycle theory has been widely discussed in the literature, starting from the works of classical economists like Jean-Charles-Léonard de Sismondi or John Stuart Mill, to contemporary econometric models. (De Sismondi Simonde & Leonar Jean Charles, 2013)

Despite the fact that business cycles have been a subject of interest for researchers for many years, they have not received a single definition. Definitions and theories concerning the business cycle vary depending on the theoretical approach and the era in which various economists lived. Table 1 presents several exemplary approaches to defining the business cycle according to different authors.

The final definition and interpretation of the business cycle can vary depending on the theoretical framework in which a given economist is working, the assumptions, analytical tools, and historical context, but all attempt to explain the natural fluctuations in economic activity.

For the purpose of this study, the term "business cycle" is understood as a pendular, recurring, though not always regular, movement in terms of both length and amplitude of fluctuations in economic activity, total national product, employment, and income. This phenomenon is usually accompanied by a significant increase or decrease in the level of economic activity noticeable in all sectors of the economy. It manifests itself in absolute changes, fluctuations in the growth rate, or deviations from the trend of important economic variables describing the level of economic activity. (Tvede, 2006a) The most important indicators signaling changes in the business cycle are primarily Gross Domestic Product, population income, or investment outlays, as well as those that directly result from the business cycle, such as employment, the ratio of imports to exports, and also corporate profits. (Nordhaus William D & Samuelson Paul A., 2010)

The business cycle is composed of four classical phases, which are illustrated in Figure 1. (Kwiatkowski & Milewski, 2018)

Table 1 Definitions of the Business Cycle

Author/Title	Approach to Business Cycles
John Maynard Keynes / (Keynes, 2016)	The business cycle is a result of changes in aggregate supply and demand, especially in relation to investment and savings. In its theory, the state plays a key role in regulating the business cycle through fiscal and monetary interventions. Business cycles are therefore the result of changes in the level of investment and consumption. His theories focus on the role of government intervention and fiscal policy as tools for smoothing out the business cycle.
Milton Friedman / (Friedman et al., 2017)	As a representative of the monetarist school, he believed that the main cause of business cycles are improper monetary policy decisions, which lead to changes in the money supply. Business cycles are therefore mainly the result of mistakes in monetary policy, leading to instability in the money supply and thereby affecting the entire ecnomy.
Joseph Schumpeter / (Schumpeter, 2021)	He emphasized the role of innovation and entrepreneurship in shaping the business cycle. According to him, waves of innovation lead to economic growth, which then undergoes natural processes of adaptation and correction. The business cycle is therefore the result of the process of "creative destruction," in which innovations lead to economic growth but also to the elimination of outdated forms of production and employment.
Friedrich Hayek / (F. A. von (Friedrich A. Hayek & Klausinger, 2012)	As a representative of the Austrian school of economics, he believed that business cycles are caused by improper coordination between stages of production and consumer preferences, often resulting from mistakes in monetary policy.
Robert Lucas / (Lucas, 1991)	In the context of real business cycle theory, Lucas and other neoclassical economists argued that economic fluctuations are a natural part of the economy's functioning and are the result of external shocks, such as changes in technology or commodity prices. This means that business cycles are a natural part of the functioning of a market economy and are the result of reactions to external shocks (e.g., technological changes).

Hyman Minsky / (H. P. Minsky & Papadimitriou, 2005)	He is known for his theory of the financial cycle, which is often linked with the business cycle. His theory describes how periods of financial optimism lead to speculation and excessive debt, ultimately ending in a financial crisis and recession. Therefore, the business cycle is closely related to the financial cycle and periods of "financial euphoria." When conditions are good, businesses and individuals are more inclined to take risks and incur debt, which ultimately leads to a financial crisis.
Arthur Spiethoff / (Schweitzer, 1941)	Economic history shows that the most important macroeconomic variables, such as national income, consumption and production, investment, and employment, grow unevenly. The pace of their growth is characterized by periodic fluctuations of varying strength. These periodic changes in the level of economic activity are called business cycles.
Karl Marx / (Hollander, 2008)	Although this is not in line with mainstream economics, it's worth mentioning this author, who believed that business cycles are an inherent feature of capitalism, resulting from the drive to maximize profit and the exploitation of the working class. This means that business cycles are an integral part of the capitalist production system, in which tendencies towards overproduction and crises are built into the mechanisms of capitalism.

Source: Own elaboration based on the cited literature.
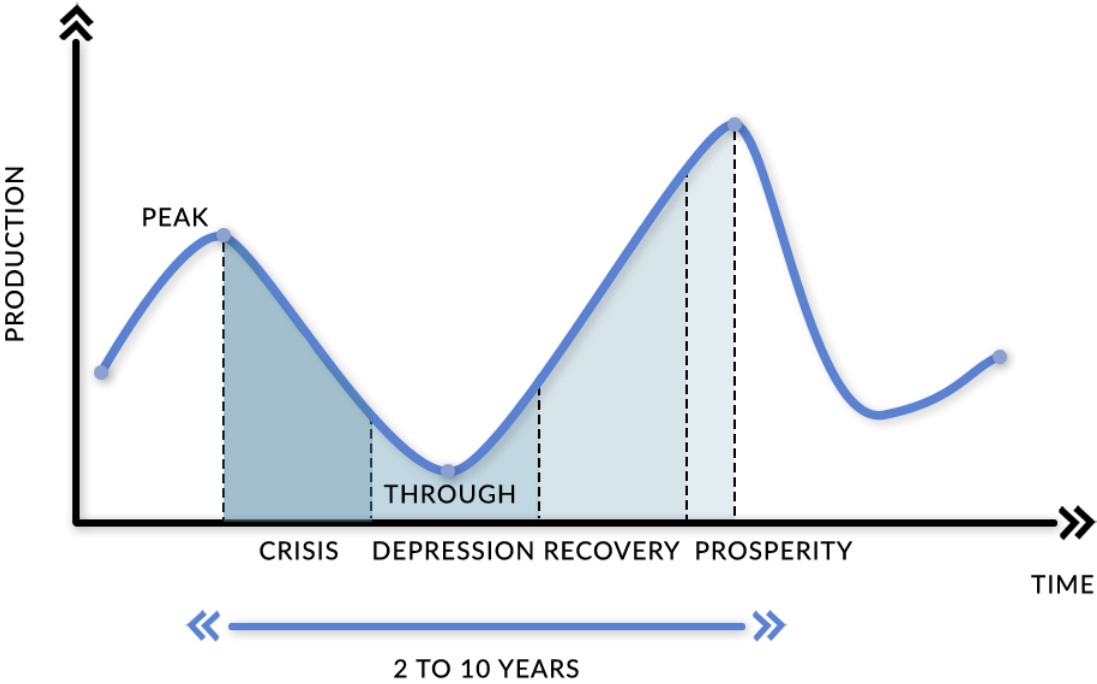
Figure 1 Course of the classical business cycle

Source: Own elaboration based on (Kwiatkowski & Milewski, 2018)

Based on the analysis of the above drawing, it is possible to distinguish two main phases of the business cycle. The downturn phase, which includes crisis and depression, is called a recession. During this phase, real GDP continuously decreases (for at least two consecutive quarters). (Amusa Abdulateef, 2017) On the other hand, the growth phase is defined as expansion and is the exact opposite of a recession. It includes recovery and prosperity. During expansion, GDP grows, unemployment decreases, the level of investment increases, and overall economic activity is stronger. (Carlin & Soskice, 2014) In this phase, we can also notice two characteristic points: the peak and the trough of the business cycle, which are also the turning points of the cycle.

In each of these phases, characteristic points occur: the peak and the trough of the business cycle. The peak is the moment when the economy reaches its highest level of economic activity before starting to decline. The trough is the point where economic activity reaches its lowest level before it starts to grow again. These turning points are extremely important as they signal the transition from one phase of the business cycle to another. (Zarnowitz, 1992)

Generally speaking, understanding the phases of the business cycle and their characteristics is crucial for both economists and policymakers, who must make decisions aimed at mitigating the effects of recessions and stimulating expansions. The complexity of these processes leads many researchers to continually seek better models and strategies for managing the business cycle. (Arnon. Arie, 2022)

The crisis phase is associated with an economic collapse. The most noticeable aspect is a decline in key macroeconomic indicators. As a result, banks become more restrictive in granting loans, leading to a drop in investment and, subsequently, difficulties in selling goods. This situation creates a surplus of supply over demand in the market, causing an increase in inventories held by producers. Consequently, there is a decline in production, profits, production capabilities, and employment. A decrease in prices also becomes apparent, leading to a slowdown in the rate of inflation. (Caban Wiesław, 2001)

The fading of the downward trend in production, profits, employment, wages, and prices is evident in the depression phase. The point at which key macroeconomic indicators reach their lowest level is called the trough of the business cycle. The trend in investments and consumption also stabilizes at a certain, low level. As a result, companies that have survived in the market are forced to improve profitability. A characteristic of this phase is also the maximum restriction in the granting of loans by commercial banks, which largely causes a decrease in investment demand and consumption. (Alegria, 2021)

The crisis and depression phase is a particularly dramatic stage of the business cycle, where the economy experiences a sharp decline in activity. Significant drops in key macroeconomic

indicators such as production, profits, investments, and employment are characteristic of this phase of the cycle. (Takahashi, 2022)

During an economic crisis, banks often restrict the granting of loans, leading to a decline in investments. (Bernake, 1983) Reduced lending causes difficulties in selling goods, an oversupply in the market, an increase in inventories among producers, and further declines in production, profits, and employment.

Depression is the phase where the downward trend stabilizes at a very low level. Key macroeconomic indicators reach their minimum, often referred to as the trough of the business cycle. As noted by Eichengreen, depression is a period when the economy typically reaches its lowest levels of production and employment. (Eichengreen, 1996) A significant decline in prices, which may lead to deflation—an overall decrease in the price level—is also notable. Both phenomena often occur simultaneously.

In the depression phase, companies that have survived the crisis are forced to look for ways to improve their profitability. During this period, commercial banks usually maximize restrictions on granting loans, causing an additional decline in investment demand and consumption. (Atkeson & Kehoe, 2004)

Understanding and managing these phases is crucial for policymakers and economists. Using various policy tools, such as monetary and fiscal policies, governments and central banks attempt to mitigate the effects of recessions and stimulate economic recovery. (H. P. Minsky & Papadimitriou, 2005)

The recovery phase marks the beginning of economic expansion, signaled by a gradual improvement in key macroeconomic indicators. This phase is characterized by rising demand, initially only in investment, which also results in increased production, revenue, profits, and employment. A rise in prices is also characteristic of this phase of the business cycle. (Caban Wiesław, 2001)

The prosperity phase is characterized by the highest level of economic activity, exceeding the economic activity observed during the last peak. This phase features a very dynamic growth in basic macroeconomic indicators, which consequently reach the upper turning point of the business cycle. (Schweitzer, 1941) High sales volumes, high profitability rates, and high levels of employment stabilize production at a high level. High price levels can also be observed during this phase. (Olschwang, 2022)

The recovery and prosperity phase is a time when the economy regains its strength after a period of recession and moves toward full economic health.

During the recovery phase, a gradual rebound in key macroeconomic indicators is noticeable. This usually starts with a revival in investments, leading to increased production, revenue, profits, and employment. During this time, prices also begin to rise. (Hicks, 1959)

The next stage is the phase of prosperity, when economic activity reaches its peak and surpasses the level of the last peak. Macroeconomic indicators grow very dynamically and reach the upper turning point of the economic cycle. As Kindleberger suggests in his work, this phase is often associated with excessive optimism and speculation, which can lead to "bubbles" in various markets. (Kindleberger & Aliber, 2011)

Sales, profitability rates, and employment are at high levels, and production stabilizes at a high level as well. High prices are also characteristic of this phase of the cycle. Hayek points out how the rise in prices, especially in the capital goods sector, can serve as a signal for investors, leading to increased investment, which in turn fuels further growth. (F. A. von Hayek et al., 2012)

During these two phases, the economic policy of the government and the central bank often focuses on maintaining stable growth, avoiding excessive overheating of the economy, and controlling inflation. For example, the central bank may decide to raise interest rates to combat inflation, which is well-described in economic literature. (Taylor, 1993a)

Undoubtedly, there is a cause-and-effect relationship between these phases, as processes and mechanisms occurring in one phase of the economic cycle condition the processes and mechanisms that manifest in the next phase.

The range that appears between the upper and lower turning points is defined as the amplitude of cyclical fluctuations. As it increases, we can observe a more explosive course of the economic cycle; conversely, as it decreases, we observe a softening of the cycle. (Aspachs et al., 2007)The course of subsequent economic cycles is usually irregular due to the large variation in individual phases and amplitudes of fluctuations. However, despite this, they are generally similar to each other, so during each subsequent cycle, we observe similar shaping of certain economic variables. (Kwiatkowski & Milewski, 2018)

The cause-and-effect relationships between different phases of the economic cycle are a key element of business cycle theory. Excessive investments during the expansion phase can lead to instability and ultimately a decline in the recession phase. (F. A. von Hayek et al., 2012) Therefore, the mechanisms operating in one phase can shape the processes observed in the next phase.

The amplitude of the economic cycle, which is the difference between the upper and lower turning points of the cycle, is a measure of the strength of economic fluctuations. An increased amplitude of the economic cycle can lead to greater economic instability, while a decreased amplitude can indicate a milder course of the cycle. (H. Minsky, 2016)

The course of economic cycles is often irregular due to various factors that can affect the economy, including economic policy, external shocks, technological changes, and others. Despite these differences, economic cycles often show some similarities, so the shaping of certain economic variables during each cycle is to some extent predictable. (Lucas, 1977)

The growth phase can set the stage for the next recession by creating excessive optimism and speculation, which can lead to "bubbles" in various markets. (Kierzenkowski, 2002) In this way, decisions made during one phase of the cycle can have long-lasting effects that influence future phases of the cycle.

1.2. Theories and types of business cycles

Determining the causes, course, and mechanisms of the lack of economic stability is complicated, undoubtedly due to the nature of economic processes, their diverse mechanisms affecting social welfare, and various feedback loops associated with these mechanisms. Therefore, we can distinguish many concepts that attempt to explain the course of business cycles, differing only in the emphasis placed on the role of individual factors shaping the business cycle.

Systematic research into fluctuations in economic activity began in the 19th century. Theoretical considerations on the subject emphasized the existence of two main theoretical concepts. One spoke of the impossibility of avoiding economic downturns, particularly promoted by J. Ch. S. de Sismondi and T. R. Malthus. The second trend characterized the view of the random nature of fluctuations in economic activity, popularized, among others, by J.B. Say. (Orłowska, 2003)

J. Ch. S. de Sismondi and T. R. Malthus belonged to the so-called pessimistic school, which proclaimed the inevitability of economic fluctuations, called business cycles. According to them, these fluctuations resulted from the inevitable imbalance between production and consumption in the capitalist economic system.

For example, Sismondi argued that capitalist production systems generate excessive production, which ultimately leads to a crisis. (De Sismondi, 1955) Similarly, Malthus argued that population growth leads to increased production but also to an imbalance between production and consumption, which eventually leads to an economic collapse. (Malthus et al., 2018)

On the other hand, J.B. Say, a representative of the optimistic school, argued that business cycles are a random and temporary phenomenon. According to Say, these fluctuations result from temporary disruptions, such as wars, political changes, or natural disasters. His famous "Say's Law" states that "production creates its own demand," which means that, in the long term, the economic system should return to a state of equilibrium. (Say, 1960)

The period with the highest number of formulated theories on the origins of business cycles falls between 1870 and 1930. It can be called the golden age of business cycle theories. During this time, many theories emerged trying to explain economic fluctuations; however, due to their diversity and abundance, it is difficult to comprehensively systematize them. Nevertheless, there are several key concepts and trends that have gained the most popularity and are still widely cited. Therefore, only the most popular concepts of business cycles will be presented.

One of the more important trends in existing theoretical concepts is the classification of the causes of business cycles into exogenous (external) and endogenous (internal) factors.

BUSINESS CYCLES

**Exogenous (external)**

Endogenous (internal)

Figure 2 Business cycles classification

Source: Own elaboration based on (Rosier & Dockes, 1987)

Exogenous theories see the sources of business cycles as fluctuations in external factors relative to the economic system. In many of these concepts, the economic system is viewed as relatively stable, so the emergence of business cycles does not result solely from the characteristics of the system itself. Factors that determine the emergence of cyclical patterns in the economy primarily include: elections, wars and revolutions, oil prices and other important natural resources, scientific discoveries and related technological innovations, and even meteorological phenomena that can affect production. This theory suggests that the economy is generally stable and returns to a state of equilibrium after external disturbances.

The most important exogenous theories include the meteorological, political cycle, and innovation concepts. (Nordhaus William D & Samuelson Paul A., 2010) The meteorological concept of the cycle, formulated in the 19th century by W.S. Jevons, was one of the first theories of this type to emerge. It associates economic fluctuations with changes in the Sun's atmosphere, specifically the size and number of sunspots. According to the knowledge at the time, cyclical changes in the number of sunspots, especially their increase, were seen as the cause of crop failures, which in turn led to cyclical changes in industrial production. Consequently, it was assumed that the existence of cycles in the economy is the result of external natural forces affecting economic processes. The rhythm of economic life and the changes occurring in it were seen as phenomena directly dependent on the level of solar activity (Caban Wiesław, 2001).

EXOGENOUS THEORIES

Meteorological concepts

Political cycle concepts

Innovation concepts
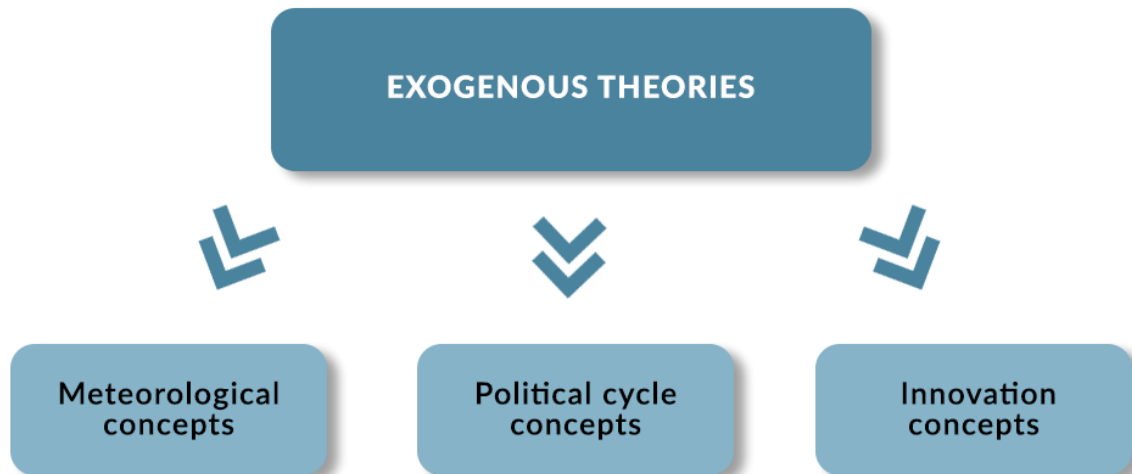
Figure 3 Endogenous theories classification

Source: Own elaboration based on (Rosier & Dockes, 1987)

This theory assumes that changing weather conditions can cause fluctuations in agricultural production, which then affects the entire economy. For example, adverse weather conditions can lead to food shortages, which in turn leads to rising prices, reduced consumption, and economic recession.

Another important exogenous theory is the political cycle theory, which emerged in the 20th century, with M. Kalecki as its precursor. (Rosier & Dockes, 1987) It identifies the activities of politicians, who often manipulate macroeconomic tools to stay in power, as the cause of economic fluctuations. According to this theory, political decisions, such as changes in fiscal or monetary policy, can cause cyclical changes in the economy. For example, a government may increase spending and lower taxes before an election, leading to economic growth. However, after the election, it may be necessary to incur debt or raise taxes, leading to an economic slowdown. History suggests that parliamentary elections are influenced by the economic conditions of the preceding year, so changes in economic priorities become evident with each election cycle for successive ruling parties aiming to gain support. Because voters are most influenced by the current economic situation, to ensure reelection, the government may initially deliberately "cool down" the economy by conducting restrictive monetary or fiscal policies. Later, in the pre-election period, they can stimulate the economy using previously prepared reserves and tools. The consequences of such manipulation of the economy by politicians can be an increase in inflation, a decrease in disposable income, investments, and savings, or even a disruption of the country's trade balance. In the face of such a situation, the government, directly after the elections, increases the tax burden

while limiting state expenditures and allowing for a reduction in the money supply and an increase in interest rates. Currently, this is a less popular theory. (Marciniak, 2022)

Another concept of the business cycle is Joseph Schumpeter's theory of innovation cycles, which identifies the emergence of technical-organizational innovations as the cause of cyclical fluctuations in the economy. This theory is one of the most well-known approaches to understanding the role of innovation in the economy.

According to Schumpeter, innovations act as the engine of economic growth and lead to "creative destruction" — a process in which new technologies, products, or methods of production replace older, less efficient solutions, contributing to their downfall but simultaneously opening doors for new opportunities and economic growth. (Schumpeter, 1934) According to this concept, ground breaking scientific discoveries and technological innovations can lead to cyclical fluctuations in the economy. New technologies can bring rapid economic growth but can also replace older technologies and result in job losses, leading to recession. Moreover, the process of adopting new technologies can take a long time, resulting in cyclical ups and downs in the economy.

However, according to this theory, the mere existence of an infinite stream of innovations is not a sufficient condition for economic development. There should also be an entrepreneur interested in utilizing the new idea in their business. In this case, extraordinary profits that are achieved thanks to revolutionary solutions become an impulse for other entrepreneurs, who act as followers, to pursue the pioneering innovation. A rapid dissemination of innovation occurs, along with a wave of intensified investments, causing an increase in production, which usually isn't accompanied by a corresponding increase in demand. This situation leads to a drop in prices, and along with it, a decline in the rate of profit, which consequently results in a decrease in investment demand and pushes the economy into a crisis phase. Only the next impulse in the form of new innovations and their dissemination will cause the economy to re-enter a phase of recovery. Therefore, it can be observed that, according to this theory, the introduction and subsequent dissemination of innovations not only condition economic growth but also determine its cyclical nature. (Kwiatkowski & Milewski, 2018)

All these theories illustrate the complex interactions between external factors and the economy, showing how these factors can influence the economy's cyclicality.

The second group of business cycle theories mentioned earlier are endogenous theories. These focus on finding mechanisms that initiate the business cycle from within the economic system itself. In these views, the cause of cyclical fluctuations is seen as instability within the economic system. These concepts are concentrated on the internal dynamics of a given economic system, while external factors are considered secondary because the theories mainly focus on the internal dynamics of the system. (Orłowska, 2003)

Endogenous theories of the business cycle focus on mechanisms that initiate the cycle from within the economic system. According to these theories, the cause of business cycles is the internal instability of the economic system. In this framework, the economy is not a stable system but a dynamic one, where fluctuations are triggered by internal tensions and interactions between various elements of the system.

These endogenous theories suggest that the economy is inherently unstable and that cyclical fluctuations are not just the result of external shocks but also arise due to the economic system's own dynamics. This perspective allows for a more nuanced understanding of economic behavior by acknowledging that fluctuations can be an intrinsic part of how economic systems operate.

The most important theories of this type are generally considered to be the business cycle fluctuations consistent with the economic theories of J.M. Keynes and M. Kalecki. (Lubiński, 2003)

Figure 4 Business cycles theories

Source: Own elaboration based on (Lubiński, 2003)

The theoretical model of the business cycle by J.M. Keynes, also known as the multiplier-accelerator model, assigns fundamental importance to changes in investment spending. According to this theory, economic fluctuations are caused by changes in aggregate demand, particularly in investments. In Keynes's view, investments are inherently unstable because they are tied to expectations about future profits, which are uncertain. When entrepreneurs become pessimistic about the future, they reduce their investments, leading to a decline in aggregate demand, rising unemployment, and recession. (Jakimowicz, 2003)

An increase in investment demand, consistent with the investment multiplier theory, leads to a multiplied growth in national income. The operation of this multiplier is tied to the demand-driven condition of the national economy. That is, aggregate demand determines the extent to which economic growth, induced by supply factors, can be multiplied. Therefore, an increase in investment demand during a slump triggers the release of positive multiplier effects, eventually leading to an increase in national income. With the increase in income, investment demand indirectly also stimulates consumer demand.

The need to satisfy growing consumer demand triggers another increase in investment demand. The increase in the production of consumer goods necessitates having additional capital resources in the form of net positive investments. These investments, which are triggered by changes in consumption and national income, are defined as induced investments. The relationship between changes in national income and changes in induced investments is determined by the accelerator principle. This principle states that a change in national income results, with some lag, in changes in induced investments. (Piech, 2012)The magnitude of the multiplied induced investments depends on the durability of the production equipment and the scale of changes in consumer demand caused by changes in income.

Overall, the Keynesian model emphasizes the complexity of economic cycles and the interconnectedness of various factors such as investment, consumer demand, and national income. It suggests that internal dynamics, driven by aggregate demand, can initiate and propagate business cycles. (Kwiatkowski & Milewski, 2018)

The multiplier-accelerator model of John Maynard Keynes is one of the central models in macroeconomics, enabling an understanding of the mechanisms leading to economic cycles. (Romanow, 1999)According to this model, changes in investment expenditures are crucial for the dynamics of the economy. When companies increase their investments, global demand rises. In line with Keynes' multiplier concept, an increase in investment by a certain amount leads to a multiplied increase in national income. This is the result of the multiplier effect, where an increase in investment demand leads to increased production, which in turn increases workers' incomes. These incomes are then spent, further increasing demand and production, and so on.

On the other hand, increased incomes lead to increased consumer demand. To meet this increase, companies must invest in additional production resources, leading to another rise in investments. Such investments, induced by changes in consumption and incomes, are called induced investments.

The principle of acceleration describes this relationship, suggesting that a change in national income brings about, with some delay, changes in induced investments. Hence comes the name of the multiplier-accelerator model: the multiplier refers to the effect of multiplying national income triggered by an increase in investment, and the accelerator refers to the effect where an increase in national income stimulates additional investments.

The size of the induced investments depends on two main factors: the durability of production equipment and the magnitude of changes in consumer demand brought about by changes in income. If the equipment is less durable, larger investments are needed to replace old machines and equipment. Similarly, if the increase in income leads to large changes in consumer demand, companies will have to invest more to meet this increased demand.

The theory of the multiplier and accelerator provides an opportunity to explain the cumulative processes that contribute to an economy's transition into a recovery phase. The increase in national income and consumer demand influences the multiplication of investment demand. The mutually stimulating and increasing demand should be realized through increased utilization of available production capacity. This process results in rising production costs and dampens further profitability growth. The reversal of the upward profitability trend impacts entrepreneurs' subsequent decisions about capital accumulation, who then begin to reduce investment demand. Consequently, the weakening of investments leads to negative multiplier effects and further decreases in both investment and consumer demand.

The weakening demand meets the supply effect of earlier investments. There is a time lag between these effects; the demand effect appears during the execution of a specific investment, while the supply effect related to increasing production capacities in the economy occurs only after its completion. (Burda & Wyplosz, 2013)The supply effect can be maintained as long as investments are positive. However, to achieve the demand effect, an absolute increase in investments is necessary. Investment stabilization ensures increasing production capacities but is insufficient by itself to trigger the operation of the multiplier.

It's worth noting that investments play the most critical role in the process of economic growth. The simultaneous occurrence over time of weakening demand and the supply effect from earlier investments results in an increasing disparity between the dynamics of production potential increases and the growth of effective demand. These differences are reflected in overproduction crises. (Zadora & Zieliński, 2012)

Thus, crises play a unique role in cyclical development and also activate mechanisms that restore conditions for extended production. They influence the increase in economic dynamics and its further development. (Kwiatkowski & Milewski, 2018)

The theory of the multiplier and accelerator is fundamental to understanding the processes leading to economic growth and recovery phases. As mentioned earlier, the increase in national income and consumer demand leads to a multiplication of investment demand. This demand drives mutual growth in various sectors of the economy, leading to the utilization of the economy's full production potential. However, according to the theory, this increase in investment leads to a rise in production costs, which may consequently limit firms' profitability. As a result, these companies may decide to reduce their investments, leading to a drop in overall investment demand and triggering negative multiplier effects.

These declines in demand then encounter the supply effect resulting from earlier investments. There is a noticeable time lag here because the demand effect occurs during the execution of investments, while the supply effect—a boost in the economy's production capacity—appears only

after the investment is completed. The supply effect persists as long as investments are positive, but to evoke the demand effect, absolute increases in investments are necessary. In other words, maintaining investment levels may ensure growth in production capacity but is not sufficient to activate the multiplier effect. Nonetheless, investments are crucial for economic growth.

When demand weakens simultaneously with the supply effect from earlier investments, a disparity may arise between the dynamics of the increase in production potential and the growth of effective demand. These differences can lead to an overproduction crisis. (Keynes, 2016)

Although painful, crises play a significant role in the cyclical development of the economy. They create conditions for the restoration of extended reproduction, contributing to increased economic dynamics and further development. Stabilizing mechanisms, activated during a crisis, can contribute to the rebuilding of the economy and its adaptation to new conditions, enabling further growth.

Another endogenous theory is the business cycle concept formulated by M. Kalecki. It focuses on the role of income distribution between labor and capital. According to this theory, an increase in income inequality can lead to an economic crisis because workers have a lower propensity to save compared to capital owners. Therefore, the rise in income inequality leads to a decrease in overall demand and a recession. This theory includes some simplifying assumptions; for example, changes in the economic cycle are considered under the conditions of a closed economy. This eliminates the influence of external factors on the internal level of economic activity. Another assumption relates to the existence of only two main social groups: capitalists, who receive income in the form of profit earmarked for consumption and accumulation, and workers, who, thanks to the wages they receive from their work, can satisfy their consumption needs. Additionally, this theory omits the existence of trends, meaning that after completing a full cycle, the economy returns to its original state. The reason for economic downturns is seen as the constant changes in the balance of power between employers and employees.

Michał Kalecki's business cycle theory, from the Polish economist, is an innovative approach to the analysis of business cycles, focusing on the dynamic interaction between capitalists and workers. This model employs certain simplifying assumptions to focus on the basic economic mechanisms. (Osiatyński, 2020)

First and foremost, Kalecki analyzes the economic cycle in the context of a closed economy, thereby eliminating the impact of external factors on a country's economic activity. In this way, the model focuses exclusively on internal processes and interactions, ignoring international factors that may influence the business cycle. The model assumes the existence of only two main social groups: capitalists and workers. Capitalists receive income in the form of profit, which they can allocate to

consumption or investment (capital accumulation), while workers, who earn their living from wages, use their income exclusively for consumption needs.
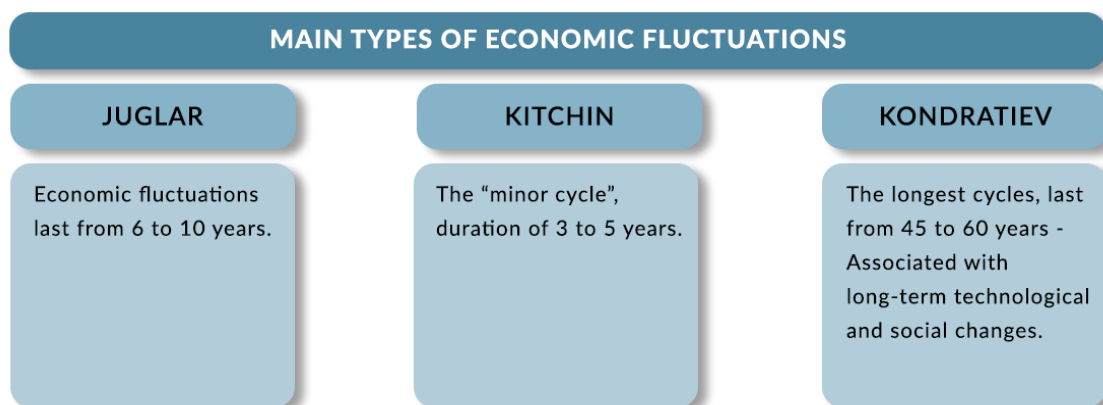
This theory also omits the existence of long-term trends, meaning that after each full cycle, the economy returns to its original state. This is a key assumption that allows for the study of purely cyclical economic fluctuations, without the need to consider long-term structural changes. In Kalecki's model, the cause of downturns in the economic cycle lies in changes in relations between capitalists and workers. Specifically, changes in income distribution between these two groups can affect demand, investment, and employment levels, which in turn leads to fluctuations in economic activity. For example, an increase in the share of workers' income may boost consumption but simultaneously discourage capitalists from investing, ultimately leading to a decline in economic activity. (Kalecki, 2007)

Business cycles are primarily driven by changes in the size of private investments in fixed capital. An increase in investment orders leads to increased production of capital goods (gross accumulation), which contributes to the continuation of active investment activities. Growth occurs when the supply of investment goods does not exceed the level of demand for expanding the production apparatus. The appearance of such a situation leads to a decrease in investment orders. The decline then lasts until investment orders once again fall below the level necessary to maintain the stability of the production apparatus. The reduction of the production apparatus leads to an increase in the level of investment orders, which begin to oscillate around the level necessary to maintain production stability.

In this theory, production is seen as the sum of the incomes earned by capitalists and workers, and these wages are equal. Fluctuations in the incomes earned by workers are smaller than fluctuations in production. Therefore, it is noted that the share of capitalists in social income is subject to change along with the movements in overall production, while the share of workers decreases during periods of expansion and increases during recessions.

The main components of global production are consumer goods and investment goods. The production of investment goods corresponds to gross accumulation, while the production of consumer goods equals the sum of wages, which are entirely spent on the purchase of consumer goods and capitalist consumption. (Sokołow, 1970) Therefore, the production of consumer goods tends to have lower fluctuations than overall production and gross accumulation. It can thus be pointed out that during the business cycle, both the size of social production and its structure are subject to change. (Lubiński, 2003)

Research on business cycles has led to the identification of three main types of economic fluctuations, which differ in their duration. These are Kitchin, Juglar, and Kondratiev cycles:

MAIN TYPES OF ECONOMIC FLUCTUATIONS

JUGLAR	KITCHIN	KONDRATIEV
Economic fluctuations last from 6 to 10 years.	The "minor cycle", duration of 3 to 5 years.	The longest cycles, last from 45 to 60 years - Associated with long-term technological and social changes.

Figure 5 Three main types of economic fluctuations

Source: own elaboration based on (Kwiatkowski & Milewski, 2018)

These different cycles are interconnected and influence each other, creating a complex pattern of economic fluctuations. While these cycles vary in length, they maintain a close relationship with one another: the curves of the longer cycle serve as a trend for the shorter cycle. In this way, the growth phase of a longer cycle indicates an extension of the growth phase in a shorter cycle, while the contraction or downturn phase of a longer cycle tends to extend and deepen the downturn phases of shorter cycles. (Kwiatkowski & Milewski, 2018)

This interconnectedness highlights the complexity of economic behavior and the many factors that can influence the direction of an economy at any given time. The coexistence and interplay of these various cycles provide a multi-layered, dynamic view of economic fluctuations, making the analysis and forecasting of economic trends a challenging but vital endeavour.

The basic type of business cycles was identified by Clément Juglar, a French economist and statistician. He was one of the first scholars interested in studying the cyclical development of the economy. By creating an economic model of the business cycle, he laid the foundation for research in this area of economic life. This cycle is considered a medium-term business cycle.

Juglar distinguished two phases of business cycles: the expansion phase (growth), which runs from the low to the high turning point of the cycle and is characterized by a positive rate of economic growth; and the recession phase (downturn), which runs from the high to the low turning point of the cycle, and is characterized by a decline in key macroeconomic variables. The time during which production was in a strongly decelerated growth phase was also considered a recession. The downturn phase of the business cycle was also referred to as a crisis.

The Juglar cycle, also known as the classical or primary cycle, points to fluctuations in the level of economic activity occurring since 1815 with a fairly high degree of regularity. It has been observed

that the cycles of economic fluctuations last from 6 to 10 years, with the dominant ones having an average duration of 8 years. According to this concept, the causes of cyclical fluctuations are monetary and credit phenomena. In Juglar's opinion, the crisis was a consequence of restricting bank credit expansion during prosperity. Therefore, certain adverse changes occurred in the growth tendency of demand and the technical equipment of production, or in the level of investment in fixed capital. These changes occurred with a certain cyclicality, and these cycles affected the entire economy. (Orłowska, 2003)

This theory was important not only for its introduction of a two-phase model of the business cycle but also for its understanding of the complex relationships between the banking sector and the rest of the economy. It explained how changes in credit policy could lead to broad fluctuations throughout the economy, affecting production, employment, and investment. As a result, Juglar's work laid the foundation for later research on business cycles, including monetary theories of business cycles.

The shortest cycle of fluctuations is the one described in 1923 by Joseph Kitchin. It is also called the minor cycle, due to its duration of 3 to 5 years. These cycles are often associated with changes in inventories and market demand. Kitchin noticed that companies often accumulate stocks in anticipation of increased demand, leading to cyclical increases and decreases in economic activity. Kitchin identified these cycles based on the fluctuations that appeared in the United States between two consecutive classical crises identified by Juglar. Until the beginning of World War II, these cycles were only observed in the USA; they were not detected in Europe, most likely due to the lack of detail in the statistical studies conducted in that region at the time. It is assumed that one full classical cycle averages two Kitchin cycles. So far, no causal relationship has been detected between the occurrence of these two types of cycles. While Juglar cycles usually end abruptly, minor cycles most often end gently, without sharp collapses. The occurrence of Kitchin cycles is caused by changes in working capital inventories, and their consequence is fluctuations in the level of economic activity. (Orłowska, 2003)

The longest cycles, known as Kondratiev cycles, last from 45 to 60 years and are associated with long-term technological and social changes. They are named after the Russian economist Nikolai Kondratiev, who was the first to notice these long-term waves in economic data and presented them in 1922.

According to this concept, a regular repeatability of cycles lasting about 45 to 60 years is assumed. Four important factors have been identified as the causes of cyclicality: the sphere of money—inflation or deflation, innovations, and significant events in the political sphere, as well as the prevailing lifestyle.

According to Kondratiev, the business cycle consists of two phases: stagnation and growth, with the average duration of each phase being roughly equal. According to this concept, the phase of stagnation or growth is initiated by the economy of a country that is one of the world leaders. Long-term cycles are determined by the consumption and reproduction of the most important elements of fixed capital (production, construction, or transport investments). Such significant socio-economic changes, in Kondratiev's opinion, take place extremely slowly. Each subsequent cycle is the result of the accumulation of new technologies during the period of stagnation, leading to changes in the structure of the organization of the economy, which in turn results in another upswing. (Orłowska, 2003)

It's important to understand that these cycles are not isolated, but rather influence each other. For example, a longer cycle can shape the trend for a shorter cycle, with the growth phase of the longer cycle encouraging the extension of the growth phase in the shorter cycle. Similarly, a downturn in the longer cycle can contribute to the deepening and prolongation of the downturn in the shorter cycle. This interaction between different cycles adds an additional layer of complexity to the analysis of economic conditions.

Business cycles can also be distinguished by the scope of their occurrence, so one can identify global, regional, national, and local cycles. (Kwiatkowski & Milewski, 2018)
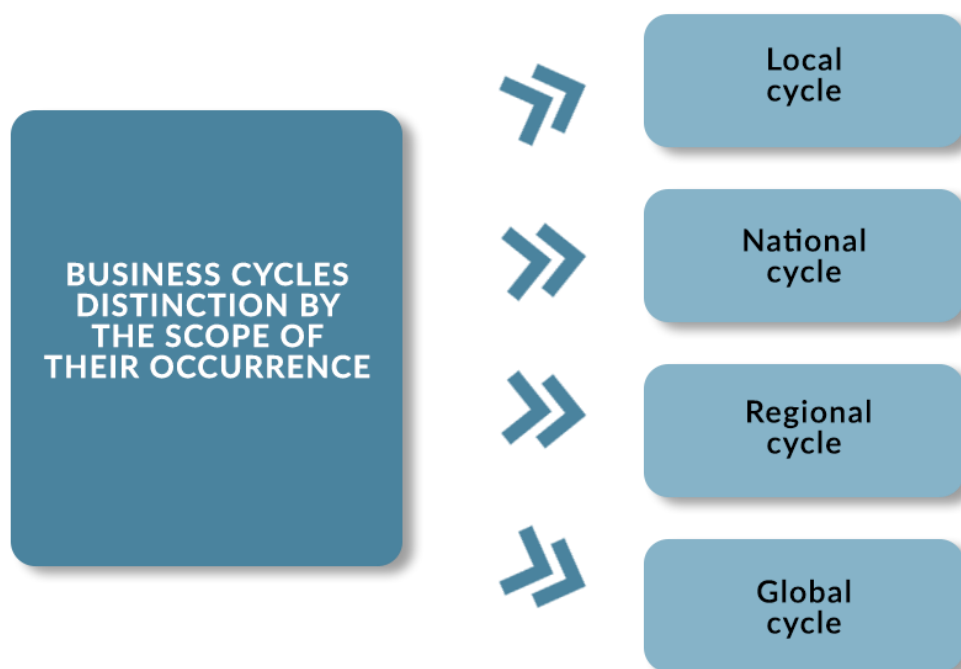
Figure 6 Business cycles distinction

Source: own elaboration based on (Kwiatkowski & Milewski, 2018)

The business cycle with the broadest geographic scope is the global cycle. These are cycles that affect most countries in the world, often related to global trends, such as technological innovations, changes in the international financial system, or global crises (e.g., the 2008 financial crisis). Kondratiev cycles, characterized by long periods (from 45 to 60 years), are often cited as examples of global cycles. Initially, the global cycle was described using the industrial production index on a global scale; however, it is now measured based on, among other things, global real GDP, global inflation, long-term interest rates, or global commodity prices. This cycle features significant synchronization of cycles in individual countries that are economically interconnected. (Piech & Wierus, 2012)It's worth mentioning that the concept of this business cycle applies not to the entire world but only to a group of countries playing a significant role in international economic relations and also having a significant share in global GDP production.

Regional business cycles, on the other hand, cover cyclical fluctuations in a group of countries that are economically interconnected and also geographically close to each other. They may also appear in regional integration arrangements, such as only in countries forming the European Union. These cycles affect specific regions and can be caused by regional factors, such as changes in trade policy, regional conflicts, or natural resources. For example, business cycles in European Union countries are often synchronized due to close trade and financial links.

National cycles, also known as national business cycles, are cycles that affect individual countries and can be caused by various factors, including fiscal and monetary policy, changes in domestic demand, or investments in infrastructure. (Ratajczak, 2014) These cycles are the most extensively researched and described in economic literature. The main identifying factor is real gross domestic product, as well as industrial production and unemployment in a given country.

Cycles with the smallest geographic scope are local cycles. These cycles impact specific local communities or sectors and can be related to very specific factors, such as the discovery of a new deposit of mineral resources in a given region or the opening or closing of a large manufacturing facility.

This typology shows that business cycles are a complex phenomenon that can be analyzed at different levels. Different cycles can also overlap and mutually influence each other, complicating the analysis and forecasting of economic phenomena.

1.3. Methods of measuring business cycle fluctuations

The characteristic feature of economic activity is its variability. Various reasons for this variability can be pointed out. Some of them are random, incidental, while others result from the impact of

specific administrative or institutional solutions, and yet others from the seasonal rhythm of certain activities.

Cyclical fluctuations and the business cycles that arise as a result of the sequence of their shaping are the subject of analysis by economists who focus on dynamic economic processes, occurring in both market systems and centrally controlled ones.

The term "economic climate" refers to the general state of the economy at a specific time, covering aspects such as economic growth, employment, inflation, and other economic indicators. Different authors and economists may define this term in various ways, but there are certain common elements that are often included in the literature on this topic. Definitions of the economic climate have been presented in Table 2.

Each of these definitions can be useful depending on the context and purpose of the analysis. In practice, many approaches to the analysis of economic conditions utilize a combination of different definitions and indicators. The subject of study in economic conditions broadly encompasses the dynamics of economic activity. An essential element of this is the mutual relationships between changes occurring simultaneously across all areas of economic activity.

All these theories provide different definitions and approaches to economic conditions, but they generally agree that it is a variable state of the economy influenced by various factors such as investment, consumption, technology, and government policy. In practice, economic analysts and policymakers often use a combination of these theories and indicators for analyzing and forecasting economic conditions.

1. Cyclicity, which is a periodic phenomenon, meaning that certain patterns of economic behavior repeat themselves at regular intervals;

Phases, as the business cycle is divided into phases, each characterized by certain economic indicators:

- Expansion is the phase of increased economic activity when GDP is rising, investments are at a high level, and the unemployment rate is dropping,
- Peak is the moment when the economy reaches its maximum production capabilities; it is usually characterized by high inflation and low unemployment,
- Recession is a period of decreased economic activity. GDP decreases, investments are limited, and the unemployment rate rises,
- Trough, which is the lowest point of the cycle where economic activity is at its minimal level. After this phase, expansion occurs again;

3. Global character, as business cycles are not isolated phenomena in one country. It is often a global phenomenon affecting many countries simultaneously, although different economies may be at different stages of the business cycle.

Table 2 Definitions of economic climate

Type of the definition	Characteristics
Classic Definition	In its simplest form, economic climate refers to the variable state of the economy, which can be described as a cycle consisting of phases of expansion (growth), peak, recession (decline), and trough.
Indicator-Based Definition	Some definitions rely on specific economic indicators, such as GDP, unemployment rates, inflation, etc., to describe the economic climate. For example, the expansion phase is usually characterized by an increase in GDP, a decrease in unemployment, and moderate inflation.
Behavioral Definition	Some approaches to economic climate focus on the behavior of economic agents, such as consumers and investors, as well as their expectations and decisions that influence demand and supply in the economy.
Financial Definition	In some works, the economic climate is described in the context of financial markets and their impact on the overall economic situation. Here, elements such as interest rates, working capital, and financial liquidity may be included.
Political-Economic Definition	From this perspective, the economic climate is often considered in the context of macroeconomic policy, including fiscal and monetary policy. Governments and central banks use various tools, such as changes in interest rates or tax policy, to influence the economic climate.
Global Economic Climate	In the era of globalization, the economic climate is increasingly considered in a global context, where different economies are interconnected and influence each other.
Sociocultural Definition	In some analyses, the economic climate is also considered in the context of social and cultural influences, such as demographics, technology, and social norms, which can affect economic behavior.
Mathematical and Statistical Definitions	The economic climate can also be analyzed using various mathematical and statistical models that try to quantify and forecast changes in the economy.

Source: Own elaboration based on: (D. Romer, 1996), (Tvede, 2006b), (Zarnowitz, 1992), (Blanchard, 2021), (C. D. Romer, 2002), (Krugman, 2018)

Based on the presented formulas, key points of the definition of economic conditions can be identified, which include:

Analyzing each of the economic processes in terms of the interpenetration of economic activity indicators and methods for isolating business cycle fluctuations undoubtedly requires an individual approach, dependent on the ways they are defined. Therefore, the most crucial issue becomes the identification of economic activity indicators. Different schools of economic thought (e.g., Keynesianism, monetarism, classical) have varying approaches to the analysis and interpretation of the business cycle. Ultimately, however, the goal of business cycle analysis is to understand economic dynamics to make more informed decisions by politicians, entrepreneurs, and individual consumers alike. The most important issue, therefore, becomes the identification of economic activity indicators. In the literature, one can find economic activity indicators that have been presented in Table 3. (Lubiński, 2003)

Table 3 Economic activity indicators

Group of Indicators	Types of Indicators
Production Indicators	-Gross Domestic Product (GDP); -Potential output; -Industrial production volume; -Other simple representative indicators;
Utilization of Production Factors Indicators	-Unemployment rate; -Capacity utilization rate;
Price Indicators	-GDP deflator; -Producer Price Index; -Consumer Price Index;
Money Market Indicators	-Money supply; -Interest rate;
Composite Indicators	-Diffusion index; -Composite index with normalized amplitude.

Source: Own elaboration based on (Lubiński, 2003)

The first group of indicators pointing to trends in the economy are production metrics. The size of real GDP is the most commonly used variable for observing short-term fluctuations in the economy because it is the most comprehensive and sensitive indicator of economic activity. One approach to determining GDP takes the sum of expenditures incurred in a given period for the purchase of goods and services at constant, current, or market prices as the basis for calculations. The most important elements of final demand that make it up are gross private investment, individual

consumption, government expenditure, and net exports, which in many theories are seen as variables significantly affecting the course of business cycles. It's worth noting that the dominant component in GDP is individual consumption, which is also very sensitive to business cycle fluctuations. The importance of investment is admittedly smaller than consumption, but they have an equally significant impact on the economy and its dynamics. Gross domestic product is also seen as a production measure that undoubtedly shows a significant correlation with the state of economic activity. (Lubiński, 2003) Another approach to determining it defines it as the monetary value at market prices of final goods intended for consumption and services, along with the value of all new capital goods produced in a given period. Gross domestic product can therefore be treated as a stream of income, supply, or demand. Of course, each of the mentioned methods leads to identical results. Therefore, regardless of the way GDP is calculated, it is always an element that allows for the determination of further income categories. By taking into account significant factors for a given indicator based on GDP, values of gross or net national product can be determined, as well as the sum of production factors' remuneration and the value of disposable income, based on which current changes in economic conditions can also be easily illustrated.

A competitive measure of economic activity relative to GDP is the size of industrial production. The most important advantage of the industrial production indicator as a measure of economic activity is undoubtedly its very high sensitivity to business cycle fluctuations and the dominant role of industrial production in determining significant investment sizes from both the demand and supply sides. Another significant factor is that all data useful for business cycle analysis related to industrial production are available more quickly for most countries than GDP information. (Roubini, 2011)However, it should be noted that all these advantages can be easily undermined by considering the fact that in modern economies of developed countries, industrial production often accounts for less than 30% of the size of gross domestic product, complicating business cycle analysis, which is inherently macroeconomic in nature.

Simple representative indicators, which are specific measures of production, are very important for the economy because they define only one selected area of activity and are still susceptible to the influence of any major changes in the economy as a whole. Traditionally, such sizes as the production of electrical energy, iron, and steel, as well as the extraction of minerals, have been attributed to this category. However, the importance of these indicators is small. (Bednarczyk et al., 2009)They only play a supporting role in analyzing business cycle fluctuations, especially when data related to them are available earlier than those related to other, more important variables.

Another important group of indicators is the measures of utilization of production factors, due to the fact that the state of the economy is evidenced not only by the sizes characterizing current production but also by the degree of utilization of available resources. Changes occurring in a given

economy related to the production of goods and services are closely related to fluctuations in employment levels. It should be noted that labor is the most important and expensive production resource; therefore, employment fluctuations accurately reflect fluctuations in real GDP, indicating overall trends in the business cycle. (Beksiak et al., 2013)The measure of the utilization of the labor resource is the unemployment rate, defined as the ratio of the number of people out of work to the total number of people professionally active in a given country. Therefore, it can be observed that when real GDP decreases, unemployment increases. The utilization of owned production resources is directly proportional to fluctuations in the main macroeconomic indicators describing economic activity.

The next group of indicators characterizing economic activity consists of price measures. They are primarily used to adjust nominal values (e.g., GDP, investments, consumption). This allows for the identification and evaluation of processes currently occurring in the economy, which is extremely important when determining business cycle trends. Price measures, and in particular the intensity of their movement, are standalone indicators that allow for an assessment of the state of the economy (e.g., accelerating inflation is a sign of emerging internal imbalances). (Hall & Taylor, 1997) Another important feature of economic fluctuations is their correlation with the inflation rate, which is the percentage change in the average price for all goods and services in a given economy. Simplifying, when prices rise faster, the economy is near its peak, and conversely, when prices rise more slowly, it is near its bottom. These increases and decreases are delayed in relation to fluctuations in real GDP. Meanwhile, the GDP deflator is the basic price indicator. It reflects price changes in goods and services included in GDP calculations. Additionally, the consumer goods and services price index and the producer price index are also calculated. Alongside these basic indicators, measures with greater detail are also used for analyzing changes in economic trends. These include price indices for goods originating from imports or exports, investment expenditures, purchases of agricultural products, etc. (Lipschitz & Schadler, 2019)

Monetary market indicators are another group of measures characterizing economic activity. They are essential for assessing business cycle fluctuations due to the role they play in determining production, resource utilization, and prices. The most important indicators related to the money market are the money supply and interest rates. Money supply is conventionally defined as all liabilities from the banking system towards non-banking entities (but only those that serve as a means of payment). Literature emphasizes that there is a close relationship between the money supply and the various phases of business cycles, related to the fact that changes in the money supply can be a factor causing fluctuations in the economy, or even its primary driving force. Interest rates also show a tendency to fluctuate during the business cycle. They are considered procyclical because they increase during economic recovery and decrease during recession. We can

also observe that they usually rise with inflation to compensate lenders for the declining purchasing power of money. (Hall & Taylor, 1997)

The last important group of indicators for determining the level of economic activity are composite indicators. The most commonly used measure of this type is the diffusion index, which represents the ratio of the number of indicators indicating the same change in direction to their total number. (Dalio, 2021)The determination of the dynamics index begins with the selection of an appropriate set of measures characterizing the state of the economy. Then it is necessary to determine how many of the studied variables showed growth, and based on this, the diffusion index is calculated. Its value is expressed as a percentage and informs about how widespread a particular direction of change is. The main problem in its creation is the appropriate selection of the variables that make it up, during which one can refer to various concepts of the business cycle or the experience of the person conducting the study. Unfortunately, in none of the cases will it be possible to obtain unambiguous indications due to the possibility of variously interpreting the sources of cyclicality and the subjectivity of opinions. The diffusion index was developed primarily as a tool for analyzing changes in the business cycle, but it is also a useful tool wherever the subject of interest is determining the dominant direction of ongoing changes.

The empirical study of the business cycle aims primarily to assess the economic situation in a specific area (general business cycle, industry market, or for a given product). (Kaufman & Hotchkiss, 2002)The main goal of empirical business cycle research is therefore to provide current information on the state and trends of the business cycle. Possessing and being able to evaluate this type of information is undoubtedly a guarantee of success and has an impact on reducing the risk of any business activity.

The most important methods used for forecasting and analyzing the business cycle include (G. Kowalewski, 2000):
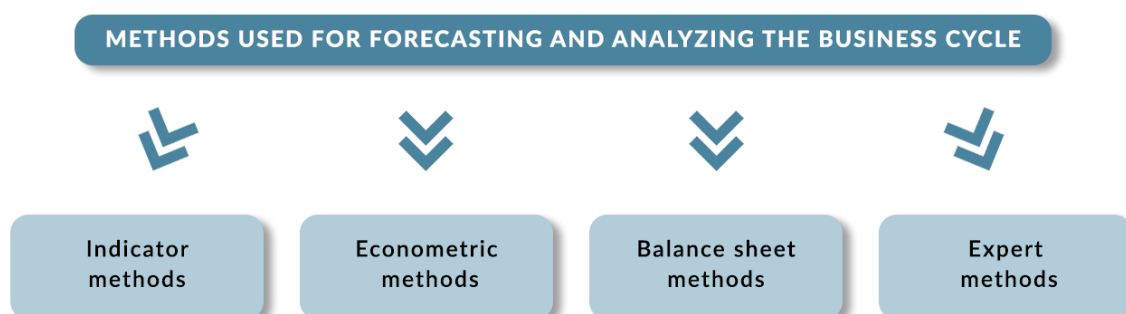
Figure 7 Methods used for forecasting and analyzing the business cycle

Source: own elaboration based on: (G. Kowalewski, 2000)

To determine the developmental trends of the level of economic activity, it is essential to know and monitor basic economic indicators that describe the state of the entire economy or part of it. Analysis of the most important indicators describing the macroeconomic situation provides essential information that allows predicting or assessing the direction of changes in the economy. The most important indicators of the state of the economy are leading, coincident, and lagging indicators.

Leading indicators change several months before a change in the trend of the overall indicators of the level of economic activity. By increasing or decreasing, they signal a changing business climate. The most important indicators of this type include (Szczepaniec, 2014):

•   The number and value of shares sold;

•   Real Gross Domestic Product (GDP);

•   The number of people laid off from work;

•   The number of newly opened or bankrupt companies (indicator of changes in the number of companies);

•   The number of permits granted for the construction of houses or other buildings;

Coincident indicators, on the other hand, change almost simultaneously with the overall state of the economy. These include:

•   GDP;

•   Turnover of manufacturing or trading companies;

•   Personal income change indicator (net of transfers);

•   Investment indicator;

•   Level of employment outside agriculture;

•   Unemployment level;

•   After-tax profits of companies;

These indicators provide a comprehensive overview of the economy's current state and can be instrumental in predicting future trends and making informed decisions.

The last of the mentioned groups are lagging indicators, which react to economic changes with a delay, showing a rising or falling trend only several months after the change in the economy's developmental trend. We can distinguish the following indicators:

•   Personal income levels;

•   Retail sales volume;

•   The number/size of new consumer loans granted;

•   Interest rates;

•   Labor force costs;

The most significant importance is given to leading indicators, thanks to which it is possible to calculate a composite index of leading indicators. This index is the sum of twelve economic indicators showing the ability to decline or increase several months before the change in the trend of general measures of the level of economic activity, based on which it will be possible to predict changes in the real Gross Domestic Product. Such a constructed index often allows for more accurate predictions than any forecasts based on any single indicator. (Kamerschen et al., 1992)

By observing the index along with its individual indicators, it is highly probable to determine what will happen to economic activity in the future. In a situation where the composite index of leading indicators declines over several consecutive months, an approaching recession can be predicted with relative certainty.

The next method used in creating forecasts for economic cycles is the creation of econometric forecasting models, which began to be used in the search for more detailed ways of forecasting changes in the economic climate. An econometric model is the most formalized method used for business cycle forecasting. Econometric models are descriptive models; most of them are described by an appropriate set of equations characterizing the dynamics and state of the economic cycle, where the parameters have been determined based on past data. Building such a model begins with creating an analytical schema that includes equations representing total demand and total supply. Using the tools of modern econometrics, it is easy to fit individual equations to their corresponding historical data. In each subsequent step of building this model, it is necessary to examine the significance of the considered variables and their correlation with the phenomenon under study. After specifying the appropriate variables, one can proceed with extrapolating the system of equations into the future, providing the future value of the most important economic variables. Econometric forecasting models can be divided into short-term and long-term models. When creating short-term models, it is necessary to assume that the productive assets remain constant during the period under study. In long-term models, however, attention is focused on changes in the structure of the analyzed economy, thus examining the structure and size of investments that have a significant impact on structural changes in the national economy. It should also be noted that, as evidenced by empirical studies on economic cycles, the quality of the forecasts increases with the extension of the forecast time horizon. (Nordhaus William D & Samuelson Paul A., 2010)

Econometric models usually have good predictive values, as long as significant historical trends important for the model are not disrupted. However, if they are changed, the development of the economy, both currently and in the future, may deviate from the existing pattern. In the case of significant trend changes, the model will not indicate accurate forecast values. The drawbacks of this method of economic cycle forecasting become particularly evident in the case of a sudden and

unexpected crisis when the models are unable to accurately predict this abrupt collapse, even after refining them with atypical observations. (Nordhaus William D & Samuelson Paul A., 2010)

The balance sheet method is also used for forecasting economic cycles. (G. Kowalewski, 2009)This method uses social accounting for economic cycle analysis, which utilizes economic statistics to quantitatively depict the entirety of the national economy in a given country. The aim of social accounting is to record the processes of creation, distribution, and consumption of the Gross Domestic Product (GDP). By using this method, it is easy to capture the entirety of economic activity during the studied period through a system of accounting ledgers and also synthetic balances of all economic events. Captured in this way are all flows of financial streams, goods, and services. Social accounting encompasses only those parts of statistics that are related to global output and its constituent elements. In its assumptions, the basic elements are sectors, accounts, and transactions.

In order to create sectors, it is first necessary to identify the types of economic entities in a given country and then combine them. The basis for distinguishing sectors is the homogeneity of economic entities, based on a criterion considered to be fundamental. The most commonly used division identifies the existence of three sectors in the national economy: commercial enterprises, the state, and the population and non-profit institutions. Further internal divisions of these sectors can also be made depending on needs.

For each of the sectors, functional accounts exist where transactions representing a particular type of economic activity are recorded. Production accounts can usually be distinguished, on which revenues and expenditures related to production activities in a given sector are recorded. The balance of this account, representing the global profit, is recorded on the next consumption and distribution account. This account records revenues, including profits from production activities, investment income, and other current inflows from other sectors. Recorded as expenses are global current expenditures, and the balance, savings, which are also recorded as a balance on the sector's accumulation account. On the last account, both savings and depreciation allowances, capital inflows, and loans to other sectors are recorded as income, while transfers, investments, and capital loans are recorded as expenses.

The last element of the structure of social accounting is transactions, which are events in the economy that result in a change in the financial situation of at least two economic entities simultaneously. The following groups of transactions are distinguished: material, transfer, and settlement. The first of these are related to the transfer of material values upon making payment. Transfer transactions, on the other hand, involve the flow of values without a corresponding flow of goods. Examples include pensions, social benefits, or taxes. The last group of transactions are

settlement transactions, in which a claim on one side corresponds to a claim on the other, such as non-cash credit transactions.

This briefly presented social accounting system has a lot of very useful data for the purposes of economic analysis. However, its use is limited by the fact that the basic period for preparing reports is only one year. In theory, one may encounter retrospective accounting, in which historical economic reality is examined, and prospective accounting, in which future economic reality is examined. Social accounting is mainly used as a tool for assessing the state of the business cycle, less often for forecasting its course.

Expert methods, which are often also referred to as intuitive methods, involve formulating views and drawing conclusions about the current and future shaping of the examined quantities based on the researcher's knowledge, experience, and also intuition. The opinions of experts who assess the domestic or foreign economic situation are an important source of knowledge about prospects and the current state of the economy, as systems for assessing the economic situation are created based on these opinions. In practice, this means the existence of many methods differing in details, although based on the same, common assumptions. One of the important features characterizing this method of forecasting economic cycles is that the expert is not obliged to disclose the information base used for forecasting purposes and does not have to justify their reasoning. This may, of course, be associated with the risk of formulating forecasts based on researchers' subjective opinions, and, in turn, it complicates the ability for recipients to verify the forecast. (Lubiński, 2003)

Research on economic trends using this forecasting method is most often conducted by independent research institutes. The subject of expert assessment is both the current and anticipated economic situation. The studies are based on a survey filled out by company experts and several independent external experts invited to participate in the research. The survey includes questions related to the general assessment of economic trends in the country and the world. It also gathers information on trends in investments, consumption, and foreign trade, as well as on the level of inflation, interest rates, and forecasts for currency exchange rates and other important macroeconomic issues related to the economic development of specific areas. Most questions are qualitative in nature, allowing only the qualification of the current state of affairs or its direction. The results obtained in this way provide a picture of the general economic situation, current development trends, and identify the main problems of the economies of individual countries or globally. Expert opinions are quite often used in assessing indicators characterizing the business cycle. They contain information important from the point of view of shaping fluctuations in the economy.

Modern economic fluctuations are processes characterized by constant changes in both mechanisms and morphological features. This necessitates continuous improvement of the assumptions and empirical methods for forecasting economic cycles. From the presented brief analysis of business cycle forecasting methods, it follows that none of them are without flaws; however, with full awareness of these limitations, they can be effectively applied. Methods of business cycle forecast analysis must each time take into account their characteristic features appropriately selected for the current conditions of the study.

2. Banking system stability

2.1. The concept of economic stability of the banking system

Deep transformations of the global economy and the subsequent changes in the shape and operating principles of financial systems were primarily driven by the globalization of financial markets, the dynamic development of societies, and technological advancements. (C. D. Romer, 2002) The scale of these changes, as well as their intensity and rapidity, resulted in fragility and instability of the financial systems.

Additionally, the development of new financial instruments, especially derivatives, the speed and short-term nature of capital flows, and often volatile reactions of market participants made the financial market highly variable and uncertain. Consequently, the financial system, on one hand, represents a modern, global system with boundless opportunities for all market players, but on the other hand, it has become more susceptible and sensitive to collapses and crises. (Bernanke, 2022)

In the figure 8 , the structure of the financial system is presented. All elements of this financial system are interconnected - as indicated by the horizontal arrows in the figure - by a network of mutual relations. Moreover, all these elements are interdependent.
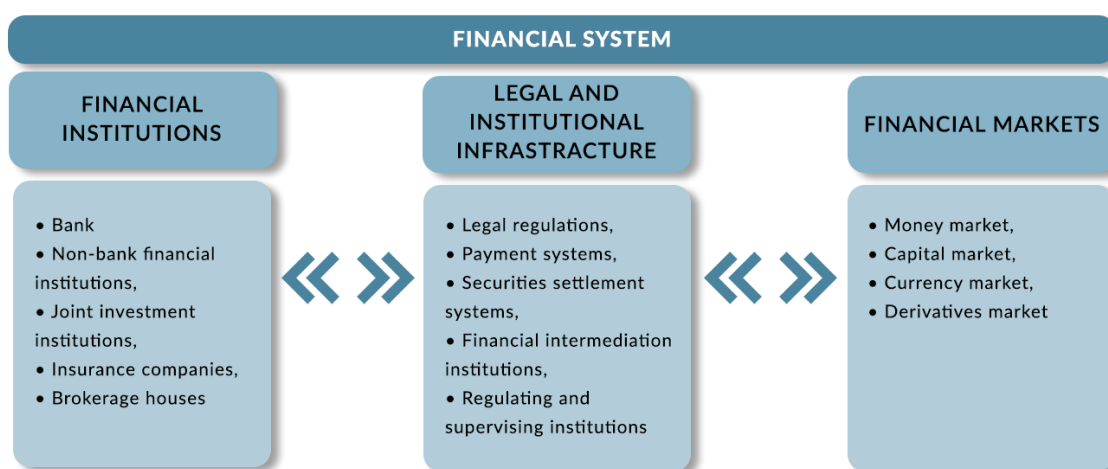
Figure 8 Structure of the financial system

Source: own elaboration based on (Szczepańska, 2008)

Financial crises have proven that any benefits derived from increasing the efficiency of financial markets are not possible without ensuring an adequate level of safety of national financial systems, and more importantly, financial stability on an international scale. (Reinhart & Rogoff, 2011)

Interest in the stability of the financial system arose as a result of the liberalization of financial markets and severe financial crises, primarily from the late 20th century. Economists' attention was

drawn to this issue, prompting the development of methods to prevent future crises, ensuring the effective functioning of the entire financial system. All changes related to liberalization, globalization, and technological advancement have increased interdependencies between financial institutions and made the system more susceptible to any disruptions. (Kindleberger & Aliber, 2011)

In the literature, the terms financial stability and stability of the financial system are used interchangeably and are treated as synonymous. The concept of financial stability was first used by the Bank of England in 1994 to describe the objectives of the central bank's activities unrelated to ensuring price stability. (Liu, 2023)

The two main approaches to defining financial stability are distinguished (Kołodziejak, 1986) :

Figure 9 Approaches to financial stability

Source: Own elaboration based on (Kołodziejak, 1986)

The broader concept involves an attempt to present certain features in the economy that would define the functions that a stable financial system should fulfill. The narrower approach, on the other hand, is a simplified attempt to define stability by determining what financial instability is. With the first approach, one encounters the problem of too broad a view of the essence of this phenomenon and the use of concepts that are difficult to measure. This can have a negative impact on the clarity of the objective and make it difficult to reduce the definition to a form that can be applied in practice by the central bank. The lack of consensus on a single definition of financial stability may result from the varied and changing nature of financial crises and the specifics of national financial systems, which, despite ongoing globalization and liberalization, are still different. (Knaack, 2022)

The second approach to defining the concept of financial stability focuses on the phenomenon of a financial crisis - so it is not just a theoretical concept. It facilitates understanding financial stability using a specific example. However, when using this approach, the perception of stability is often narrowed down to the absence of a crisis. However, this thinking is not correct, primarily because

the build-up of systemic risk can occur without any visible signs of a crisis. The concept of financial stability should be seen as an integral part of the entire financial system, and the financial crisis - as an extreme form of a lack of stability.

The broad conceptual range and the multitude of definitions created pose a challenge for the central bank in defining financial stability, which will determine the scope of actions taken in this area, both preventive and interventionist. (Arner & Taylor, 2016)

Financial stability is a concept frequently examined and analyzed in economic literature, but different sources may provide different definitions and interpretations of this term. Below are definitions and explanations that often appear in the literature on financial stability. (Caprio et al., 2012)

According to the European Central Bank (ECB), financial stability is defined as a condition in which the financial system is capable of effectively allocating resources, assessing and managing risks, and absorbing shocks without harm to overall economic well-being. (European Central Bank, 2023)

The Bank for International Settlements (BIS) emphasizes the importance of the financial system's resilience to various kinds of shocks and the system's ability to maintain the continuation of financial intermediation functions. (Bank for International Settlements et al., 2009)

The Financial Stability Board (FSB) also highlights the financial system's ability to manage risk but further emphasizes the importance of effective supervision and regulation to ensure stability. (Financial Stability Board, 2023)

In his Financial Instability Hypothesis, Hyman Minsky describes how financial systems can be unstable over time, and financial stability is a condition in which the system is resistant to the accumulation and realization of financial risks. (H. P. Minsky et al., 2008)

N. Gertler and S. Gilchrist, in their work on the role of financial institutions in business cycles, define financial stability as the ability of the financial system to maintain effective financial intermediation, even in the face of adverse shocks.

Frederic S. Mishkin, in his writings on financial stability, focuses on the importance of information and informational asymmetry in assessing financial stability, emphasizing that a stable system is one that minimizes problems related to informational asymmetry. (F. S. Mishkin, 2012)

Tobias Adrian and Hyun Song Shin, in their works, focus on the role of financial leverage and risk management in the context of financial stability. For them, financial stability is a state where financial institutions can manage their leverage in a way that prevents crises. (Adrian & Shin, 2008)

Charles Goodhart points to the connections between financial institutions and markets as a key element of stability, emphasizing that financial stability is impossible to achieve without considering these connections. (C. A. E. (Charles A. E. Goodhart, 1989)

All these definitions have their own nuances and emphases, but generally focus on the ability of the financial system to withstand negative shocks and effectively perform its functions as a financial intermediary.

A. Marysek-Jędrych (2007) focuses on defining stability in its broad sense. According to the author, the financial system is a network of interconnected financial institutions, financial markets, and elements of the financial system infrastructure. Thanks to this system, households, enterprises, and the government can not only raise funds but also invest their savings and meet other financial needs. Therefore, financial stability covers many areas and requires ensuring the stability of institutions, markets, and the entire payment infrastructure. This poses a significant challenge for the central bank, especially in terms of analyzing potential factors causing instability and determining and implementing preventive measures. (Matysek- Jędrych, 2007)

A. Ostalecka (2009) considers financial stability depending on its subject. She distinguishes in this way the stability of financial institutions and the stability of financial markets. This approach suggests that if financial institutions independently and without disruptions regulate their obligations, it indicates their stability, but it does not determine the stability of the entire financial system. (Ostalecka, 2009a)

P. Smaga (2014) proposed defining financial stability as a set of the following factors (Smaga, 2014a):

• the entire financial system properly fulfills its functions,
• there is a limited degree of systemic risk,
• the system is resilient to external and internal shocks,
• the system has mechanisms that allow a return to the state before disturbances occurred.

The concept of financial stability is thus very complex and multifaceted. J.G. Schinasi (2006) argues that financial stability cannot be treated punctually, but as a continuous and dynamic process and a continuum of stages in which the financial system can be. This conditions the actions taken by central banks to stabilize the system. (Schinasi, 2006)

M. Foot (2003) believes that financial stability occurs when monetary stability is maintained, unemployment is at the level of the natural rate of unemployment, society trusts financial institutions, and there are no significant changes in the prices of financial and tangible assets. (Foot, 2003)

A. Crockett defines financial stability as the stable and uninterrupted functioning of financial markets and financial intermediaries. He notes that the main requirement is for financial institutions to be stable, meaning they can continuously meet their obligations without external assistance. Additionally, for financial stability to be maintained, key markets must be stable. This means that participants can transact on them without any concerns. He also emphasizes that the bankruptcies of smaller financial institutions and the occasional losses of larger institutions do not indicate instability in the financial system but are simply ordinary market events. (Crockett, 2001)

The National Bank of Poland interprets the concept of financial system stability as a state in which it continuously and effectively performs its functions. This holds true even in the event of unexpected and adverse disruptions. (Narodowy Bank Polski, 2023)

The theory of financial stability is primarily focused on studying phenomena that are certain deviations from the equilibrium state of the financial system. If these deviations are significant, they can lead to a severe financial crisis. In the era of globalization, this is a very dangerous phenomenon on a global scale. The high price that the economy is forced to pay in a crisis situation means that maintaining the stability of the financial system is treated as a public good. (Blinder, 2022)

The diversity of definitions of financial stability and their nature primarily arise from the complex nature of the financial system. Despite differences in defining this concept, several common features can be identified. They include, among others:

•   reference to the basic functions of the financial system in the economy and the relationship between the efficiency of their implementation and the real sector of the economy,

•   the assertion that a stable financial system does not mean that it is static and unchanging,

•   focusing on the resilience of the entire financial system to all disturbances and downplaying the failures of individual banks as long as they do not affect the functioning of the system,

•   recognizing that the financial system is inherently able to prevent financial crises.

Table 4 presents a compilation of the previously discussed definitions of financial stability presented by various authors.

Table 4 Compilation of the definitions of financial stability presented by various authors

Author	Financial stability definition
H. Minsky	Financial systems can be unstable over time, and financial stability is a state in which the system is resilient to the accumulation and materialization of financial risks.
N. Gertler i S. Gilchrist	Financial stability is the ability of the financial system to maintain effective financial intermediation, even in the face of negative shocks.
F. Mishkin	A stable system is one that minimizes problems related to informational asymmetry.
T. Adrian i H.Song Shin	Financial stability is a state in which financial institutions are able to manage their leverage in a way that prevents crises.
C. Goodhart	Points to the ties between institutions and financial markets as a key element of stability, emphasizing that financial stability is impossible to achieve without considering these ties.
A. Marysek-Jędrych	Financial stability encompasses many areas and requires ensuring the stability of institutions, markets, and the entire payment infrastructure.
A. Ostalecka	Considers financial stability depending on its subject. She distinguishes between the stability of financial institutions and the stability of financial markets.
A. Crockett	Financial stability is the stable, undisturbed functioning of markets and financial intermediaries.
M. Foot	The occurrence of financial stability is determined by maintaining monetary stability, unemployment rate close to its natural rate, and trust in financial institutions.
J.G. Schinasi	Financial stability is the ability to perform the basic functions of the system, which includes, among others, effective allocation of investor resources and proper valuation and management of financial risk.

P. Smaga	Financial stability occurs when the entire financial system properly performs its functions, there is a limited degree of systemic risk, the system is resistant to external and internal shocks, and it has mechanisms that allow it to return to its state before disturbances occurred.
K.Solarz	Financial stability is a state of dynamic and lasting equilibrium in interconnected financial markets.
National Bank of Poland	Interprets the concept of financial system stability as a state in which it continuously and effectively performs its functions, even in the event of unexpected and unfavorable disturbances.

Source: Own study based on the literature.

For the purposes of this work, it was determined that the stability of the banking system is a key element of overall financial and macroeconomic stability. The concept of the economic stability of the banking system refers to a state in which banks and other financial institutions are capable of maintaining their profitability, liquidity, and capital resilience in various market conditions. Several key aspects of this concept can be distinguished, which are presented in figure 10 and table 5. (Ramlall, 2018)
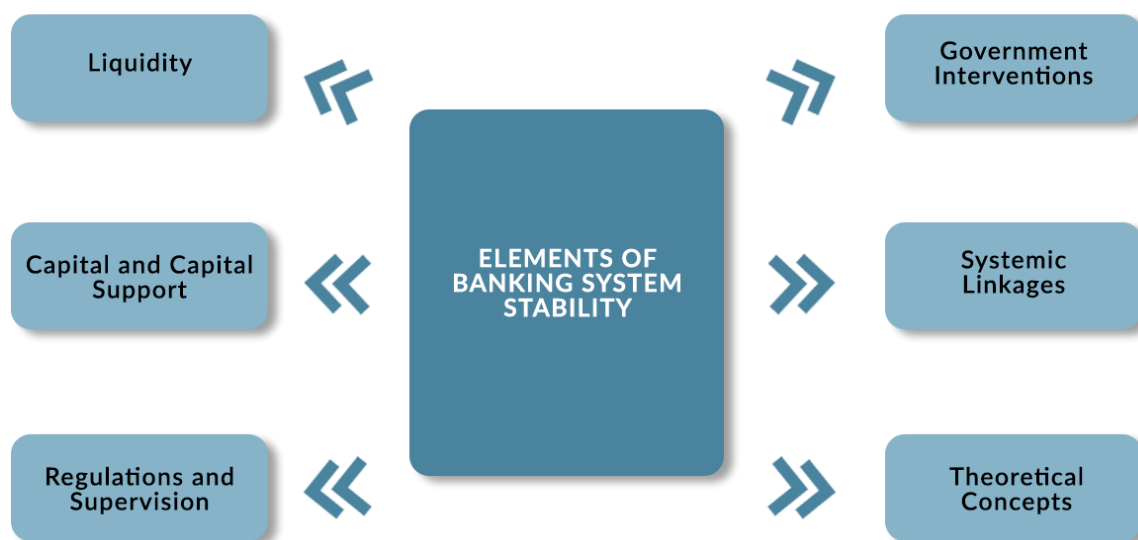
Figure 10 Elements of banking system stability.

Source: Own elaboration based on: (Ramlall, 2018)

Table 5 Aspects of banking system stability and their characteristics.

Aspects of Stability	Characteristics
Liquidity	Financial systems can be unstable over time, and financial stability is a state in which the system is resilient to the accumulation and materialization of financial risks.
Capital and Capital Support	Banks are required to maintain a certain level of capital relative to their risky assets. Various capital measures, such as Tier 1 and Tier 2 equity ratios, have been introduced to ensure that banks are sufficiently protected against potential losses.
Regulations and Supervision	Banks are subject to various regulations and oversight by regulatory bodies (e.g., in the USA - Federal Reserve, in the EU - European Central Bank). These bodies aim to ensure the stability of the banking system by monitoring bank activities and introducing appropriate regulations.
Government Interventions	In crisis situations, governments and central banks might intervene to ensure the stability of the banking system. This might include measures like lowering interest rates, providing liquidity, or even direct financial support for troubled banks.
Systemic Linkages	The stability of the banking system also depends on its linkages with other financial institutions and capital markets. A crisis in one market segment can quickly spread to other segments, which might affect the stability of the entire system.
Theoretical Concepts	Financial stability theories study the mechanisms that influence the financial system's ability to maintain balance and resilience to various types of shocks. They investigate mechanisms that can lead to instability in the banking and financial system.

Source: Own elaboration based on: (Ramlall, 2018)

Maintaining financial stability is one of the goals pursued by central banks worldwide. Table 6 presents an overview of the features found in definitions adopted by the central banks of countries belonging to the European Union.

Table 6 Review of financial stability definitions adopted by central banks of European Union countries.

Country	Bank	Resilience to shocks	Proper functioning of the financial system	Efficient allocation of resources by the financial system	Mutual connections between elements of the financial	Impact on the real economy sector
Austria	Oesterreichische Nationalbank	X	X	X	X	
Belgium	Banque Nationale de Belgique		X	X		X
Bulgaria	Bulgarian National Bank					
Croatia	Hrvatska narodna banka	X	X	X		
Cyprus	Central Bank of Cyprus	X		X	X	
Czech Rep.	Česká národní banka	X				X
Denmark	Danmarks Nationalbank		X		X	
Estonia	Eesti Pank			X	X	
Finland	Suomen Pankki	X		X		
France	Banque de France	X			X	
Greece	Bank of Greece	X	X	X	X	
Spain	Banco de Espana		X	X		
Netherlands	De Nederlandsche Bank	X	X	X		X
Ireland	Central Bank of Ireland				X	X
Lithuania	Lietuvos Bankas	X		X	X	
Latvia	Latvijas Banka					
Luxembourg	Banque Centrale du Luxembourg	X	X			
Malta	Central Bank of Malta	X	X	X	X	X
Germany	Deutsche Bundesbank	X	X	X		
Poland	Narodowy Bank Polski	X	X	X		X
Portugal	Banco de Portugal	X	X	X	X	
Romania	Banca Naţională a României	X	X	X		
Slovakia	Národná Banka Slovenska	X	X		X	
Slovenia	Banka Slovenije	X	X		X	
Sweden	Sveriges Riksbank	X	X	X		
Hungary	Magyar Nemzeti Bank	X	X	X	X	
Great Britain	Bank of England		X	X		
Italy	Banca d'Italia		X	X		
Sum		19	19	18	13	8

Source: Own elaboration based on (Smaga, 2014a) and the websites of central banks.

According to the definitions of financial stability provided by the banks of individual countries, one can notice that the greatest importance is attached to:

• the system's resilience to shocks,

• proper performance of functions by the system,

• effective allocation of resources by the financial system.

Financial stability is also defined by indicating the characteristics of financial instability. For when a situation of financial instability does not occur, one can argue that the system is stable.

H.P. Minsky was among the first to consider the stability of the financial system, defining it through the formulation of hypotheses concerning financial instability. According to him, financial instability arises when at least one of the following phenomena occurs (H. Minsky, 1972):

• a sudden and significant drop in asset prices,

• the collapse of large financial and non-financial institutions,

• the emergence of deflation,

• disturbances in the currency markets.

Minsky further argues that the occurrence of an external shock can destabilize the entire financial system (H. P. Minsky, 1992). A. Nocoń (2016), citing Minsky (1992), lists potential sources of external shocks that can cause destabilization of the financial system (Nocoń, 2016). These include:

• changes in the economic cycle,

• capital liberalization,

• investment and credit boom,

• deregulation of bank operations,

• technological progress,

• information asymmetry,

• overly restrictive policy of the central bank.

Minsky also observes that an economic recovery that persists over a longer period results in a reduction of the safety margin used by financial institutions. Banks then lower the criteria for evaluating ventures, considering them as profitable and characterized by a low level of risk. As a result, he introduced the mechanism for increasing financial instability. This was presented in figure11.
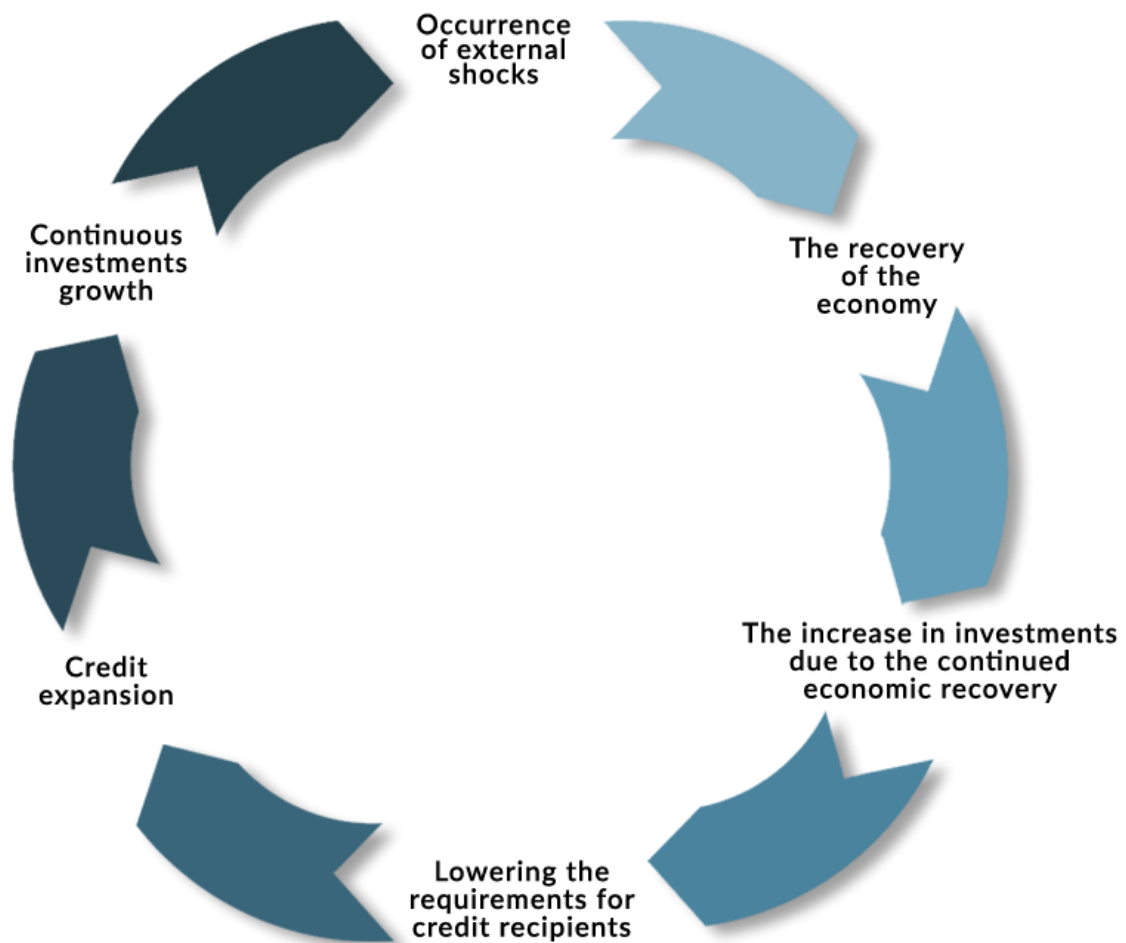
Figure 11 H. P. Minsky's Mechanism of Increasing Financial Instability.

Source: own elaboration based on (Nocoń, 2016)

F.S. Mishkin believes that financial instability occurs in the case of shocks to the financial system that disrupt the flow of information and prevent the system from fulfilling its main tasks. He also points out the destructive impact of crises on a properly functioning financial system, which prevents the utilization of productive investment opportunities. (F. Mishkin, 2014)

W.A. Allen and G. Wood (2006) note that financial stability is a property of a given system. They define the concept of stability in relation to financial instability. Instability occurs when a certain number of entities (households, businesses, governments) experience a financial collapse, which does not directly result from their previous behaviors. Therefore, they defined financial stability as a situation where the possibility of any episode of instability is very small, and thus economic entities do not take it into consideration. (Allen & Wood, 2006) However, such an approach does not facilitate monitoring financial stability. It's difficult to distinguish between entities that

experience a crisis as a result of their actions and entities that collapsed despite their rational behavior.

Prolonged lack of financial stability can lead to a financial crisis. Figure 12 shows the process of its emergence.
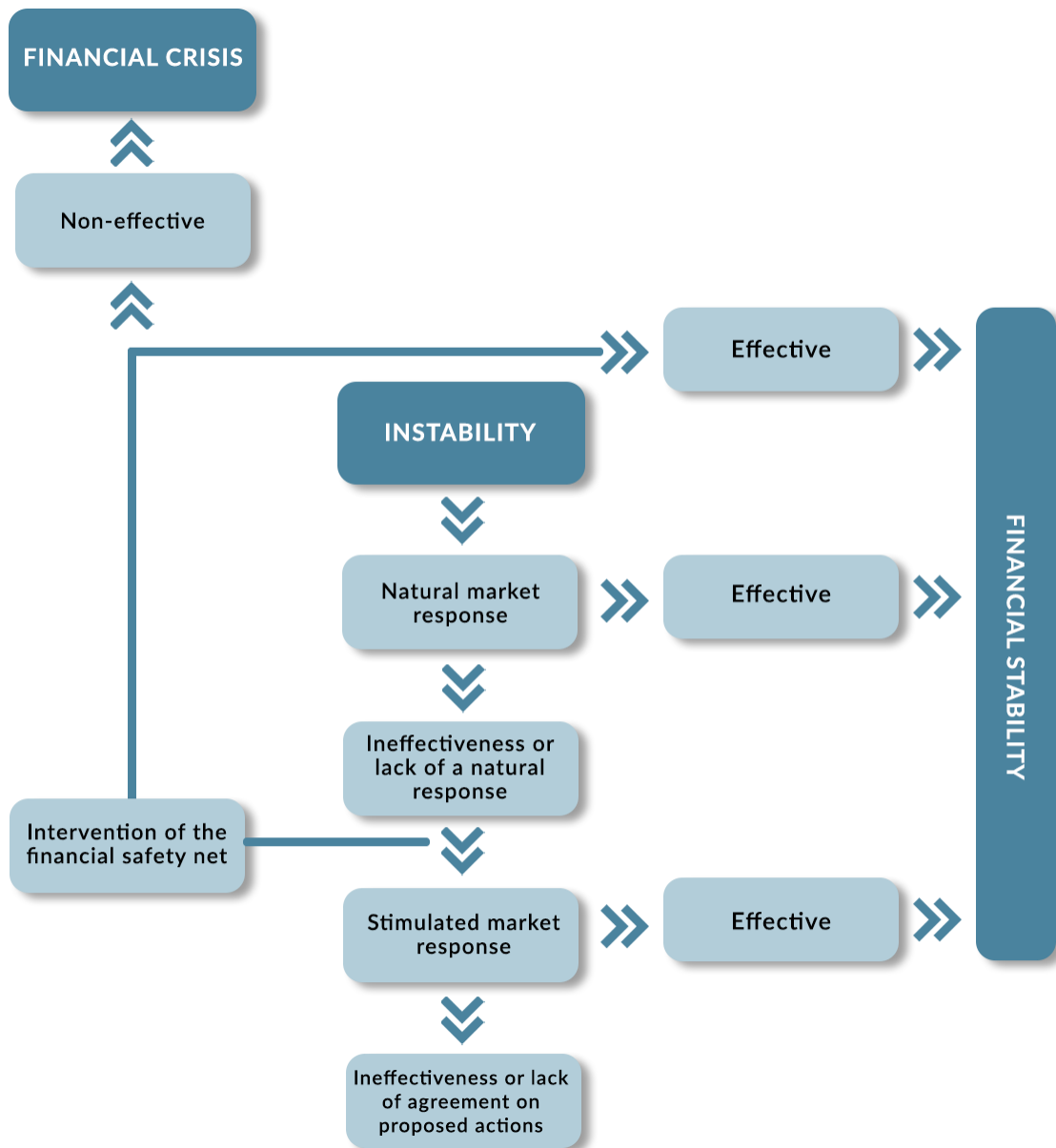
Figure 12 The process of financial crisis emergence.

Source: own elaboration based on: (Niedziółka, 2011)

There is no clear definition of instability in the banking sector in the literature. Financial sector stability is not considered per se, as it is a specific form of financial instability. (Nocoń, 2016) defines instability primarily as the occurrence of medium- and long-term financial problems of several financial institutions, which prevent the proper functioning of the entire sector. Instability

in the banking sector is also associated with excessive lending. In the case of insolvency of borrowers, problems with repayment, or the occurrence of a large percentage of endangered loans, there may be a need to recapitalize or even nationalize banks. The emergence of instability in the sector leads to a so-called crisis of confidence in banking institutions, and as a result - the withdrawal of financial contributions by depositors. Such a situation can result in a very dangerous bank run, and consequently - further problems of the sector. (Haynes, 2023)

In general terms, financial stability is understood as the system's ability to maintain financial liquidity and solvency. Its basis is therefore a solid and properly functioning banking system, mainly because of its dominant share in most financial systems around the world. The stability of the entire financial system is thus determined by the stability of banks. (Ramlall, 2018)

The instability of the financial system, and therefore of the entire banking sector, has also been considered from the perspective of individual stakeholder groups. They are presented in Table 7.

Table 7 Assessment of banking sector instability according to individual stakeholder groups.

Stakeholder Group	Assessment of Banking Sector Instability
Bank Management	Negative evaluation of financial statements and indicators describing the bank's operations and generated profit.
Shareholders	Decline in share prices, absence or very low dividend level.
Depositors	Uncertainty about deposit withdrawals and the guaranteed interest stipulated in the agreement.
Borrowers	Imposing high requirements on potential borrowers.
Central Bank	Banks not meeting the required prudential standards.
Regulatory Authorities	Banks not meeting capital requirements and non-compliance with regulations imposed by regulatory authorities.
Government	Inefficient satisfaction of financial needs and the occurrence of contagion effect - transferring dysfunctions that reduce the efficiency of the entire economy.

Source: own elaboration based on (Nocoń, 2016)

The stability of the banking sector is therefore of great importance not only for the bank's management but also for those using its products (mainly borrowers and depositors). The entire banking sector is significant from the perspective of the economy, which, in the event of instability in the financial sector, may undergo negative changes that reduce its efficiency.

The stability of the banking system is a key element of a country's overall financial and economic stability. Its importance is multifaceted and covers many aspects, because (F. S. Mishkin, 2012):

- banks are among the main institutions on which trust in the financial system is based. Their stability is therefore fundamental to maintaining this trust among both investors and savers. This trust is the foundation for the effective functioning of financial markets;
- banks play a key role in the financial intermediation process, transforming short-term deposits into long-term loans. The stability of banks is crucial for maintaining this mechanism, which in turn is essential for financing businesses and households;
- a stable banking system provides liquidity and access to capital, which is essential for the functioning of the economy. Banking crises, where banks become distrustful and limit lending, can result in recession and economic stagnation;
- banks are the main channel of monetary policy transmission. The stability of the banking system is therefore essential for the effectiveness of the central bank's actions in terms of interest rates and other monetary policy tools;
- the stability of one bank can affect the stability of other financial institutions and the financial markets as a whole. This phenomenon, known as "contagion," can lead to widespread financial crises;
- an unstable banking system often requires government intervention, which is ultimately costly for taxpayers. Additionally, bailing out banks can lead to a moral hazard problem, where banks take excessive risks, knowing they will be saved;
- finally, the stability of banks is important for overall macroeconomic health. Banking instability can lead to higher interest rates, declining investment, rising unemployment, and other negative macroeconomic effects.

Therefore, the stability of the banking system is not only important for the financial sector itself, but also has broad implications for overall stability and economic prosperity. This is why banks are often the subject of special oversight and regulation aimed at ensuring their stability.

2.2. Factors shaping the stability of the banking system

The financial system is a crucial component of any organized economy, facilitating effective resource allocation, risk management, and transaction facilitation, which in turn affects economic stability and growth.

The financial system, being a set of interrelated institutions and financial markets, serves as a platform connecting savers and investors, assisting in transferring capital from entities with surplus funds to those in need of financing. (Vinãls et al., 2012) Several key elements highlight the importance and significance of the financial system:

- the financial system aids in efficiently redirecting financial resources from savers to investors, subsequently influencing economic growth and development;
- the financial system provides instruments that allow for managing various forms of risk, such as currency risk, commodity price risk, and interest rate risk;
- financial markets, a part of the financial system, enable entities to quickly convert various asset forms into cash, enhancing their flexibility and ability to respond to market conditions;
- institutions like banks, investment funds, and insurance companies act as financial intermediaries, facilitating capital flow and providing diverse financial services;
- prices in financial markets serve as an informational mechanism aiding investors in decision-making. Consequently, the financial system plays a role in information transmission, vital for effective resource allocation;
- a stable financial system is essential for maintaining macroeconomic balance, influencing elements like employment, inflation, and economic growth. It's also crucial for the effective transmission of monetary policy;
- the financial system is also a field for innovation, allowing the development of new financial products and services, which can further enhance the efficiency and flexibility of the economy;
- a well-developed financial system can also contribute to increased financial inclusion, providing a broader population spectrum access to financial services.

The banking system, on the other hand, encompasses all banking institutions, including stabilizing institutions, market-creating institutions (i.e., the banking sector), and auxiliary institutions that don't engage in lending-deposit activities. The banking sector mainly comprises commercial banks, cooperative banks, and branches of credit institutions. The relationships between the mentioned spheres are presented in Fig. 13.
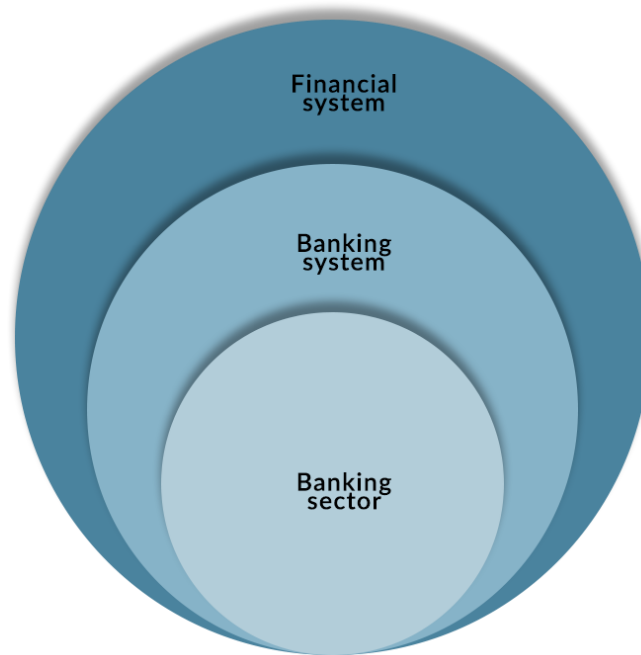
Figure 13 Financial system and its elements.

Source: Own elaboration

The stability of the financial system greatly depends on maintaining the stability of the banking sector, which plays a significant role in most developed economies worldwide. Hence, it can be argued that the occurrence of certain disturbances in the functioning of individual banks, and consequently – the banking system, will disrupt the operation of the financial system in the future. The stability of the banking sector is present when no significant disturbances in its operation are observed. Therefore, to assess whether the system is stable, it is necessary to analyze the factors causing its instability. Therefore, in the following part of the study, the factors affecting the occurrence of instability in the banking sector and, consequently, the financial system, will be analyzed. (Papadimitriou, 1996) Determinants of the stability of the banking sector can be divided into:

•   external, resulting from the impact of the external environment,
•   internal, resulting from the operational activities of banks.

External causes are common to both the financial system and the banking system, while internal causes, in the case of the banking system, relate exclusively to banks.

The stability of the banking system is influenced by many diverse factors, which can be grouped into several categories, and their detailed breakdown is presented in Table 8.

Table 8 Determinants of the stability of the banking system.

Key Determinants	Elements
Macroeconomic factors	-Economic growth -Inflation -Monetary policy -Balance of payments
Microeconomic factors	-Banks' equity and solvency -Asset quality -Liquidity -Risk management
Regulations and oversight	-Banking supervision -Capital regulations -Deposit protection -Safeguard mechanisms
Behavioral and market factors	-Trust and morality -Information and transparency -Financial innovations -Systemic linkages -Financial globalization -Technological advancement -Competition among banks -Contagion phenomenon

Source: own elaboration based on: (Papadia & Välimäki, 2018)

As can be seen, the determinants of financial stability are diverse and encompass both macroeconomic and microeconomic factors, regulations and oversight, as well as the behavioral aspects of the functioning of markets and institutions. These determinants are interconnected and can influence each other, further complicating the analysis and management of financial stability. In practice, both policymakers and decision-makers in financial institutions must pay attention to many different factors to maintain and promote financial stability. (Gilbart, 2022)

Stable and balanced economic growth typically supports financial stability by increasing the repayment capacity of companies and households. The stability of the banking system is greater when the economy is growing because the ability of borrowers to repay debt increases.

Moderate inflation is usually seen as beneficial for financial stability, while hyperinflation or deflation can be destabilizing. Moderate inflation is generally favorable, but excessively high or low inflation can negatively impact bank stability.

Stable and predictable interest rates help banks manage their loan portfolios and liquidity, aid in risk management, and investment planning, which in turn supports financial stability. (Niedziółka, 2010)

A persistent current account deficit can increase the risk of a financial crisis, especially in developing countries.

The macroeconomic policy is therefore considered a primary source of instability in the banking sector. This includes excessively expansionary monetary and fiscal policies that drive increasing instability in the banking and foreign exchange markets. Attention is also drawn to the lack of a diversified tax policy capable of flexibly responding to emerging disturbances. The lack of proper competencies of central banks and the lack of appropriate solutions in performing the lender of last resort function can also be seen as causes of instability in the banking sector. Additional risk factors for instability include macroeconomic weaknesses, which manifest themselves in high and volatile inflation, high unemployment, the presence of a deficit and public debt levels, and sudden economic changes. (Corbae & Levine, 2019)

Microeconomic factors also have a significant impact on the stability of the banking system. Banks with better credit portfolios are more stable. Weak credit portfolios increase the risk of insolvency. Banks must maintain an adequate capital level to absorb potential losses and retain the trust of investors and depositors. A high level of equity and good asset quality of banks are crucial for their solvency and overall financial stability. Having sufficient liquid resources allows financial institutions to meet sudden cash needs and survive short-term shocks. (Caprio et al., 2012)

Effective mechanisms for identifying and managing risks are vital for a bank's stability. Efficient management of credit, market, and operational risks is essential for maintaining financial stability. Effective regulatory oversight, including capital standards and liquidity requirements, can help maintain financial stability.

Indeed, effective banking supervision is crucial for monitoring and maintaining the stability of the banking system, and the introduction of regulations, such as capital requirements, helps ensure this stability. Deposit guarantee schemes and other forms of protection for investors can, in turn, enhance the trust and stability of the financial system. They can help maintain confidence in the banking system and minimize the risk of a banking panic. (Kindleberger & Aliber, 2011)

Behavioral and market factors, such as trust in financial institutions and markets, are key to financial stability. Moreover, access to accurate information and transparency in the operations of

financial institutions can reduce information asymmetry and elevate the level of trust. (Nowakowski & Famulska, 2008)

Technological progress, such as digitization and blockchain, introduces new challenges and opportunities for the stability of the banking system. New financial products and services can influence stability by introducing new forms of risk, but also by offering tools to manage it. Financial innovations can both increase and decrease stability, depending on how they affect risk management and market structures. (Belasco, 2021)

Interdependencies between financial institutions can lead to "contagion" and are a key element of systemic stability. These connections can lead to domino effects in case of insolvency of one institution. Ethical behavior and corporate social responsibility can influence the perception of banks and, in turn, their stability.

International capital flows and financial linkages can affect stability, especially in small, open economies. International cooperation and connections can both enhance and reduce the stability of the banking system. (Iwanicz - Drozdowska, 2012a)

Among the external reasons for instability, one can also include the institutional weaknesses of national governments and entities overseeing the banking sector. A lack of appropriate supervisory solutions, combined with their ineffective cooperation with other components of the financial safety net, results in decreased effectiveness in counteracting excessive banking risk. Another significant cause of instability is the lack or limitation of access to market information and overly lenient requirements regarding disclosed information. (Arnold, 2014)

Szpunar (2012) also pointed out that a significant cause of instability in the banking sector is the materialization of systemic risk. It is defined as the risk of disrupting the system, which can adversely affect the internal market and the entire real economy. Systemic risk is also considered as a sudden and unforeseen event that may pose a threat to current economic activity. Systemic risk is also the danger of the so-called domino effect, which means that the instability of one entity negatively affects the condition of other market participants. With the ongoing processes of globalization and liberalization, and the free flow of money, the importance and threat of systemic risk increases. The strong interdependence of international institutions and banking systems means that the condition of one of them has a significant impact on the others. (Szpunar, 2012) The significant increase in this type of risk is attributed to:

- acceptance of the "too big to fail" (TBTF) doctrine (Sorkin, 2010),
- advancing financialization in the global economy,
- liberalization and globalization,
- the development of derivatives based on a mortgage collateral multiplier,

- anti-regulatory innovations that allow for increased financial leverage.

Currently, systemic risk is treated as primary and most important. Before the outbreak of the great financial crisis, none of the institutions identified or adequately assessed the level of this risk. This ultimately led to instability not only in the banking sector but also in the entire financial system of the global economy. (Corbae & Levine, 2019)

Also, the financialization of the economy is counted among the external factors leading to system instability. It denotes a situation where financial markets increasingly influence overall economic policy. This concept points to the growing role of the financial market in the functioning of the economy.

Financial liberalization is another factor contributing to disturbances in financial markets. The liberalization, which led to the great crisis at the beginning of the 21st century, was mainly associated with the relaxation of prudential regulations, a significant reduction in the mandatory reserve ratio, and a general lowering of the requirements set for banks. The condition of the financial system is also influenced by the process of globalization. A. Ostalecka (2009) notes that a manifestation of globalization is the increase in connections and dependencies between economies, markets, and financial systems. The growing negative significance of globalization is influenced by, among other things, the intensification of imperfections occurring on the global financial market and the risk of a contagion effect between financial institutions and markets. (Ostalecka, 2009a)

The risk of creating instability in the financial system increases due to the growing use of complex derivative instruments in the financial market. This allows investors to hedge against various types of risks and provides a broad opportunity to invest in assets. Internal reasons for the increasing instability are conditioned by banks conducting excessively risky activities.

In figure 14, a division of the internal causes of instability in the banking system is presented. The division was made into management factors and responsibility factors.

MANAGEMENT FACTORS

Inappropriate management

Lack or inadequate internal control

Lack of owner supervision in banks

RESPONSIBILITY FACTORS

Change in business model

Innovations of commercial banks

Size of credit actions

Level of credit risk

Capital base of banks
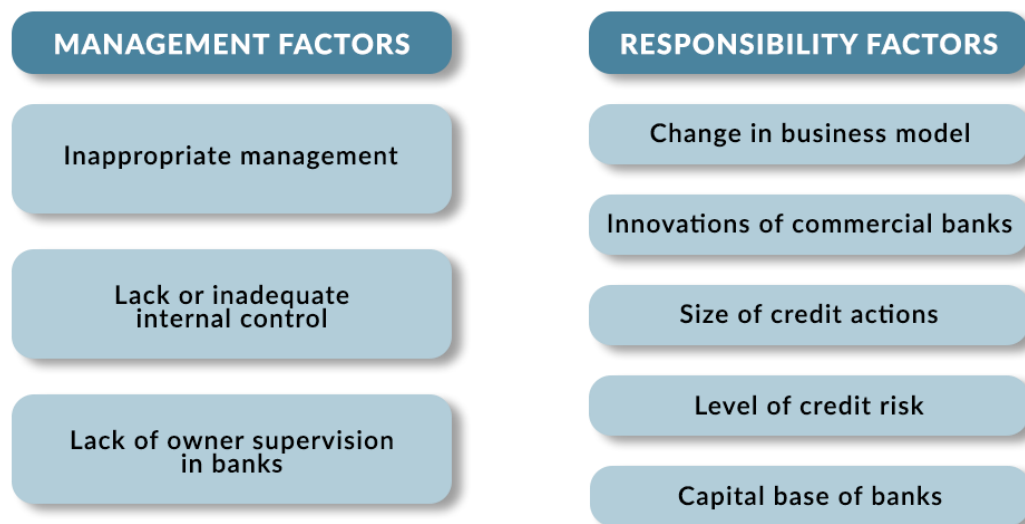
Figure 14 Internal causes of instability in the banking system

Source: Own elaboration based on (Nocoń, 2016)

Inappropriate management (by inexperienced or incompetent managers), lack of or insufficient internal control, and absence of proper ownership supervision in banks directly lead to a decrease in overall trust in the banking sector. Moreover, it results in banks facing challenges in meeting capital requirements and maintaining financial discipline. It also hinders the ongoing monitoring of borrowers and effective risk management. All these aspects can destabilize a financial entity and, as a result of contagion, lead to a financial crisis. The lack of effective control and oversight increases the risk of banking operations, tax fraud, and even the publishing of falsified bank financial statements. (Admati & Hellwig, 2013)

Nowadays, changes in the business model of banks are particularly significant in generating financial instability. During the global crisis, banks underwent a so-called management revolution, which led to banks engaging in highly risky activities. The motivation system at the time encouraged the maximization of short-term returns. An excessive focus on these activities meant that conducting financial transactions carried above-average risks but promoted an increase in the value of bank shares. Bank boards were not interested in making changes in this area because the operations so far had generated relatively high profits. (Szpringer, 2014)

Innovations introduced by banks are also crucial for the stability of the financial system. These innovations (before the onset of the great crisis in the early 21st century) primarily served to gain a competitive advantage. Banks decided to lower the requirements for borrowers when assessing their creditworthiness. As a result, there was an increase in value and maximization of interest income from loans. However, such dynamic credit expansion was associated with ever-increasing risk. (Nowakowski, 2010)

Since the beginning of the 21st century, banks have increased their involvement in granting subprime mortgages. The recipients of these loans were so-called NINJA clients (No Income, No Job, No Assets), characterized by very low or even no creditworthiness. Their commitment settlement was only possible through refinancing loans or in the situation of continuous property price growth. This gave rise to the so-called speculative bubble, where the real value of property was much lower than the asset value in that market. This attracted investors and speculators. However, problems began to emerge when property prices started to drop sharply. Elevated loan costs associated with rising interest rates, coupled with simultaneous declines in the real estate market, made it impossible for debtors to repay their obligations. This situation led to growing instability in the entire banking sector and ultimately contributed to the onset of the great crisis in the United States in the early 21st century. (Freixas et al., 2023)

Another potential source of instability in the banking sector and the entire financial system became the securitization of assets. This is a method of converting receivables into cash, which enables the "release" of tied-up capital. Securitization became a way to obtain short-term financial capital. It's done while simultaneously transferring risk to another entity. By securitizing, banks improved their liquidity. However, during the financial crisis, this process contributed to increasing instability. The creditworthiness of target banks deteriorated, resulting in lower ratings for securitized instruments. All these factors had a negative impact on the entire interbank market, causing, among other things, a trust crisis and a collapse in mutual loans of credit institutions. Commercial banks began to face financial liquidity problems and, consequently, problems in settling obligations. Additionally, a lack of demand for securitization significantly limited their access to short-term financing. (Quagliariello, 2011)

According to M. Iwanicz-Drozdowska (2002), the safety of the banking sector can be discussed when the safety of individual banks belonging to the system is ensured. It is mainly conditioned by the regulatory environment, the policies of individual banks, market discipline, and economic factors. (Iwanowicz-Drozdowska. Małgorzata, 2002)

Central banks are therefore faced with the need to analyze and assess constantly changing factors determining the stability of the financial system. Overlooking seemingly insignificant factors may adversely affect the effectiveness of actions aimed at financial stabilization in the future. (Wang, 2021)

Financial stability is essential for maintaining and promoting healthy economic development. Financial instability, such as bank bankruptcies or sudden changes in credit access, can lead to recession, increased unemployment, and general economic uncertainty.

Central banks of individual countries, due to their special rights, play a crucial role in maintaining financial stability. In addition, they are responsible for implementing monetary policy, act as the

state bank, bank of banks, and the issuing bank. The history of central banks in ensuring financial stability is very long. (Blinder, 2001) A good example of the transformation of a central bank can be the United States. There, the motivation to establish a central bank was precisely the need to restore and maintain broad financial stability. Initially, however, the establishment of central banks aimed to issue payment instruments and finance the needs of a given country's government. With the development of trade and the entire financial system, the importance of financial system stability increased. (LUI, 2018)

Understanding the essence of financial stability can be aided by comparing it to the central bank's concern for maintaining price stability. (Marszałek, 2010) analyzed the impact of price stability on financial stability. He found that a low and relatively constant inflation rate reduces the sensitivity of the economic cycle to changes in asset prices. Therefore, financial crises spread more slowly in the case of maintained price stability than in the case of sudden changes in the level of inflation. On the other hand, a high inflation rate can exacerbate the information asymmetry between borrowers and lenders. When there is high inflation volatility and consequently - a high interest rate, confidence in the national currency decreases, and interest grows in foreign currency-denominated loans. Such a situation can be a source of disturbances in the financial market in the case of significant and rapid currency exchange rate volatility. Price stability also affects the reduction of the risk premium expressed in interest rates, which occurs as a result of decreasing uncertainty about the level of inflation and future central bank rates. Research conducted by M. Bordo and D. Wheelock in 1998 showed that a central bank's monetary policy focused on price stabilization influences the achievement of financial stability. A stable financial system allows for the smooth flow of signals in monetary transmission mechanisms and promotes effective resource allocation. Financial system stability will not occur in the case of price instability, and financial stability cannot be treated as a "side effect" of striving for price stabilization. (Bordo & Wheelock, 1998)

The emergence of instability in the banking sector generates high costs not only for the banks themselves but for the entire economy. The larger the scale of the problems that arise, the higher the costs of fixing them. The costs of instability in the banking sector are primarily associated with actions aimed at limiting the effects of the spread of instability to other markets and entities.(Szpringer, 2001) These costs also encompass the entire process of restoring the sector to a stable state. These are largely borne by banks, but also by central institutions, the state, and ultimately - by taxpayers. Therefore, the costs of instability in the banking sector can negatively affect the public finances of a country that has been hit by this problem. Generally, the costs of financial instability are divided into fiscal costs and economic costs. (Nocoń, 2016)

Fiscal costs are borne by the state authorities. Economic costs, on the other hand, are reflected in changes in the main economic aggregates. They are estimated by losses in the GDP of a given country. The types of instability costs are presented in figure 15.

COSTS OF INSTABILITY IN THE BANKING SECTOR

FISCAL COSTS

Direct Costs - result from emergency liquidity support, restructuring, recapitalization, or nationalization of banks.

Indirect Costs - result from lower state budget revenues due to taxes and higher government expenditures.

ECONOMIC COSTS

- Costs borne by the bank's stakeholders,
- Decline in investments and household expenditures,
- Drop in economic growth,
- Decrease in depositors' income,
- Restriction of money supply,
- Decline in the bank's credit actions,
- Seeking alternative sources of capital.

Figure 15 Types of costs of instability in the banking sector.

Source: Own elaboration based on (Nocoń, 2016)

The high costs incurred by the American economy, and to a large extent by the European economy, suggest that the natural starting point for actions aimed at financial stability should be the prevention of the emergence and accumulation of threats to the financial system. The financial market liberalization that has been progressing since the 1980s, leading to a continuous increase in financial assets in relation to GDP, and increasingly complex links between the financial system and the real economy, result in a significant increase in the importance of indirect mechanisms affecting the entire financial system. Currently, the approach to responsibility for maintaining financial stability is relevant in certain areas of central banks' activities. These include: (Armour et al., 2016)

• increased involvement in actions aimed at ensuring the safety and stability of payment systems,

• the evolution of the role and form of the central bank's engagement in banking supervision,

• development of the identification and assessment of threats to financial stability - macroprudential analysis,

• increasing importance of information policy, which is a significant instrument in supporting the stability of the financial system.

Ensuring the stability of the financial system is a multifaceted and complex task. Its difficulty is compounded by the fact that no precise model has yet been developed to predict stability or assess the performance of tasks aimed at achieving the set goal. A stable economy meets many criteria. It can be observed that many of them are related to areas of the economy that are beyond the reach of the central bank's influence. Therefore, supporting, guaranteeing, and protecting financial stability is a task that requires the involvement of both public and private institutions. (Góra, 1998) The central bank shares responsibility for maintaining financial stability with institutions belonging to the so-called safety net. In a financial context, the "safety net" refers to mechanisms aimed at stabilizing the financial system and protecting against crises. (Mayntz, 2012) These mechanisms may include, for example, bank deposit insurance, credit guarantee systems, or various regulations and oversight. At the financial system level:

- guarantees on bank deposits protect customer savings in the event of a bank's collapse,
- the central bank acts as a lender of last resort, with the possibility of central bank intervention to provide liquidity to commercial banks,
- regulatory bodies' actions aim to monitor and control risk in the financial system,
- crisis mechanisms that include rescue funds, international agreements, and other mechanisms aimed at supporting the financial system in times of crisis.

Each of these elements has its advantages and disadvantages, but their combination can significantly increase resilience to various financial shocks.

2.3.   Indicators of financial stability

Both the measurement and analysis of financial stability are of significant importance for the central bank. They enable the definition of the scope of preventive or corrective tasks in this area. The multitude of existing definitions and the ambiguity in understanding the concept of financial stability mean that the problem of determining whether the financial system is stable and to what extent has not been unequivocally resolved yet. However, the literature provides examples of quantification and the creation of analytical tools that can be used. They primarily differ in the factors included in the analysis and their interpretation. (Choudhry, 2022)

Table 9 presents selected variables used in the analysis of financial stability of various economic sectors. The real sphere, enterprises, households, the external sector, the financial sector (mainly banks), and financial markets are covered.

The measures presented in the table, which are used to determine financial instability, consider many sectors of the economy. This indicates that the financial system is linked with the entire

economy, not only at the local level but also globally. The financial system and the economy mutually influence each other.

Table 9 Measures used in the analysis of financial stability.

Economic Sector	Measure	Meaning and interpretation
Real Sphere	**GDP Dynamics**	Economic growth measure. A slow growth rate indicates a likely emergence of credit losses resulting from the deterioration of the real sector entities' situation. Too rapid growth signals the emergence of macro-financial imbalances.
	Fiscal situation	Public sector's ability to manage liabilities. A high level of borrowing needs caused by a budget deficit indicates a risk to the entire economy. A high level of debt can have a negative impact on the entire banking sector.
	Inflation	Rise in the overall price level. A high level of inflation can indicate economic imbalances and the risk of rising nominal interest rates. Conversely, low inflation can lead to an increased risk appetite in financial markets.
Enterprises	**Equity debt ratio**	Debt to equity ratio. Excessive use of financial leverage might suggest an elevated risk associated with debt servicing.
	Income to interest cost ratio	Excessive income burden by interest costs over an extended period can lead to solvency issues.
	Foreign currency debt	Sensitivity to currency volatility or depreciation.
	Number of enterprise bankruptcies	A significant increase in the number of enterprise bankruptcies can signal problems in the banking sector. In the event of a large enterprise's bankruptcy, there's a domino risk and problems for other collaborating enterprises.

Households	**Assets**	Net household assets in relation to consumption expenditures and debt service expenses indicate the risk of repayment issues and allow for assessing the demand for financial institution products.
	Debt	
	Income to consumption expenditures and debt service costs ratio	
External sector	**Real exchange rate**	Overvaluation or undervaluation of the currency can lead to a currency crisis through sudden capital inflows or outflows and a loss of export market competitiveness.
	Foreign reserves	The resilience of an economy to external shocks. A reserve level lower than short-term debt might lead to repayment issues.
	Maturity or currency mismatch	Mismatches can expose an economy to shocks from sudden capital outflows or adverse currency rate changes.
Financial sector	**Monetary aggregates**	Excessive growth can signal inflationary pressure.
	Real interest rates	High real interest rates may be a sign of growing credit risk (problems with debt servicing). Whereas too low interest rates can distort efficient resource allocation and lead to speculative bubbles.
	Rate of credit growth	Too rapid growth might suggest the emergence of speculative bubbles and an excessive rise in credit and systemic risk.
	Amount of write-offs for asset value loss	Decreasing liquidity and capital buffers, as well as increasing losses, can lead to higher market financing costs and an aversion to risk, culminating in financial institution bankruptcies and a confidence crisis in the sector.

Financial sector	Capital adequacy ratio	Decreasing liquidity and capital buffers, as well as increasing losses, can lead to higher market financing costs and an aversion to risk, culminating in financial institution bankruptcies and a confidence crisis in the sector.
	Liquidity ratio	
	Financial institution ratings	
	Concentration/ diversification ratio	Excessive business concentration can increase systemic risk through increased sensitivity of many institutions to the same events.
Financial markets	Changes in stock price indices	These influence corporate financing costs. Too rapid growth of stock price indices might suggest speculative bubbles, economic imbalances, and systemic risks.
	Spreads	Risk assessment of entities seeking financing. An increase can suggest rising credit risk or an increased aversion to risk.
	Market liquidity	Market liquidity disturbances can disrupt the operation of financial institutions and directly affect the price and range of services they offer.
	Volatility of financial instrument quotations	Increased volatility might suggest increased market-wide perceived risk. High volatility might result in liquidity disturbances, while low volatility might indicate the paradox of instability.
	Real estate prices	Too rapid real estate price growth might suggest a speculative bubble, leading to excessive demand for loans and over-consumption by households. This in turn deepens economic imbalances and increases systemic risk. A market crash in real estate prices poses a real risk of credit risk materialization.

Source: own elaboration based on (Smaga, 2014b)

Due to the mutual interactions of the various sectors of the economy, it is important that each of them functions properly and without any disturbances.

In addition to using the measures presented in the table above to assess financial instability, methods are also used, the division of which is presented in figure 16.

73

METHODS OF MEASURING FINANCIAL INSTABILITY

Econometric models

Indicator analysis
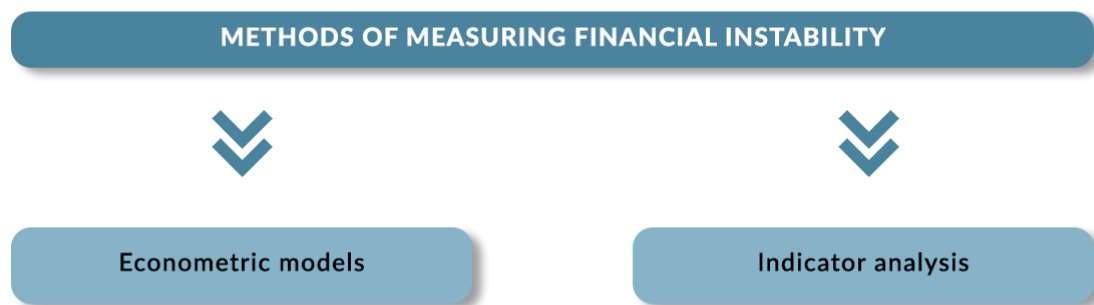
Figure 16 Classification of financial instability measurement methods

Source: Own elaboration based on (Heffernan, 2007)

The first econometric studies on the use of economic models for assessing financial stability date back to the 1980s. They are primarily based on the accomplishments of F. Kydland and E. Prescott. (Kolasa, 2012) They analyzed the economic business cycles and cyclically recurring recession periods. In econometric research, the tool used is a model. It is a simplification of reality and reflects dependencies on the factors that shape it. For the generated model to be useful, it must consider all variables that influence the phenomenon under analysis.

Over the past three decades, there has been significant development in econometric models of financial stability. This was driven by the changing needs of central banks, for whom maintaining financial stability became an increasingly important goal. The intensification of crises in recent years has prompted increased research on the use of econometric models to assess financial stability. They began to be applied for quantitative evaluation to indicate the proper direction of conducted monetary and fiscal policies.

Currently, the following econometric models are distinguished for analyzing financial stability: (Pignataro, 2022)

- RBC models (Real Business Cycle),
- Diamond-Dybvig models,
- DSGE models (Dynamic Stochastic General Equilibrium),
- OLG models (Overlapping Generation),
- FHGE models (Finite Horizon General Equilibrium),
- SVAR model (Structural Vector Autoregressive),
- DAE model (Dynamic Aggregative Estimated).

ECONOMETRIC MODELS USED FOR ANALYZING FINANCIAL STABILITY

RBC models (Real Business Cycle)

Diamond-Dybvig models

DSGE models (Dynamic Stochastic General Equilibrium)

OLG models (Overlapping Generation)

FHGE models (Finite Horizon General Equilibrium)

SVAR model (Structural Vector Autoregressive)

DAE model (Dynamic Aggregative Estimated)
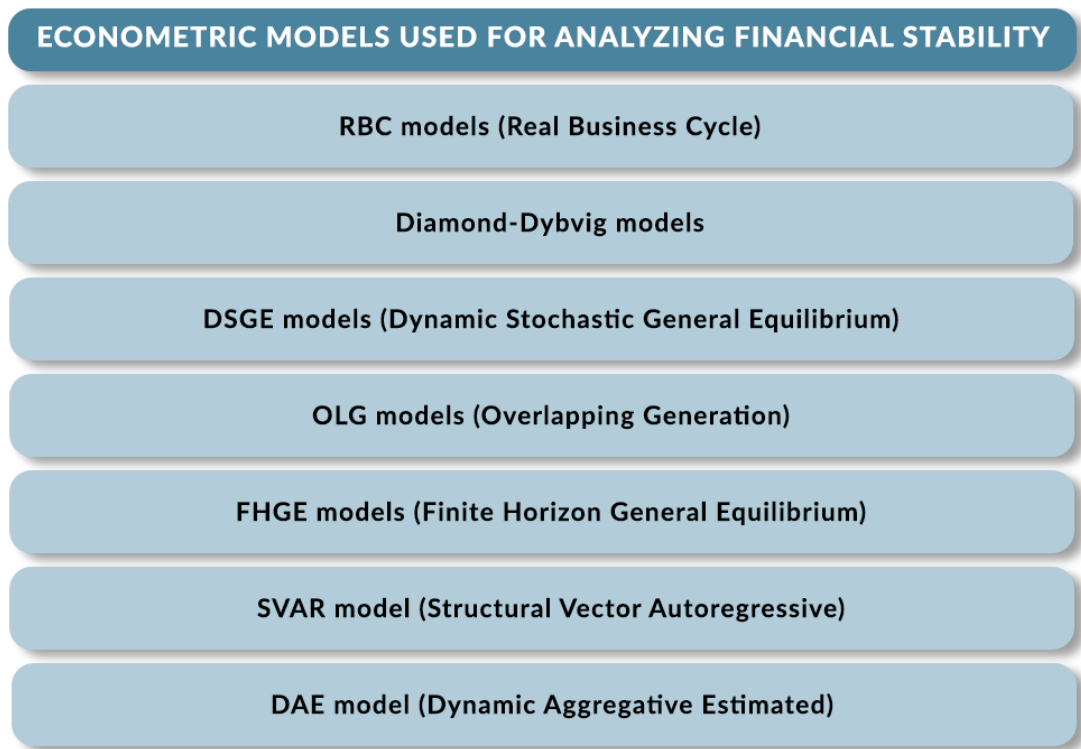
Figure 17 Econometric models used for analyzing financial stability.

Source: own elaboration based on (Pignataro, 2022)

Each of these models focuses on different classes of risk and analyzes the financial system's condition differently. As a result, each can be applied differently and has different limitations.

Variables used to analyze financial stability and assess the banking sector in the aforementioned models include: (C. Goodhart, 2008), (Jahn et al., 2012)

• banks' liquidity level,

• funding sources,

• size of equity,

• interest rate level,

• degree of compliance with certain requirements (capital and regulatory),

• banks' solvency level,

• return on investment,

• risk of a bank run,

• banks' bankruptcy index,

• bankruptcy risk,

• credit risk size,

• systemic risk size,

• overall assessment of the sector's operation.

Real Business Cycle (RBC) models are tools for analyzing the business cycle. Their nature is purely theoretical and does not account for changes related to the participants of the analyzed market. (Pignataro, 2022) Due to their significant limitations, these models have not gained importance and are primarily used to verify other models with a higher application level.

The Diamond-Dybvig model focuses on the phenomenon of bank insolvency. In this model, uncertainty is identified with situations where depositors massively withdraw deposits, leading to liquidity problems for banks. Therefore, instability is caused by a bank run. Additionally, liquidity issues arise in cases of mismatched maturity of assets and liabilities. Bank obligations are typically short-term, while assets have a long maturity and are characterized by low liquidity. The entire banking sector can be shaken if several smaller banks or one significant bank faces liquidity problems. (Selgin, 2020)

Dynamic Stochastic General Equilibrium (DSGE) models are used for monetary policy modeling and assessing the condition of the banking sector. These models center around structural disturbances that destabilize the financial system, so they can be applied to studies on financial instability. (Torres Chacón, 2015) These models examine an economy consisting of a household, a business, and a central bank. A characteristic of DSGE models is the description of optimal allocation and price levels under equilibrium conditions, assuming that participants, considering the limiting resources, maximize their objective functions.

Overlapping Generation (OLG) models focus on the phenomenon of moral hazard. This arises from the information asymmetry in short- and long-term credit markets. The information asymmetry is related to the investment decisions of non-financial entities and leads to an increase in behaviors associated with moral hazard. OLG models incorporate production as a variable, allowing for the examination of the relationships between the credit market and production growth. (Pignataro, 2022) They can be used to analyze financial instability in the context of disturbances in the credit market.

Finite Horizon General Equilibrium (FHGE) models demonstrate that instability arises from disequilibrium. (Pignataro, 2022)These models analyze the interactions between monetary policy and regulatory policy. In the banking sector analysis, FHGE models assume a diversity of banks and their capital requirements, as well as the possibility of insolvency. This diversity means that each bank makes decisions regarding risk, income, and capital levels individually. This situation results in differences in market interest rates and the emergence of spreads between deposit and credit rates. For central banks, the primary tool is the interest rate. Hence, this model allows the identification of banks with high levels of insolvency and those that violate capital adequacy regulations.

Structural Vector Autoregressive (SVAR) models replicate past data and identify market shocks and transmission mechanisms concerning the future. (Mazzi et al., 2016)These models are used to analyze the effects of economic shocks (primarily monetary and fiscal). They are currently used to model economic processes.

Dynamic Aggregative Estimated (DAE) models assume an active role for central banks concerning changes in asset prices. The central bank's response results from the potential influence of speculative bubbles on excessive levels of consumption and investment and the risk of bubble bursts, which would destabilize the entire financial system. (Pignataro, 2022)Models from this group present basic transmission mechanisms, such as the depreciation of the national currency caused by a decrease in the interest rate, resulting in changes in prices and wages. This can simultaneously increase market participants' competitiveness, reduce unemployment, and increase income. On the other hand, increased competitiveness reduces the risk of bankruptcy and improves the creditworthiness of economic entities, which in turn affects banks' financial condition.

In the literature, several other models are also distinguished, which to some extent relate to the phenomenon of financial stability or analyze factors that may cause disturbances in the banking sector. An example is the Aspachs-Goodhart-Tsomocos-Zicchino model, which is based on the concept of social welfare. (Tabak et al., 2013)The assumption of this model is the existence of a household sector, three heterogeneous banks, and a central bank. This model allows identifying the economy's response to events related to regulatory and monetary policy and shocks appearing in the credit and capital markets. Factors affecting changes in social welfare and the level of financial stability are primarily bank profitability and their insolvency probability. Although it is a two-factor model, both factors are not treated equally, mainly due to difficulties in estimating insolvency risk.

The presented econometric models are quantitative models, and despite many advantages and potential applications, they also have drawbacks. The most important ones include:

- oversimplification of reality,
- neglecting numerous connections between market participants,
- low level of flexibility in adapting to new factors,
- minimal emphasis on researching and analyzing the banking sector's condition, which is a crucial element of the financial system,
- lack of an early warning system allowing central banks to take preventive actions.

Another group of methods used for analyzing and assessing the banking sector's stability is indicator methods. Broadly speaking, indicator analysis is a method of a bank's financial analysis. It involves calculating certain indicators based on financial data and assessing their size over time and in relation to other financial institutions. Additionally, using indicator analysis allows for a

synthetic assessment of a bank's condition – liquidity, profitability, or solvency. One of the main objectives of conducting indicator analysis is to predict future events that might pose a threat to the bank or the entire sector based on the analysis of historical data. (Belasco, 2021)

Indicator analysis uses economic indicators of various informational and analytical significance. Due to its flexibility and the ability to select specific indicators, it can be used by central banks, supervisory institutions, or even the state. The analyzed indicators also have a cumulative character, allowing in a synthetic way to find the most critical information. The primary goal of conducting indicator analysis is the quantitative assessment of various bank areas. Mainly it examines:

- the bank's economic-financial condition,
- development opportunities,
- critical areas of activity,
- the level of risk generated by a given bank,
- the size of risk for the entire sector,
- external factors influencing the bank's operations.

Indicator analysis indicates certain trends and deviations in the entire banking sector. It also allows for comparison of banks and calculation of average values in the sector. The result of the conducted indicator analysis is an image of financial condition and the level of stability or instability of the banking sector. It is a method that allows for identifying irregularities in the sector and assessing their intensity. As a result, it is treated as an early warning method. Regular monitoring of indicator levels can provide significant information about emerging instability in the banking sector. However, using the analysis for this purpose requires defining the desired value of selected, significant evaluation indicators. To assess the risk of financial instability, mainly the following are used: (Padberg, 2017)

- indicators assessing systemic risk,
- indicators evaluating the financial system's condition,
- indicators to assess the level of credit risk,
- indicators measuring credit-deposit instability,
- profitability indicators.

The significance of measuring the level of financial instability of the listed indicators is presented in Table 10.

Table 10 The significance of individual groups of indicators.

Group of Indicators	Significance for Instability Measurement
Systemic Risk Assessment Indicators	Increasing significance of systemic risk in the global economy, which is the most crucial factor affecting the destabilization of the banking sector. This results from the continuously growing and strong interdependence of various banking institutions.
Financial System Condition Assessment Indicators	A primary source of information about the condition of the entire financial system, on which the condition of the banking sector heavily depends.
Indicators to Assess the Level of Credit Risk	An increase in credit risk causes a series of disruptions in banks, leading to a deterioration of the bank's asset portfolio, thus destabilizing its operational conditions.
Indicators Measuring Credit-Deposit Instability	Monitoring banks' lending actions in relation to deposit activities allows for the assessment of financing sources and the direction of the bank's capital allocation. Excessive lending combined with liberalized creditworthiness assessment can significantly influence the emergence of instability in the banking sector.
Profitability Indicators	A decline in the profitability of a financial institution signals a deterioration in its economic and financial situation. A decrease in a bank's profitability can exacerbate instability in the entire banking sector.

Source: Own study based on (Nocoń, 2016)

The table contains a brief description of individual indicators, while their detailed classification is presented in Table 11 below.

Table 11 Classification of Indicators.

Group of Indicators	Indicators
Systemic Risk Assessment Indicators	-Financial assets to GDP ratio -MES indicator -SRISK indicator
Financial System Condition Assessment Indicators	-Financial condition indices -LIBOR-OIS spread -TED spread
Credit Risk Level Assessment Indicators	Markit iTraxx Financial indices
Indicators Measuring Credit-Deposit Instability	-Bank's credit activity indicator -Bank's deposit activity indicator -Credit/Deposit ratio -Non-performing loan ratio
Profitability Indicators	-Return on Assets (ROA) -Return on Equity (ROE)
Indicators Assessing the Safety Level of Banking Institutions	-Solvency ratio -Tier1 ratio

Source: Own study based on (Nocoń, 2016)

The occurrence of systemic risk is one of the main causes of instability in the banking system. The processes of globalization and economic liberalization, coupled with the growing significance of assets of the largest banking institutions, have inscribed systemic risk into the group of characteristics inherent to the current financial system. (Ostaszewski & Malinowska - Misiąg, 2021)Given the ongoing changes, there is a need to monitor systemic risk, which poses a threat to the stability of the banking sector. The increasing systemic risk in the modern economy has led to a growing interest in methods for its measurement and analysis. (Dobrzańska, 2016) The group of systemic risk assessment indicators includes:

- Financial assets to GDP ratio,
- MES indicator (Marginal Expected Shortfall),
- SRISK indicator (Systemic Risk Contribution).

The formula for the financial assets ratio in relation to GDP is as follows:

$$\frac{Financial\ assets\ of\ the\ banking\ sector}{GDP}$$

The higher the level of the indicator expressed by formula, the greater the systemic importance of the banking sector or the analyzed bank. A higher indicator also means that the bank's financial assets have a greater influence on the condition of the entire banking sector. It allows for the identification of institutions that are key from the perspective of financial stability.

The ratio of financial assets to GDP does not fully reflect the systemic risk occurring in the banking sector. Therefore, other indicators, such as MES and SRISK, are used. These are among the methods for measuring systemic risk used by the European Central Bank.

The MES indicator represents the marginal expected capital shortfall in the banking system. It is caused by a capital deficit that occurs in a crisis situation in a single financial institution. The starting point in this analysis is to determine the level of the VaR (Value AT Risk) indicator, which is the most popular measure of a bank's financial risk. The equation for the MES indicator is as follows:

$$MES_i^q = E\ (L_i | L > VaR^q)$$

Where:

L_i – potential loss on the assets of a given bank,
L – losses incurred by the entire banking sector,
VaR^q – the maximum possible loss value in a bank's portfolio over a given period and with a specified probability of occurrence,
$E\ (L_i | L > VaR^q)$ – the marginal expected capital shortfall that will occur due to a loss in a given bank and provided that the sector-wide losses exceed the VaR value.
The MES indicator thus shows the strength of the influence of a single financial institution on systemic risk. It is measured as a percentage of the balance sheet total of a given bank. The equation for a bank's liabilities and assets is described by the equation:

$$D_i + C_i = \sum_{j=1}^{k} X_{i,j}$$

Where:

D_i – all obligations of the bank,
C_i – the equity of a given bank at the current market price,
$X_{i,j}$ – assets of a given bank at the current market price.
The size of this indicator indicates the share of a given bank in systemic risk in the event of a crisis. Therefore, in this approach, the measure of systemic risk is the amount of capital that must be

added to a given bank to balance the capital-to-assets ratio. The necessary recapitalization of the bank should be paid by the owners or obtained on the market. However, in the event of a crisis, such a way of raising capital may not be possible. Ultimately, this task falls on the government. Thus, the higher the level of the MES indicator, the higher the level of systemic risk in a given situation, and the desired capital size is higher.

A variant of the MES indicator is SRISK, which uses a measure of systemic risk. In this model, SRISK is equal to the expected size of the required equity shortfall of a bank in the event of a crisis, as shown by the following formula:

$SRISK_i = E$ (capital shortfall/ crisis

thus:

$$SRISK_i = E(k(D_i + C_i) - C_i \mid crisis) = kD_i + k(1 - LMRES_i)C_i - (1 - LMRES_i)C_i$$
$$= kD_i - (1 - k)(1 - LMRES_i)C_i$$

where:

E – expected capital deficit of the bank in the event of a crisis,

k – capital adequacy ratio (ratio of equity capital to total assets),

D_i – total liabilities,

C_i - equity capital of the bank,

$LMRES_i$ - expected percentage decline in equity value in the event of a crisis.

The equation indicates that at a given level of the capital adequacy ratio (k), the systemic risk generated by a bank is smaller the greater the bank's equity capital. The magnitude of systemic risk is greater the higher the bank's liabilities and the potential decrease in capital value under crisis conditions ($LMRES_i$).

The SRISK indicator measures the percentage capital shortfall that will occur in a particular financial institution in the event of a crisis. When the value of this indicator is greater than 0, the bank is exposed to the risk of insolvency or liquidity loss. The total systemic risk is determined as the sum of the SRISK values for individual banks.

Both the MES and SRISK indicators can be significant in an early warning system due to two of their fundamental advantages: (Nocoń, 2015)

• Both indicators are expressed in monetary values, which allows for aggregation on a sectoral scale and determination of the potential capital needs of the sector in the event of a crisis.
• These indicators are estimated based on banks' balance sheets.

Another group of indicators used to study the instability of the banking sector are indicators of the financial system's condition. They are a primary source of information about the current situation in

the financial system, and variables related to the banking sector are used to estimate them. The use of these indicators can be of a signaling nature, as they allow for the detection of irregularities and provide general information about the condition of the banking sector, which is the main link of the financial system. (Grocholski, 2016) A sudden and significant change in the values of individual indicators may indicate a deterioration in the financial system's situation and requires a thorough examination of individual market segments for instability. (Ramphul, 2009)There are three basic groups of financial system condition indicators:

- Financial Condition Indices (FCI),
- LIBOR-OIS spread,
- TED spread.

The first group of indicators is the broadest. It includes financial variables that affect the behaviors of individual entities and the overall state of the economy. Variables related to the banking sector include, among others:

- the scale of the credit action,
- the size of credit risk,
- credit terms and availability,
- the level of interest rates prevailing in the interbank market,
- capital adequacy ratios,
- the level of borrower risk,
- the shape of the yield curve.

There are two methods for estimating financial condition indicators. The first is based on the use of a weighted average of individual variables included in the index. After assigning weights to each of the variables, they are assigned based on an estimate of their impact on changes in GDP. This estimate is made based on macroeconomic models or using a vector autoregression model, which is a risk assessment method (Value at Risk). (Wu & Zhou, 2015)

The second estimation method is based on the main variables of the indicator and involves extracting a single common factor characterized by the highest variability.

Most financial condition indicators are constructed based on current values of financial variables. (Orzeszko, 2013) However, there are also those based on past values. All indices from the FCI group measure the overall impact of financial conditions on economic growth achieved. Currently, the indices presented in Table 12 are used worldwide. The table also provides a brief description of them along with an interpretation. All these indicators differ from each other in the selection of variables and the weight assigned to each of them.

Credit risk intensity indicators have been adopted in the early warning system due to the fact that excessive credit risk is the main threat to the stability of the entire financial system. This risk is

equated to the danger of a borrower not fulfilling their obligations to the bank, which exposes the lender to financial losses. (Smaga, 2014c)

Credit risk can originate from endogenous factors, meaning those resulting from decisions made within the bank, or exogenous ones – related to the overall macroeconomic situation. The materialization of credit risk in the form of increasing lost, endangered, or overdue receivables significantly impacts the financial condition of a bank. Therefore, studying and analyzing the level of credit risk is crucial for identifying the condition of the banking sector. (Orzeszko, 2013)

The early warning indicators also include the LIBOR-OIS spread. It represents the difference between the 3-month LIBOR rate and the overnight swap rate. LIBOR (London Interbank Offered Rate) is the interest rate for loans offered in London's interbank market.

In financially stable conditions, the IBOR rate follows two basic principles:

- The longer the period, the higher the rate (reflecting the risk of lending for an extended period),
- IBOR rates depict expectations for rate changes in the interbank market.

The OIS (Overnight Index Swap) instrument is a swap from a fixed interest rate to a variable one, where the variable part is linked to the reference one-day rate. In an OIS agreement, both parties commit to paying different interest rates than initially agreed upon. Thus, there's an exchange of two cash flows – the fixed part (a one-time payment calculated according to the contract rate) and the variable part (variable payment being interest calculated based on the overnight rate).

An increase in the LIBOR-OIS spread indicates limited trust in the interbank market and the emergence of instability in the banking sector. As a result, it is considered a barometer of the banking sector's condition. This indicator also points to the insolvency of individual banks. In situations where liquidity is limited in the banking market, financial institutions are forced to pay a higher rate for borrowed loans. A higher LIBOR-OIS spread level is thus interpreted as banks' reduced readiness to grant loans, while a lower level indicates more liquidity in the market. (Alińska, 2012)

The TED spread is also part of the early warning indicators group and, like the LIBOR-OIS spread, reflects financial institutions' trust in banks. The TED spread is the difference between the yield of 3-month treasury bills and the 3M LIBOR rate. Treasury bills are risk-free instruments, while the interbank deposit rate LIBOR indicates banks' credit risk. Therefore, a low level of the indicator may indicate the stability of the banking sector, while a high level indicates instability in the sector.

Table 12 Financial condition indices used worldwide.

Financial Condition Indicator	Description
Bloomberg Financial Condition Indices (BFCI)	An indicator for assessing the condition of the financial system. It is a combination of money market, stock market, and bond market indicators. Negative values of the BFCI indicate a state of financial instability.
Bank of Canada Financial Condition Index (CFCILEVL)	An index developed by the central bank of Canada. While estimating its level, the following are taken into account: credit conditions, corporate bond interest rates, short-term and long-term interest rates, exchange rates, stock prices, and real estate prices. The lower the value of the indicator, the higher the risk of financial system instability. A value around zero indicates financial stability.
Kansas City Financial Stress Index (KCFSI)	This index utilizes 11 financial indicators, with each representing one of the five selected risk areas, reflecting the prices/returns of financial instruments. Positive values of the KCFSI indicate strong financial instability. The desired value hovers around zero.
Goldman Sachs Financial Stress Index (GS FSI)	An indicator depicting the perceived risk in the sector as well as the uncertainty of economic entities and changing expectations. It is one of the most frequently used indicators. High values of the GS FSI indicate elevated risk of financial system instability. The desired value is close to zero.
Financial Condition Indicator	Description
Global Financial Stress Index (GFSI)	Provides information about the condition of the financial system and the banking sector. An increase in the value of this index indicates growing financial system instability. A value close to zero indicates the presence of stability.

Source: Own elaboration based on (Nocoń, 2016)

One group of credit risk assessment indicators are the Markit iTraxx Financial indices, which are estimated based on CDS (Credit Default Swap) instruments. These indices reflect the cost of insuring an institution against its insolvency and thus indicate the level of credit risk. The International Company Index (ICI) is responsible for estimating and publishing the values of these indices. A CDS is a type of agreement in which one party of the transaction commits to repaying another entity's due debt in a situation specified in the contract in exchange for compensation.

(Dunning Macleod, 2022a)The use of this instrument allows for better management of credit risk. Broadly speaking, the Markit iTraxx Financial index in some way illustrates the level of instability in the banking sector. The higher its value, the more likely certain disturbances will occur in the sector.

Indicators measuring credit-deposit instability can also be a source of information about the level of instability in the sector. For analysis, indicators such as:

• bank's lending activity index,

• bank's deposit activity index,

• loans/deposits ratio,

• bank's at-risk loans index.

All the mentioned indicators have been presented along with the appropriate formula and interpretation in Table 13.

Determination of the values of all the mentioned indicators allows for an assessment of financial condition in the most crucial areas of the bank.

The next group of indicators used for analyzing the instability of the banking sector are the profitability indicators of banking institutions. The primary goal of banking activity is to make a profit, which is also a criterion for evaluating effectiveness and efficiency. (Przybylska - Kapuścińska & Bednarczyk, 2012)Thus, a signal of disturbances in the banking sector and approaching instability will be a noted decrease in net profit by most banks.

In relation to the below, a parameter of the early warning system might be the value of banks' net profit. To assess the effectiveness of resource utilization committed to the bank, the most popular indicators can be used, such as:

- return on Assets (ROA), which is presented by the formula:

$$ROA = \frac{Net\ profit}{Total\ assets}$$

- return on equity (ROE), expressed by the formula:

$$ROE = \frac{Net\ profit}{Equity\ capital}$$

Table 13 Indicators for measuring the credit-deposit instability of banks.

Indicator	Formula	Interpretation
Bank's lending activity index	$\dfrac{\text{Total loans}}{\text{Total assets}}$	Indicates the scale of the credit activity in relation to the assets held by the bank. The higher the ratio, the lower the liquidity and the riskier the bank's operations. This ratio can also be influenced by economic growth and the phase of the business cycle.
Bank's deposit activity index	$\dfrac{\text{Total deposits}}{\text{Total liabilities}}$	Indicates the level of bank financing through short-term deposits. If the value of the indicator increases, the proportion of deposits in financing is growing. The risk of bank instability increases when this financing is of a short-term nature.
Loans/deposits ratio	$\dfrac{\text{Total loans}}{\text{Total deposits}}$	Informs about the coverage of credit activity with deposit activity. A safe level of this indicator is around 70% - 80%. However, the higher its value, the higher the risk of bank operations and the lower the liquidity. Both a sharp increase and a decrease in the value of the indicator may indicate irregularities.
Bank's at-risk loans index	$\dfrac{\text{Total at-risk loans bank or entire sector}}{\text{Total liabilities}}$	Reflects the quality of the bank's loan portfolio and can serve as an informational-predictive indicator. An increase in the level of this indicator can threaten liquidity and also result in the bank's

Source: Own study based on (Nocoń, 2016)

The ROA indicator informs about the efficiency of managing the assets of a given bank. It indicates how much financial result is generated by one zloty of engaged assets. Thus, the value of this indicator should always be above 1%. Larger banks, compared to smaller, local ones, usually have a lower level of this indicator, mainly due to the higher costs of operations. (Olszak, 2015)

The ROE indicator shows the amount of net profit per unit of equity that has been invested. To estimate its value, it is assumed that equity consists of share capital and reserve capital, reserve funds, and results from previous years. The ROE indicator shows the efficiency of the invested capital, i.e., it informs about the level of profit generated by one zloty of equity. The higher the value of this indicator, the greater the development opportunities of a given bank. (Skopowski & Wiśniewski, 2012)

The next group is indicators assessing the safety level of banking institutions. Safety is a key parameter for evaluation from the perspective of financing and maintaining the stability of the banking sector. Indicators for assessing the safety of banks set minimum requirements that banks

should meet in their operations. They largely concern the capital adequacy of banks. Capital adequacy is a measure for evaluating a bank, its customers, and creditors. Its assessment is made to enhance safety by taking into account exposure to banking risk. Capital adequacy indicators are among the most important indicators for assessing the financial situation of a bank, its solvency, and market position. Failure to comply with predetermined norms results in penalties imposed on banks. Non-compliance with standards by the majority of market participants can pose a real threat to the instability of the entire banking sector. Therefore, capital adequacy indicators have become an essential element of the early warning system. One of the primary indicators for assessing capital adequacy is the solvency ratio, which determines how much capital each bank should have to ensure its operations are safe. The first methodology for estimating the solvency ratio was presented in 1988 by the Basel Committee, initially referring only to credit risk. Therefore, the solvency ratio was defined as the ratio of a bank's equity to risk-weighted assets and off-balance-sheet liabilities. Equity was to serve as a buffer absorbing bank losses due to credit risk. (Marcinkowska, 2014) The Bank for International Settlements in Basel then established that the bank's solvency ratio should not be lower than 8%. However, this is a value that does not guarantee the stability of a banking institution and its solvency in the long term. For banks just starting their operations, the solvency ratio should be higher. According to the Banking Law, a bank starting operational activities should maintain a solvency ratio of not less than 15% for the first 12 months of operation and at least 12% for the next 12 months. On the other hand, too high a level of this indicator indicates ineffective financial policy and may indicate unutilized bank capital.

The constantly changing environment of the banking sector necessitated the inclusion of market (price) risk in the capital adequacy measurement. Furthermore, due to the increasing role of risk in banking activities, it was necessary to amend the solutions previously adopted by the Basel Committee.(Hryckiewicz - Gontarczyk, 2014)

Since 2011, banks are required to maintain a solvency ratio of not less than 12%.

A detailed indicator of the solvency ratio is the Tier1 ratio, which measures the financial strength of a given banking institution. It measures the share of core funds in relation to risk-weighted assets. The higher the value of this indicator, the more advantageous the activity from a stability point of view. Since 2011, the Tier1 ratio should be at a level of not less than 9%.

2.4. Methodology of empirical research

The analysis included a statistical description of the structure of the studied population in relation to all countries. The description is, in statistical terms, unidimensional and dynamic. It is also worth mentioning here that an analysis of the interdependence between various characteristics defining

88

the studied population was conducted, considering that the subject of the study also included the dynamics of phenomena.

The statistical description of the discussed study consisted of a description of the population structure and the interdependence of phenomena, which were used to determine the laws governing the studied phenomena and to show the diverse nature of the studied population. Due to their universal nature, descriptive statistics methods are used in various scientific disciplines, as well as in the business sector, while in this study, their informational function (obtaining an objective picture of the studied phenomenon) and analytical function (defining factors influencing a given phenomenon) were mainly utilized. In the discussed process, elements of three basic groups of descriptive statistics were used (Sobczyk, 2010):

1. Measures of central tendency (measures of distribution location)
   1.1. Mean,
   1.2. Median.
2. Measures of dispersion
   2.1. Range,
   2.2. Variance,
   2.3. Standard deviation.
3. Measures of distribution shape
   3.1. Skewness
   3.2. Kurtosis.

Due to the overwhelming prevalence of multimodal distributions in descriptive statistics, the mode (most frequent value) was omitted.

Regarding measures of location, both classical (weighted average) and positional (mode, median) measures were used to characterize the statistical population independently of the differences between the individual units that comprise it, making this characterization through the prism of population similarities due to the studied variable trait. The following formula for the weighted arithmetic mean was applied:

$$\bar{x}_a = \frac{\sum_{i=1}^{k} x_i * n_i}{N}$$

where:
x_i - value of the variable characteristic,
n_i - partial frequency describing the number of population units that correspond to a specific value of the variable characteristic.

The median is the value of the variable characteristic that divides the studied population into two parts in such a way that half of the population units achieve values not higher, and half not lower than the median. In the discussed study, its determination did not pose any problems and was based on the analysis of data contained in the table with cumulative frequencies.

Regarding measures of dispersion, they allowed for determining how much the obtained results were spread around the central point of distribution. To examine the diversity of distribution, both classical (variance and standard deviation) and positional measures of variability (range) were used. Classical measures of variability are calculated based on the values of the variable characteristic of all units of the studied population, simultaneously showing the differences between the values of the studied characteristic for individual units and the central value. Positional measures of variability, on the other hand, are based on the values of the variable characteristic of specific population units that have a particular position and are usually calculated when it is impossible or not advisable to use classical measures.

The range describes the total variability of the values of the studied characteristic and was used in the study for a preliminary assessment of dispersion. It was calculated using the following formula:

$$R = x_{max} - x_{min},$$

where:

x_{max} - maximum value of the variable characteristic

x_{min} - minimum value of the variable characteristic

Variance is defined as the arithmetic mean of the squares of deviations of individual values of the characteristic from the arithmetic mean of this characteristic. It has been used in the construction of many parameters, including the standard deviation discussed below. It was calculated using the following formula:

$$s^2(x) = \frac{\sum_{i=1}^{N}(x_i - \bar{x})^2 * n_i}{N}$$

where:

x_i - value of the variable characteristic,

n_i - partial frequency describing the number of population units that correspond to a specific value of the variable characteristic.

The last of the used measures of dispersion was the standard deviation, expressed as the square root of variance and calculated based on the following formula:

$$S(x) = \sqrt{S^2(x)}$$

The third of the used groups of descriptive statistics were measures of distribution shape, among which measures of asymmetry and kurtosis of the distribution were applied in the study.

Among the main available measures of asymmetry presented in the figure below, the study decided to use the classical coefficient of asymmetry, which was considered a better measure than the third central moment alone because it allows for comparing values for different distributions and provides information about both the direction and strength of skewness (it is a relative measure).

The classical coefficient of asymmetry was calculated as the ratio of the third central moment to the standard deviation, according to the following formula:

$$A(x) = \frac{\mu_3(x)}{S^3(x)}$$

In the case of asymmetry (skewness), the point of reference is the normal distribution, where positive values indicate positive asymmetry, negative values indicate negative asymmetry, and in the case of 0, we are dealing with a symmetric distribution. A graphical interpretation is presented below:

| Left-skewed, negative | Symmetric distribution | Right-skewed, positive |
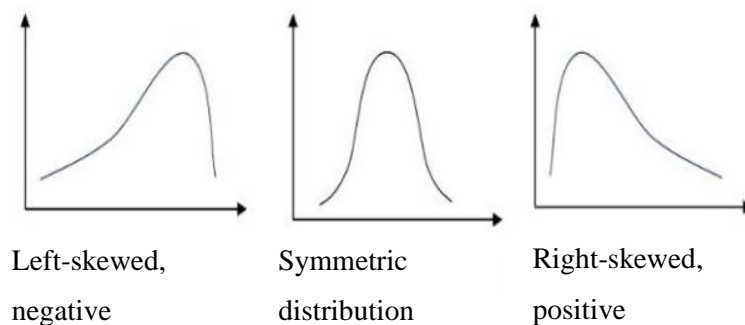
Figure 18 Types of Asymmetry

Source: own elaboration

In the study, the values of the asymmetry coefficient from table 14 were adopted.

The last of the indicators used in the study of descriptive statistics was kurtosis, which is a relative measure of concentration and flattening of the distribution. It defines the distribution and concentration of values (population) near the mean, as well as the shape of the distribution tails. It is represented in the form using the fourth central moment:

$$K = \frac{m_4}{s^4}$$

where:

m_4 - represents the fourth central moment,

s^4 - is the standard deviation raised to the fourth power.

Table 14 Evaluation of the asymmetry coefficient values

Values	Interpretation
above- 1,6	very strong negative asymmetry
from - 1,6 to -1,2	strong negative asymmetry
from - 1,2 to - 0,8	moderate negative asymmetry
from - 0,8 to - 0,4	weak negative asymmetry
from - 0,4 to 0,0	very weak negative asymmetry
0,0-0,4	very weak positive asymmetry
0,4-0,8	weak positive asymmetry
0,8-1,2	moderate positive asymmetry
1,2-1,6	strong positive asymmetry
below 1,6	very strong positive asymmetry

Source: own elaboration based on (Pułaska-Turyna, 2011)

In statistical studies, relative kurtosis was used, which can take both negative and positive values. The higher the kurtosis, the greater the concentration of the population around the mean value, which is reflected in a greater sleekness of the distribution curve. A low value of kurtosis has the opposite effect, i.e., a greater dispersion of values, weak concentration, and consequently, flattening of the frequency curve. Due to the relatively small sample size, the decision was made to use an unbiased estimator of kurtosis (Witkowski, 2010) the so-called excess coefficient, expressed by the following formula:

$$K = \frac{n(n+1)}{(n-1)(n-2)(n-3)} \sum_{i=1}^{N} (\frac{x_i - \bar{x}}{s})^4 - \frac{3(n-1)^2}{(n-2)(n-3)}$$

In the study, the following interpretation of the excess coefficient values was adopted:

$W_e < 0$ indicates a platykurtic distribution, more flattened than the normal distribution,

$W_e = 0$ indicates a mesokurtic distribution,

$W_e > 0$ indicates a leptokurtic distribution, more peaked than the normal distribution.

In conclusion, it is also worth mentioning interdependence, i.e., the assessment of the shape, strength, and direction (sometimes) of the relationship between two quantitative variables, which was examined in this study. The study also attempted to analyze and evaluate the interdependence

of characteristics of the studied phenomena, with particular emphasis on previously unidentified relationships occurring between phenomena in the studied area. The author hopes that the statistical description of these relationships will enrich the knowledge of the area of economic reality under study, thereby allowing for a better understanding of it and future attempts to change its shape. It should be noted that the statistical analysis was preceded by a logical assessment of the relationships occurring between the studied phenomena, as, especially in short periods, the co-occurrence of phenomena can be coincidental. In this work, the author focused on correlation, i.e., the co-occurrence of two phenomena or characteristics of the same population. (Pułaska-Turyna, 2011) The Pearson correlation coefficient (r_{xy}) is usually applied here, calculated using the following formula:

$$r_{xy} = \frac{\text{cov}(x, y)}{Sd_x * Sd_y}$$

$$\text{cov}(x, y) = \sum \frac{(x_i - \bar{x})(y_i - \bar{y})}{n}$$

Due to the fact that the correlation study involved time series, and in this case, there is a risk of obtaining too high correlation coefficient values because the phenomena are subject to the influence of time, (Makać & Urbanek-Krzysztofiak, 2020) the author decided to use a modified formula and assess correlations based on the first differences of consecutive terms of both time series, (Zając, 1994) where the Pearson linear correlation coefficient takes the following form:

$$r(\Delta x \Delta y) = \frac{(n-1)\sum_{\Delta xi \Delta yi} - \sum_{\Delta xi} \ \sum_{\Delta yi}}{\sqrt{[(n-1)\sum_i \Delta^2 xi - (\sum \Delta xi)^2]\,[(n-1)\sum \Delta^2 yi - (\sum yi)^2]}}$$

Being aware that in the case of a small number of pairs of observations there is a risk of considering a correlation significant which in reality is random, the author used a preliminary, logical, and substantive assessment of the studied phenomena and a table of critical values for the correlation coefficient proposed by Zieliński (R. Zieliński, 1972), which is applicable with a small number of observation pairs and a probability of erroneous evaluation of 0.05. Pearson correlation coefficients r take values from the interval [-1; 1]. These values indicate the strength of the relationship. The closer it is to "0", the weaker the relationship. The closer to "1" (or "-1"), the stronger the relationship. The interdependence means that an increase/decrease in the value of characteristic A is accompanied by an increase or decrease in the value of characteristic B. A coefficient value of "1" signifies a perfect linear relationship (this is most often obtained during the correlation analysis of characteristic A with characteristic A in a contingency table, and the aforementioned units make up its diagonal). The following interpretation of the correlation coefficient values was adopted in the study:

Table 15 Evaluation of the Correlation Coefficient Values

Values	Interpretation
from – 0,8 to – 1	very strong negative correlation
from - 0,6 to - 0,8	strong negative correlation
from – 0,4 to - 0,6	moderate negative correlation
from - 0,2 to - 0,4	weak negative correlation
from - 0,0 to - 0,2	very weak negative correlation
0,0-0,2	very weak positive correlation
0,2-0,4	weak positive correlation
0,4-0,6	moderate positive correlation
0,6-0,8	strong positive correlation
0,8- 1,0	very strong positive correlation

Source: own elaboration based on (Pułaska-Turyna, 2011)

A detailed analysis of the obtained results is presented in the subsequent sections of the study - characteristics of the research group. At this point, the author will describe the structure of the studied population and will attempt to find correlations between them using correlation analysis. To this end, both elements of static statistics (methods and techniques of descriptive statistics) and the description of interdependencies of phenomena occurring between different characteristics defining this population (correlation analysis) will be utilized. Further discussions should start with presenting the descriptive statistics of the studied population, followed by an analysis of correlations between the most important studied characteristics. It should be noted that due to the small sample sizes and the inability to compare some time series, the discussions presented below will not have the character of statistical inference, and any generalizations of the results presented here should be made with great caution.

The author suggests starting the description of the structure of the studied population by presenting the descriptive statistics of selected characteristics of all the studied countries. In the mentioned description, the focus was solely on determining statistical measures for quantitative variables that can be expressed in numerical terms, measurable (e.g., GDP), while data of nominal nature were characterized in a descriptive manner.

The following measures were used in descriptive statistics:

1) Measures of central tendency (distribution location):
   a) Weighted average,
   b) Median,
2) Measures of dispersion (distribution diversity):
   a) Standard deviation,
   b) Variance,
   c) Range.
3) Measures of distribution shape:
   a) Skewness (classical coefficient of asymmetry),
   b) Distribution concentration (kurtosis).

3. Response of the banking systems of Central European countries to business cycle fluctuations.

3.1. Opportunities and risks for the banking system arising from business cycle fluctuations.

Changes in the level of economic activity can be observed in the development of every economy, which is a result of various factors that significantly influence the fluctuations in economic activity. The banking sector, which significantly affects the functioning of other entities and is crucial for the development of every economy, is particularly exposed to economic fluctuations, which bring both serious threats and opportunities.
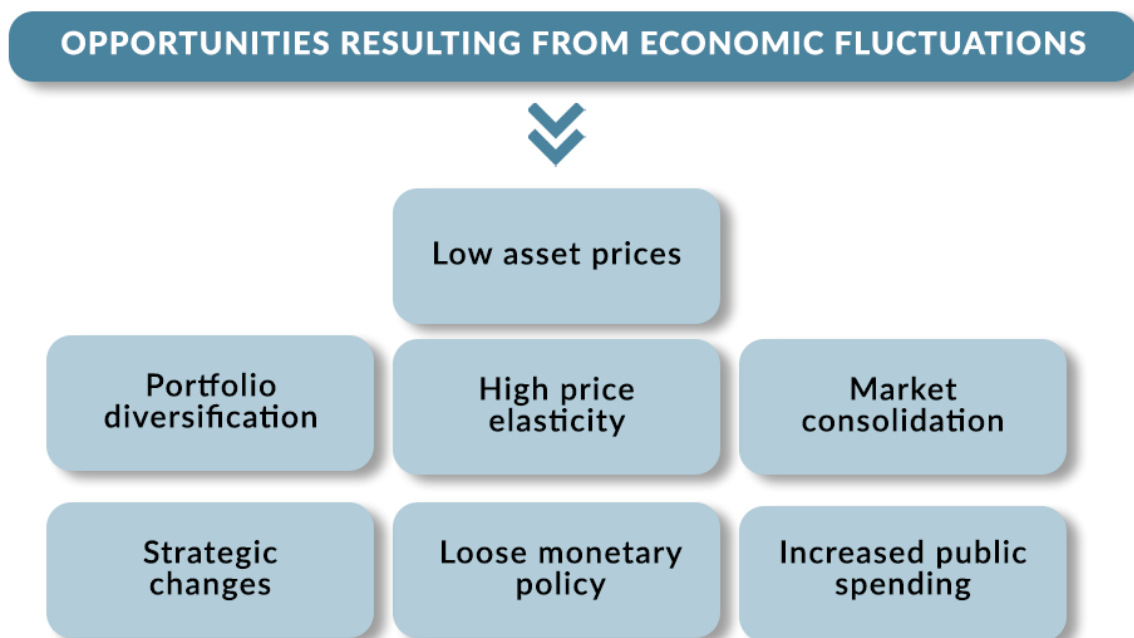
Figure 19 Opportunities resulting from economic fluctuations

Source: own elaboration based on (Paulet, 2016)

The opportunities during economic fluctuations include: (Paulet, 2016)

1. low asset prices, as recession periods often lead to a drop in asset prices, which provides an opportunity for investors and businesses to purchase them at a lower price;

2. portfolio diversification because, as Markowitz suggests in his portfolio theory, downturn periods are an excellent opportunity to diversify investments, which can reduce risk and increase the expected rate of return;

3. high price elasticity, which during recession periods can allow companies to gain a larger market share;

4. market consolidation, as financially stronger companies can take advantage of downturns to take over competitive but weaker firms;

5. strategic changes, as downturns are also times when companies can make strategic changes, reorganize, increase efficiency, and prepare for the next growth phase;

6. loose monetary policy, as governments and central banks often introduce loose monetary policies during recessions, which can be beneficial for borrowers;

7. increased public spending, as recession periods are often times of increased public investment, which can lead to new opportunities for businesses.

Risk is defined as the danger of unsuccessful actions, wrong decisions, or obtaining a negative deviation from the goal. (Onyiriuba, 2016)

The risks resulting from economic fluctuations are presented in Figure 20 and Table 16.

Figure 20 The risks resulting from economic fluctuations

Source: own elaboration based on (Kaufman & Hotchkiss, 2003), (Brealey et al., 2010), (Friedman & Schwartz, 1971)

Table 16 Risks resulting from economic fluctuations

Type of risk	Description
Decrease in demand	During cyclical fluctuations, there is often a decrease in demand for goods and services, which can be risky for businesses.
Reduction in employment	Fluctuations affect employment limitations, lower productivity, and reduce investment in human capital.
Increase in financial costs	Economic cyclical fluctuations influence financial consequences, including financial costs for businesses, which hinders the decision to incur debt and investment decisions.
Political uncertainty	Cyclical fluctuations influence financial instability, which can affect economic decisions.
Bankruptcy risk	For weaker companies and consumers with debt, the risk of bankruptcy increases during a recession.
Inflation risk	Central banks decide to raise interest rates to curb inflation, which in turn can affect investment costs and offset real investment gains.
Credit risk	Access to credit may be restricted (during economic slowdown), and an increase in interest rates will affect its cost.

Source: own elaboration based on (Kaufman & Hotchkiss, 2003), (Brealey et al., 2010), (Friedman & Schwartz, 1971)

Understanding these threats is crucial for management during periods of economic fluctuations and can assist in applying economic instruments in anticipating reactions to changes in the system. (King, 2017)

The risk in banking operations has a unique character, as profit and generated cash flows are primarily derived from specific activities that engage predominantly external capital. (Zawadzka, 2000) Factors such as interest rate levels, currency exchange rates, the development and availability of derivative financial instruments, and low employee qualifications, among others, influence banking risk. However, economic growth is often pointed out as one of the most significant reasons for the development and increased efficiency of the banking sector. (Baszyński, 2007) Therefore, striving to optimize financial results must be accompanied by an absolute

acceptance of a specific level of risk associated with this activity. It's also worth noting that excessive risk prevention is linked not only to increased operational security but also to the loss of opportunities related to the potential achievement of additional, above-average revenues. (Dobaczewska, 2000)On the other hand, an overemphasis on banking risk can have negative consequences, such as reduced financial liquidity, declining profitability, loss of the bank's credibility, and, in extreme cases, even bankruptcy.

The most critical type of risk a bank can encounter in its operations, undoubtedly related to the economic climate, is credit risk. It's defined as the probability of counterparties failing to meet the terms of one or several contracts due to their inability to fulfill financial commitments to the bank. (Zachorowska & Wójcik-Mazur, 2006) This risk particularly emerges during economic downturns preceded by rapid economic growth during which there was a surge in credit action. In such times, the burden of incurred debt might become too substantial relative to the diminishing ability of the bank's clients to service that debt, leading to the deterioration of the bank's credit portfolio quality. (Dobaczewska, 2000) Credit risk also increases when the bank applies a uniform legal security for the loan or when there's a risk of the bank's engagement in a single currency. This situation can subsequently adversely impact the solvency of banks if potential bank losses significantly reduce their capital base.

Another threat or opportunity for the banking sector related to this type of risk is the decline or increase in investment activity and consumption accompanying various phases of economic slowdown or revival, and the related interest in services provided by the banking sector. The pace at which the economy grows is the most significant factor affecting the demand made by the real sector for banking system services. It's commonly believed that with an improvement in the economic situation, the value of assets held by banks also increases. (Chang, 2015) Income growth leads to increased savings, which in turn drives demand for banking services related to saving. With further economic growth, the prospect of increasing income also promotes a greater inclination to invest and consume, thus increasing the demand for credit. However, with a decrease in economic growth and the associated dynamic income at disposal, the reaction of individuals can also negatively affect the situation in the banking sector. Households, facing declining income and rising unemployment, may maintain their consumption rate by reducing funds previously allocated for repaying current obligations. (Rogowski, 1998) The increasing number of insolvent institutions during an economic downturn results in banks incurring losses related to the inability to recover previously granted loans. On the other hand, households might fund maintaining their consumption level by reducing their savings propensity.

The role of credit during economic revival is also highlighted. A faster growth of credit action than GDP can be considered a normal phenomenon to some extent. Encouraged by good development

prospects, entities of the real economy during prosperity signal increased demand for both consumer and investment credit. (Sierpińska & Jachna, 2004) Thus, by increasing the level of loans granted, banks also influence the further development of the economy. Increasing the supply of loans is possible thanks to the previously mentioned growth in the value of bank assets, including savings. As a result, banks obtain above-average profits; the interest rate spread during this time is high as high demand for savings determines its low interest rate, and a high interest in obtaining credit increases its interest rate. As a result, the risk on the bank's side becomes smaller, and the obtained margin and commissions become higher. However, increasing the credit action by banks during the peak phase of the economy can significantly influence the collapse of the economy through the increase in expenditures financed by loans. (Ostaszewski & Iwanicz - Drozdowska, 2021) It is essential to remember that the dynamics of credit action should not be too detached from the future dynamics of economic development, as excessive credit action pace, apart from apparent gains, can also lead to an increase in the value of so-called bad loans. (Choudhry, 2022)

It's also essential to consider industry risk, which can reduce or increase credit risk. Banks must control the risk arising from commitments to industries or economic sectors that are strategic for their operations so that in case of dangers or opportunities for development, they can exploit them to increase their security. (Bednarczyk & Przybylska - Kapuścińska, 2011) In their operations, banks should also formulate economic forecasts for strategic industries and determine preferences in their credit policy based on them. It's also crucial to consider the risk of engagement towards entities from the same geographical area. In this regard, banks should also assess the concentration risk arising from engaging their resources towards entities from the same region. (Żółtkowski, 2017)

Due to unfavorable changes in the economy, the bank may face challenges in maintaining payment liquidity at a level consistent with its operations and size. Liquidity risk is identified with the ability of banks to meet current obligations, the capital available to them, and the potential for credit creation. (Zachorowska & Wójcik-Mazur, 2006) Therefore, a situation might arise where the bank cannot operate in a manner ensuring the fulfillment of all obligations according to their due dates.

A risk associated with excessive growth in credit action, particularly evident during an economic downturn, is the possibility of undermining the stability of the banking sector, leading to systemic risk. (Huerta de Soto, 2009) During prosperous times, as incomes rise, clients of financial institutions increase their propensity for consumption and investment expenditures, resulting in increased demand for credit. A threat to the stability of the banking sector due to worsening economic conditions can have severe consequences in the form of potential losses that banks throughout the country might incur. With the emergence of a significant burden of potential losses compared to the capital held by banks, there might be a risk of insolvency if the potential losses

significantly affect the reduction of their capital base. (Zachorowska & Wójcik-Mazur, 2006)Preventing such a severe threat is also related to the implementation of asymmetric interest rate policies and the need to increase revenues from other sources (e.g., increasing commission and bank fees) and aiming for cost rationalization and tightening credit granting criteria.

Another risk encountered in banking is market risk, which is the potential for unfavorable market price changes relative to the prices at which the bank conducted transactions. (Żółtkowski, 2017)Within this, there is a recognition of interest rate risk, commodity price changes, and investments in securities. Among the mentioned risk types, undoubtedly, interest rate risk is of the most significant importance to banking operations. It arises from exposing financial results to the adverse effects of interest rate changes. The essence of this risk boils down to situations where, during adverse changes in the economy, assets and liabilities were overestimated and misaligned in a given period, as well as off-balance-sheet positions. This risk is primarily associated with the bank's portfolio and is expressed in the threat to the bank's revenues in situations of unfavorably changing interest rates or significant changes in the overestimation of balance sheet positions causing changes in the income earned from interest. (Żółtkowski, 2017)

3.2.   Economic fluctuations in the economies of Central European countries

Central Europe is a geographical and cultural region of Europe. Although the definitions of which countries belong to Central Europe may vary depending on context and source, typically several countries lying between Western and Eastern Europe are included in this region. Some scholarly publications treat Central Europe as synonymous with the Visegrad Group. According to Ronald Tiersky and The Economist, Central Europe in the strictest sense refers precisely to the countries constituting this group. (Ash, 1999) The countries most often considered part of Central Europe (Poland, Czech Republic, Slovakia, and Hungary) are presented in figure. 21.

This region has often been a battleground between larger powers such as Germany and Russia. Over the centuries, the countries of Central Europe have been divided, united, occupied, or have changed their borders numerous times. Central Europe is a mosaic of cultures, languages, and traditions. Common historical experiences, as well as cultural diversity, shape the unique identity of the region. After the fall of communist regimes in Central Europe in 1989-1991, these countries underwent a process of political, economic, and social transformation, transitioning from communist systems to parliamentary democracies. These processes were difficult and challenging but led to the stabilization of democracy and market economies in the region. (Orłowski, 2010)

Figure 21 Central European Countries (Visegrad Group)

Source: own elaboration

The Visegrad Group (sometimes called "V4" from "Visegrád Four" in English) is a regional agreement of four Central European countries: Czech Republic, Hungary, Poland, and Slovakia. The group was founded in 1991 in the Hungarian town of Visegrád. The cooperation was aimed at strengthening neighborly relations, as well as accelerating integration with the European Union and NATO. The main objectives of the Visegrad Group are presented in figure 22.

Within the Visegrad Group, member countries undertake various initiatives concerning security policy, energy policy, and socio-economic issues. All countries of the Visegrad Group are both in NATO structures and have been members of the European Union since 2004. The group has become an important forum for discussing EU policies and serves as a platform for member countries to coordinate their positions on important European matters.

Figure 22 Main objectives of the Visegrad Group

Source: own elaboration

The Visegrad Group is sometimes criticized because its members occasionally make decisions that are inconsistent with the values and principles of the European Union, especially in terms of the rule of law and human rights. Nevertheless, the Group plays an important role in regional politics and is a significant player in the European context. There are varying opinions about the future of the Visegrad Group. Some believe that the Group will play an increasingly important role in European politics, while others argue that differences between member countries may weaken its cohesion. Despite certain challenges and differences, the Visegrad Group remains an important element of regional cooperation in Central Europe.

Countries of Central Europe are characterized by varied levels of economic development, but many of them have experienced significant growth since joining the European Union (Table 17 and Chart 1).

Upon analyzing the GDP of the countries presented in the table from 1993-2022, it can be observed that all countries recorded GDP growth during the analyzed period.

Poland had the highest GDP in each year compared to the other countries.

The GDP of the Czech Republic was below the levels of Poland and Hungary, but by 2022 it had surpassed Hungary in terms of GDP value.

The fastest GDP growth was recorded by Poland between 2007 and 2008 (an increase of nearly 100 billion USD), Hungary between 2002 and 2003 (an increase of nearly 18 billion USD), Slovakia between 2003 and 2004 (an increase of nearly 11 billion USD), and the Czech Republic between 2007 and 2008 (an increase of nearly 47 billion USD).

Table 17 GDP in Central European Countries from 1993 to 2021

	POLAND	HUNGARY	SLOVAK REPUBLIC	CZECH REPUBLIC
1993	110.8 USD	46.4 USD	20.1 USD	47.8 USD
1994	142.2 USD	46.6 USD	25.8 USD	60.1 USD
1995	160.1 USD	47.2 USD	27.9 USD	67.3 USD
1996	159.3 USD	48.7 USD	27.7 USD	62.1 USD
1997	174.6 USD	49.0 USD	29.8 USD	66.8 USD
1998	170.0 USD	47.2 USD	30.4 USD	65.1 USD
1999	172.2 USD	53.7 USD	29.2 USD	61.8 USD
2000	190.9 USD	67.6 USD	30.7 USD	67.8 USD
2001	199.0 USD	85.2 USD	35.2 USD	82.1 USD
2002	217.8 USD	104.1 USD	46.9 USD	100.0 USD
2003	255.1 USD	113.2 USD	57.4 USD	119.8 USD
2004	306.1 USD	115.7 USD	62.8 USD	137.1 USD
2005	344.6 USD	140.1 USD	70.7 USD	156.2 USD
2006	429.0 USD	158.3 USD	86.5 USD	190.1 USD
2007	533.5 USD	131.0 USD	100.8 USD	236.8 USD
2008	439.7 USD	132.1 USD	89.3 USD	207.4 USD
2009	475.6 USD	141.9 USD	91.1 USD	209.0 USD
2010	524.3 USD	128.8 USD	99.9 USD	229.5 USD
2011	495.2 USD	135.6 USD	94.6 USD	208.8 USD
2012	515.7 USD	141.0 USD	98.9 USD	211.6 USD
2013	539.0 USD	125.1 USD	101.4 USD	209.3 USD
2014	477.1 USD	128.6 USD	88.9 USD	188.0 USD
2015	470.0 USD	143.1 USD	89.9 USD	196.2 USD
2016	524.6 USD	160.5 USD	95.6 USD	218.6 USD
2017	588.7 USD	164.0 USD	106.1 USD	249 USD
2018	596.0USD	157.2 USD	105.7 USD	252.5 USD
2019	599.4 USD	182.2 USD	106.7 USD	245.9 USD
2020	679.4 USD	178.7 USD	118.6 USD	281.7 USD
2021	688.1 USD		115.4 USD	290.9 USD

Source: own elaboration based on https://data.worldbank.org/indicator/NY.GDP.MKTP.CD

Conversely, the biggest GDP decline occurred in Poland between 2008 and 2009 (a decrease of nearly 94 billion USD), in Hungary between 2008 and 2009 (a decrease of about 27 billion USD), in Slovakia between 2008 and 2009 (a decrease of about 11.5 billion USD), and in the Czech Republic between 2008 and 2009 (a decrease of about 29 billion USD). The proclivity of the recent years have been similar in all the discussed countries. Over the examined period, Poland recorded a GDP growth from about 66 billion USD in 1990 to about 688 billion USD in 2021 (over tenfold increase), Hungary from about 12.7 billion USD in 1990 to about 178.8 billion USD in 2022 (over fourteenfold increase), Slovakia from about 40.7 billion USD in 1990 to about 115.5 billion USD

in 2022 (nearly triple increase), and the Czech Republic from about 29.9 billion USD in 1990 to about 290.9 billion USD in 2022 (nearly tenfold increase in GDP).
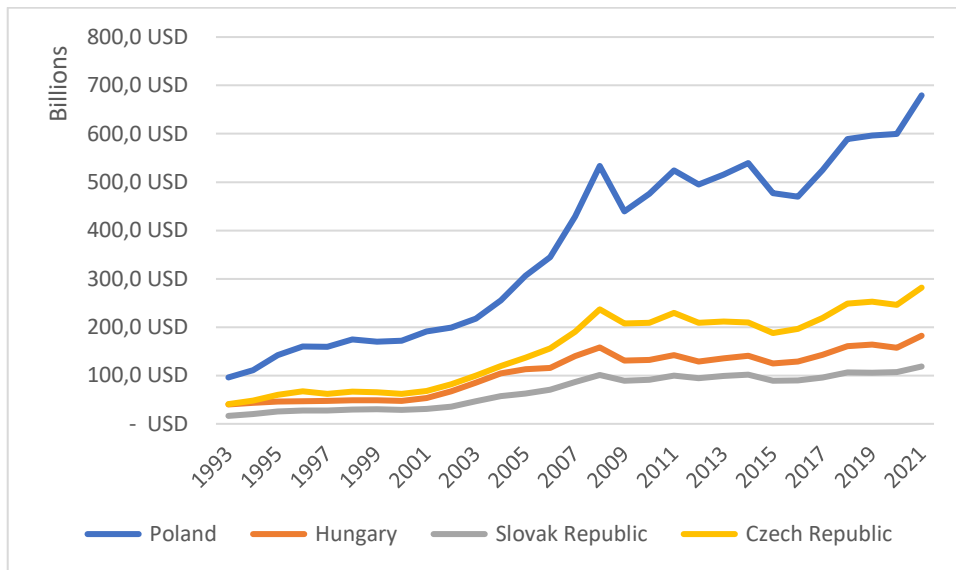
Chart 1 GDP in Central European countries 1993 - 2021

Source: own elaboration based on table 17

All countries recorded a significant GDP growth in the analyzed period. Poland and the Czech Republic seem to be the leaders in the region in terms of GDP growth, with Poland having the highest GDP value for most of the analyzed period. Hungary and Slovakia also recorded significant growth, although to a lesser extent than Poland and the Czech Republic.

Business cycles refer to fluctuations in the overall economic activity of countries. These fluctuations can be caused by various factors, including economic policy, global factors, or internal dynamics. (Kornai, 1994)Business cycles in the economy are natural changes in economic activity that occur at certain intervals. (Rosier & Dockes, 1987) Manifestations of the business cycle include periods of economic growth (expansion), which are then replaced by periods of slowdown or recession, followed by recovery phases. (M. Zieliński et al., 2018)

The Polish economy, after the systemic transformation in the 1990s, experienced several business cycles (figure 23).

From 1989 to 2000, Poland underwent fundamental changes in its economy's structure, transitioning from a centrally planned to a market economy. As a result of this process, Poland's economy initially experienced difficult years of transformation, followed by a period of recovery and growth. Starting from 1990, Poland has been achieving economic growth with some fluctuations. (Świderska, 2013)

1989

The systemic transformation that began in 1989 led to a deep recession. The privatization process, structural reforms, and the change in the economic model were challenging and complex. However, by the mid-1990s, the economy began to recover.

2009

The global financial crisis of 2009 also affected Poland, but compared to other EU countries, Poland coped relatively well, avoiding a recession.

2020-2021

The COVID-19 pandemic (2020-2021) had a significant impact on the global economy, and Poland was no exception. After an initial slowdown in 2020, the Polish economy began to recover in 2021.

2000-2008

The years 2000-2008 were a period of steady economic growth, with its peak between 2006 and 2008.

2010-2019

The years 2010-2019 were a period of relative stability and constant growth, with several brief slowdowns.

Figure 23 Business cycles in Poland since 1989

Source: own elaboration

In the early 1990s, Hungary experienced an economic slowdown, typical for many countries in the region undergoing transformation processes. Over the subsequent years, we observe an increase in GDP, indicating gradual economic stabilization and the adoption of market reforms. However, the growth rate was unstable with a slight decline in 2000.

The beginning of the new millennium brought Hungary gradual economic growth, reaching a value of 158,325,583,917.57 USD in 2008. However, the global financial crisis of 2008 also impacted the Hungarian economy, evident in the GDP decline in 2009.

After the global crisis, Hungary's economy began to rebound, with some fluctuations in 2012 and 2015. Despite some difficulties, the Hungarian economy continued its upward trend, reaching a value of 178,788,572,067.59 USD in 2022.

Hungary, like other countries in the region, faced economic difficulties in the 1990s, but over the years became more stable and resilient to external shocks. The global financial crisis of 2008 impacted the country's economy, but the ability to regenerate and adapt allowed for the continuation of economic growth.

The Czech Republic showed steady economic growth in the 1990s and early 2000s. However, the growth rate was more variable compared to other countries. The year 2009 shows a decline, reflecting the global crisis.

In the Czech economy, the early 1990s were a period of economic transformation following the fall of communism, transitioning from central planning to a market economy, and the dissolution of Czechoslovakia. In 1990, the Czech GDP was just under 30 billion USD, but within a decade it nearly tripled, reaching over 61 billion USD in 2000.

The beginning of the 21st century was a period of stabilization and further growth. The Czech Republic's entry into the European Union in 2004 brought additional economic benefits. Despite the global financial crisis in 2008, Czech GDP continued to grow, reaching over 209 billion USD in 2010.

After the financial crisis, the Czech economy continued steady growth, with some fluctuations around 2014-2015. In 2022, Czech GDP reached over 290 billion USD, indicating continuous economic growth and stability of the country.

The Czech Republic, as one of the leading economies of Central Europe, proved its ability to adapt and survive in varying economic conditions. A key factor in success was the ability to effectively transform the economy in the 1990s and integrate with the European Union.

Slovakia, like the Czech Republic, went through a period of transformation following the fall of communism and the dissolution of Czechoslovakia, which affected its economic fluctuations. The period of economic transformation in the 1990s was characterized by some instabilities, impacting GDP fluctuations.

Slovakia had an unstable growth rate in the 1990s, with some slowdown in 2000. In 1990, Slovakia's GDP was around 40 billion USD. However, by 2000, GDP had fallen to 29 billion USD, suggesting difficulties in adapting to the new economic system. Yet, after 2000, the pace of economic growth significantly accelerated, with a minor decline in 2020.

This period was marked by gradual growth and stabilization. Slovakia's entry into the European Union in 2004 and adoption of the euro in 2009 provided additional growth momentum. Slovakia's GDP reached around 91 billion USD in 2010.

The recent years of the observed period show Slovakia's steady economic growth. In 2022, GDP was around 115 billion USD. Despite global challenges, such as the financial crisis and the COVID-19 pandemic, Slovakia's economy demonstrated adaptability and a return to the growth path.

Slovakia, as a young economy in the national context, demonstrated the ability to cope with the challenges of transformation, globalization, and European integration. Its adaptability and capacity to attract foreign investments were key in achieving stability and growth.

All countries experienced the impact of the global financial crisis in 2009, evident in the decrease or slowdown in growth rates. Poland and the Czech Republic had more stable growth compared to Hungary and Slovakia. All analyzed countries recorded economic growth in recent years, indicating their ability to adapt and resilience to global shocks.

One of the more important indicators for assessing the condition of an economy is the unemployment rate. This reflects the percentage of the working-age population that is capable of working but is not employed. This indicator has numerous implications for both individuals and entire economies. Several reasons can be identified as to why the unemployment rate is so significant in assessing the state of the economy (figure. 24).
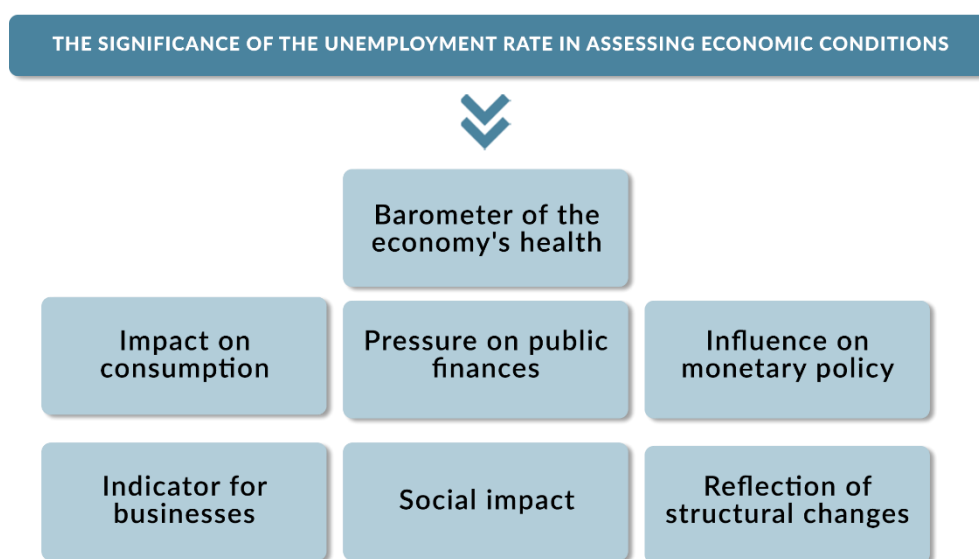
Figure 24 The Significance of the Unemployment Rate in Assessing Economic Conditions
Source: own work based on (Snower, 1995)

An increase in the unemployment rate often signals a recession or economic slowdown, while a decrease indicates economic recovery or expansion. Unemployed individuals have limited income sources, affecting their spending ability. A high unemployment rate can lead to a decrease in macroeconomic consumption, impacting production and investment. A high unemployment rate can increase government spending on unemployment benefits while reducing income from personal taxes. Central banks often base their interest rate decisions on labor market analysis. A high unemployment rate may prompt a central bank to lower interest rates to stimulate the economy. (Kruszka, 2002)

The unemployment rate can serve businesses as an indicator of workforce availability and wage levels. In periods of high unemployment, companies may have a broader choice of candidates and lower labor costs. (Huerta de Soto, 2009)

A high unemployment rate can lead to social discontent, an increase in crime, and other social problems. (Huebner et al., 1994)Moreover, prolonged unemployment can lead to skill loss among workers, having long-term negative consequences for the economy.

The unemployment rate can also reflect structural changes in the economy, such as automation or globalization, which can lead to job reductions in certain sectors. (Adamowicz, 2013)

Therefore, the unemployment rate is a crucial tool in assessing economic conditions, providing analysts, policymakers, and observers with important information about the state of the labour market and the overall health of the economy. (Barczyk & Kowalczyk, 1993) Its analysis, in the context of other macroeconomic indicators, allows for a comprehensive assessment of a country's economic situation. (Borowski, 2014)

The development of the unemployment rate in Central European countries is presented in Table 18 and in Chart 2.

Unemployment is one of the key economic indicators that reflect the health of an economy. Analysing unemployment in the Visegrad Group (V4) countries helps understand their transition through economic transformation post-communism and EU accession.

Poland started the examined period with a low unemployment rate in 1990 (6.5%), which rose to a peak of 20% in 2002-2003. Since then, the unemployment rate has gradually decreased, reaching 5.2% in 2022. Hungary began with a very low unemployment rate in 1990 (1.7%). The increase in unemployment in 2009 (10.0%) was the highest during the examined period. Since then, unemployment has gradually decreased, reaching 3.6% in 2022. Data from 1993 shows that Slovakia had the highest levels of unemployment among the V4 countries, peaking in 2001 (19.2%). In 2022, unemployment was 6.1%. The Czech Republic consistently had a low unemployment rate compared to other V4 countries, with the highest level in 2004 (8.3%). In 2022, unemployment was 2.2%, the lowest rate among the V4 countries. All Central European countries experienced an increase in the unemployment rate in the 1990s, associated with the economic transformation post-communism. However, since the beginning of the 21st century, except for the financial crisis of 2008/2009, the unemployment rate generally decreased in each country. Poland and Slovakia had significantly higher levels of unemployment compared to the Czech Republic and Hungary in the first decade of the 21st century. However, all V4 countries achieved relatively low levels of unemployment by the end of the examined period. The Czech Republic consistently had the lowest unemployment rate among the Visegrad Group countries.

Table 18 Unemployment Rate in Central European Countries

	POLAND	HUNGARY	SLOVAK REPUBLIC	CZECH REPUBLIC
1993	16,4%	12,1%	12,2%	4,3%
1994	16,0%	10,9%	13,7%	4,3%
1995	14,9%	10,2%	13,1%	4,0%
1996	13,2%	10,0%	11,3%	3,9%
1997	10,3%	9,0%	11,9%	4,8%
1998	10,4%	8,9%	12,4%	6,5%
1999	13,1%	6,9%	16,1%	8,7%
2000	15,1%	6,6%	18,6%	8,8%
2001	17,4%	5,7%	19,2%	8,1%
2002	20,0%	5,6%	18,5%	7,3%
2003	20,0%	5,8%	17,6%	7,8%
2004	19,0%	5,8%	18,2%	8,3%
2005	17,6%	7,2%	16,3%	7,9%
2006	14,8%	7,5%	13,4%	7,1%
2007	11,2%	7,4%	11,2%	5,3%
2008	9,5%	7,8%	9,5%	4,4%
2009	11,9%	10,0%	12,0%	6,7%
2010	12,3%	11,2%	14,4%	7,3%
2011	12,5%	11,0%	13,6%	6,7%
2012	13,4%	11,0%	14,0%	7,0%
2013	13,4%	10,2%	14,2%	7,0%
2014	11,4%	7,7%	11,5%	6,1%
2015	9,7%	6,8%	11,5%	5,1%
2016	8,2%	5,1%	9,7%	4,0%
2017	6,6%	4,2%	8,1%	2,9%
2018	5,8%	3,7%	6,5%	2,3%
2019	5,2%	3,4%	5,8%	2,0%
2020	6,2%	4,3%	6,7%	2,6%
2021	5,8%	4,1%	6,9%	2,8%

Source: own elaboration based on TradingView, symbols: CZUR, PLUR, HULTUR, SKUR
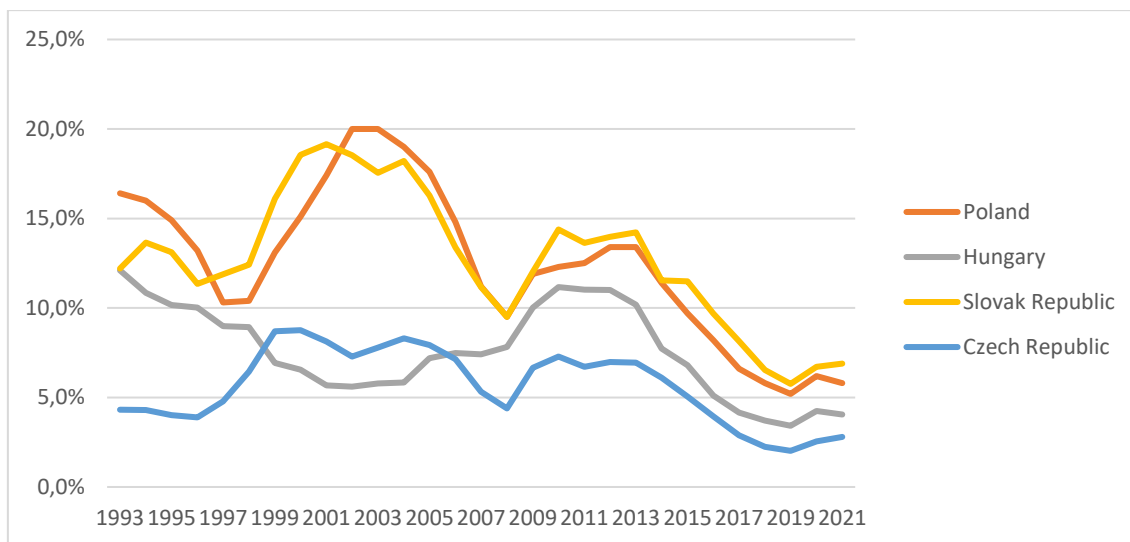
Chart 2 Unemployment Rate in Central European Countries from 1993 to 2021

Source: own work based on Table 18

When assessing the economic situation, inflation is one of the key indicators that help understand the overall financial condition of the economy. (Estey, 1959) Inflation refers to the increase in the level of prices of goods and services in an economy over a specified time. High inflation can indicate excessive economic expansion and potential overheating of the economy, while deflation (negative inflation) may signal a weakening of economic activity. (Drozdowicz - Bieć, 2012)

Inflation, especially if unpredictable, can affect investment decisions of businesses and consumer behavior. (Matysek - Jędrych, 2011) High and unstable inflation expectations can hinder investments and lead to disruptions in resource allocation. (Fischer, 1981)

At the same time, the traditional Phillips curve suggests a negative relationship between unemployment and inflation: when unemployment is low and the labor market is tight, inflation tends to increase. (Phillips, 1958)

Central banks often have a mandate to maintain price stability (low and stable inflation) and maximize employment. Therefore, they respond to changes in inflation by adjusting interest rates to the current economic situation of a country. (Taylor, 1993b)

High inflation can lead to a range of economic problems, such as price unpredictability, disruptions in resource allocation, and unfair income shifts. (Fischer, 1981)

Inflation is thus an important indicator of economic conditions, helping to assess the overall health of the economy. (Szymanik & Zyguła, 2009) There are many factors that influence inflation and its effects on the economy.

During the examined period, inflation was at the levels presented in Table 19 and Chart 3.

Table 19 Inflation in Central European Countries from 1993 to 2021

	POLAND	HUNGARY	SLOVAK REPUBLIC	CZECH REPUBLIC
1993	37,0%	22,5%	23,3%	20,8%
1994	33,0%	18,9%	13,4%	10,0%
1995	28,0%	28,3%	9,8%	9,0%
1996	19,8%	23,5%	5,8%	8,8%
1997	14,9%	18,3%	6,1%	8,6%
1998	11,6%	14,2%	6,7%	10,7%
1999	7,2%	10,0%	10,6%	2,1%
2000	9,9%	9,8%	12,0%	3,8%
2001	5,4%	9,1%	7,3%	4,7%
2002	1,9%	5,3%	3,1%	1,9%
2003	0,7%	4,7%	8,6%	0,1%
2004	3,4%	6,7%	7,5%	2,8%
2005	2,2%	3,6%	2,7%	1,9%
2006	1,3%	3,9%	4,5%	2,5%
2007	2,5%	8,0%	2,8%	2,9%
2008	4,2%	6,0%	4,6%	6,4%
2009	3,8%	4,2%	1,6%	1,0%
2010	2,6%	4,9%	1,0%	1,5%
2011	4,2%	3,9%	3,9%	1,9%
2012	3,6%	5,7%	3,6%	3,3%
2013	1,0%	1,7%	1,4%	1,4%
2014	0,1%	-0,2%	-0,1%	0,3%
2015	-0,9%	-0,1%	-0,3%	0,3%
2016	-0,7%	0,4%	-0,5%	0,7%
2017	2,1%	2,3%	1,3%	2,5%
2018	1,8%	2,9%	2,5%	2,1%
2019	2,2%	3,3%	2,7%	2,8%
2020	3,4%	3,3%	1,9%	3,2%
2021	5,1%	5,1%	3,1%	3,8%

Source: own elaboration based on TradingView: CZIRYY, PLIRYY, HUIRYY, SKIRYY
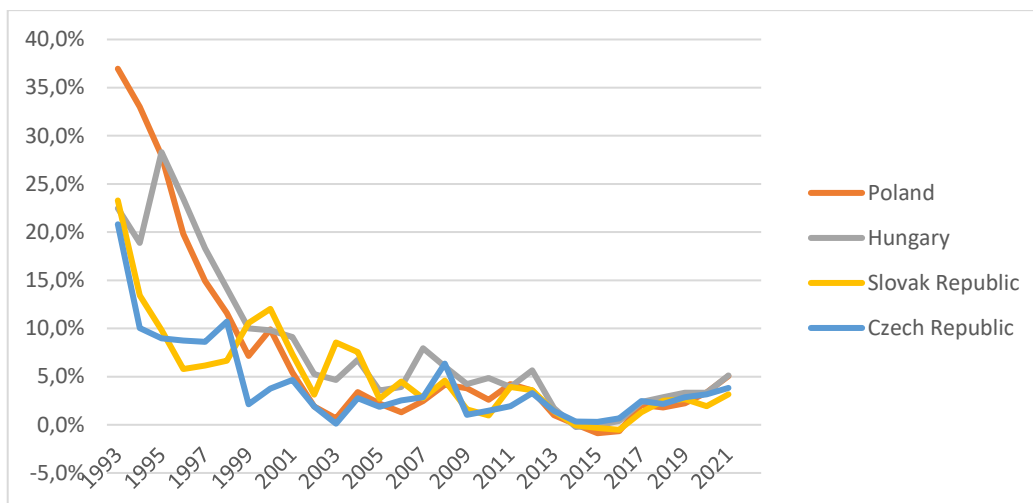
Chart 3 Inflation in Central European Countries from 1993 to 2021

Source: own work based on Table 19

In Poland, between 1989-1991, hyperinflation was recorded as a result of economic transformation and the liberalization of prices. (Kowalski, 1993) Inflation gradually decreased in the following years, reaching single-digit levels in 1999 and remaining low from 2002-2016. In 2022, Poland experienced a significant increase in inflation, which may indicate global inflationary pressures and challenges related to the COVID-19 pandemic. (Zaleska, 2021)

Like Poland, Hungary experienced high inflation in the early 1990s, though not as extreme as Poland's case. From 2002 to 2014, Hungary recorded relatively low and stable inflation. However, 2022 brought a significant inflation spike to 14.6% in Hungary.

Slovakia experienced relatively moderate inflation in the 1990s, which stabilized in the 2000s. Inflation was relatively low and stable from 2009 to 2016. As in other countries, 2022 brought a significant increase in inflation.

The Czech Republic had higher inflation levels between 1993-1998, which gradually decreased in the 2000s. (Horváth, 2000) Inflation in the Czech Republic remained stable until 2016, except for a certain increase in 2008. In 2022, the Czech Republic, like other countries, experienced a sharp increase in inflation.

All four countries faced challenges related to inflation at different stages of economic transformation. The hyperinflation in Poland in the early 1990s was the most extreme case. (Darvas, 2012) Over the last few years, all countries dealt with low and stable inflation until 2022, when a significant rise in inflation was recorded, likely due to global factors such as inflationary pressures, supply chain disruptions, and consequences of the COVID-19 pandemic.

Based on data regarding GDP, unemployment, and inflation, an assessment of the overall economic conditions in Poland, Hungary, Slovakia, and the Czech Republic for the years 1993-2021 can be made, which is reflected in charts 4,5,6 and 7.
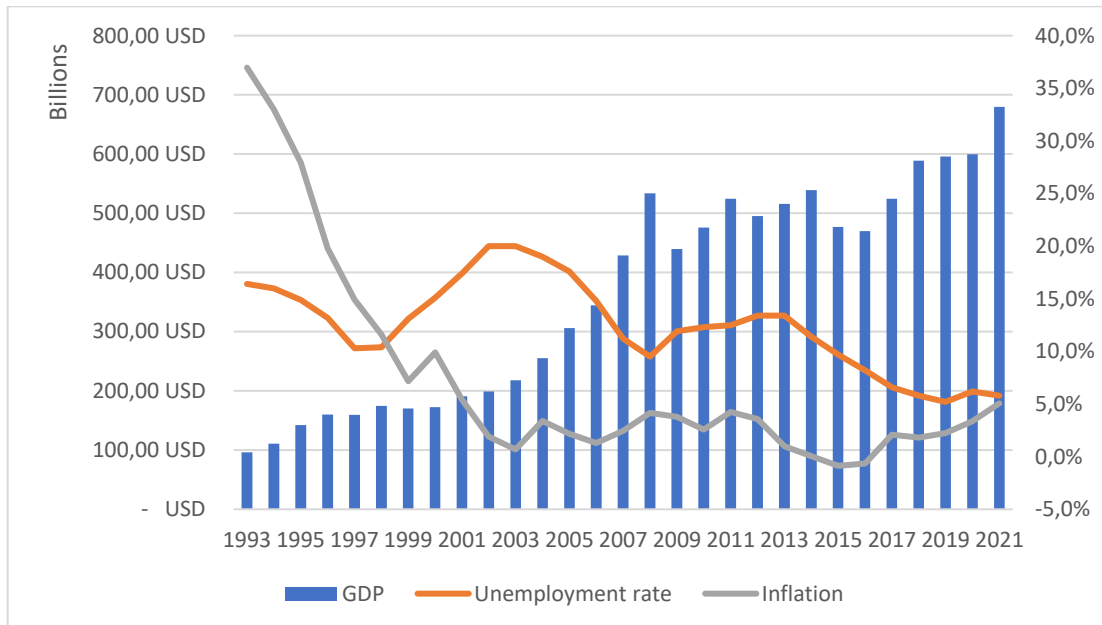
Chart 4 Economic Conditions in Poland from 1993 to 2021

Source: own elaboration based on tables 17, 18 and 19

In the early 1990s, Poland underwent a period of difficult economic reforms aimed at transforming from a planned economy to a market economy, known as "shock therapy." (Szambelańczyk, 2010)While necessary, these reforms led to significant inflation as the government tried to control prices while liberalizing the economy. Inflation was also a result of the growing budget deficit and overly expansive monetary policy. Poland, with steady GDP growth since the early 1990s, except for the economic crisis in 2009, achieved peak GDP growth in 2022. Higher unemployment occurred in the early 1990s, but a significant decline was noted in the following years. High inflation in the early 1990s significantly decreased over the decade and remained at a relatively low level in subsequent years.

There has been a steady improvement in Poland's economic conditions with short-term disruptions, such as the 2009 economic crisis, indicating a generally stable economic situation.
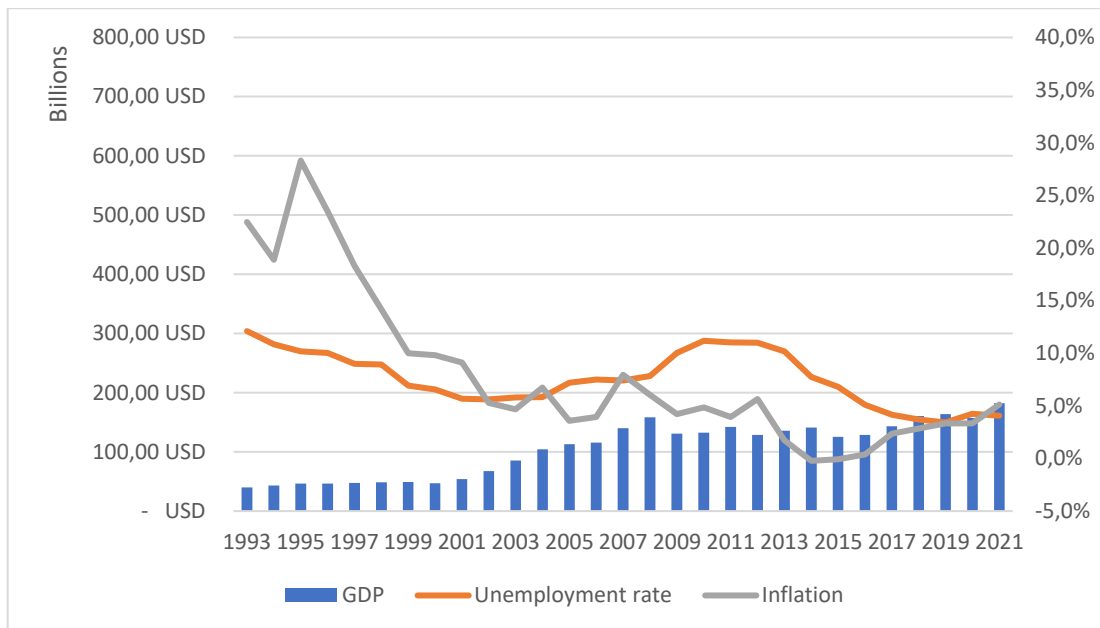
Chart 5 Economic Conditions in Hungary from 1993 to 2021

Source: own elaboration based on tables 17, 18 and 19

Like Poland, Hungary underwent an economic transformation in the 1990s. In 1995, Hungary introduced a stabilization package to address economic problems. Hungary experienced GDP growth since the early 1990s, with some slowdown in 2020 and a rebound in 2021. Hungary had a low level of unemployment compared to other Central European countries. Similar to Poland, Hungary faced high inflation in the early 1990s, which later significantly decreased over the decade and remained at a relatively low level in subsequent years. The high inflation was partly due to the devaluation of the forint and efforts to stabilize the economy. A stable economic condition with some disruptions in 2020 and GDP growth in 2021 indicates Hungary's good ability to bounce back after a crisis.

1993 marks the year when Czechoslovakia split into the Czech Republic and Slovakia. The dissolution of the state could have impacted both countries' economies. (Przybylska - Kapuścińska, 2009a) Slovakia, like other countries in the region, underwent economic transformation, which could have affected inflation. Slovakia, the smallest of the Central European countries, had steady GDP growth since the early 1990s, with some slowdown in 2015 and a slight decline in 2022.

Higher unemployment levels in the 1990s, but a significant decline was seen in the 21st century. Slovakia also experienced high inflation in the early 1990s, but it gradually decreased to lower levels over the decade. This country features stable inflation compared to Poland and Hungary. Continuous improvement in economic conditions with some short-term disruptions indicates a generally stable economic situation in Slovakia.
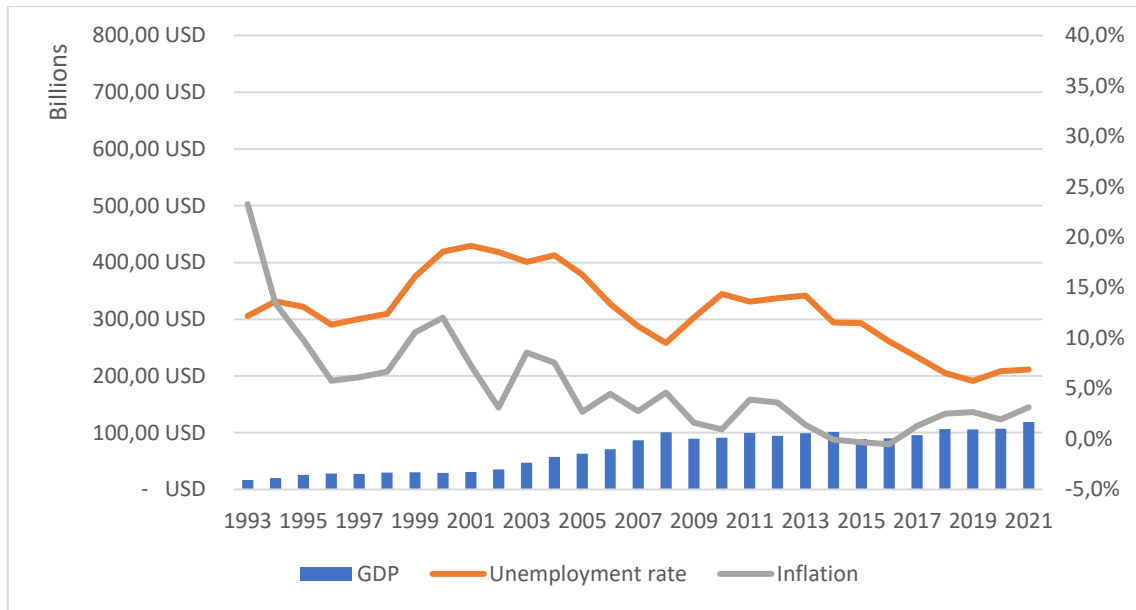
Chart 6 Economic Conditions in Slovak Republic from 1993 to 2021

Source: own elaboration based on tables 17, 18 and 19
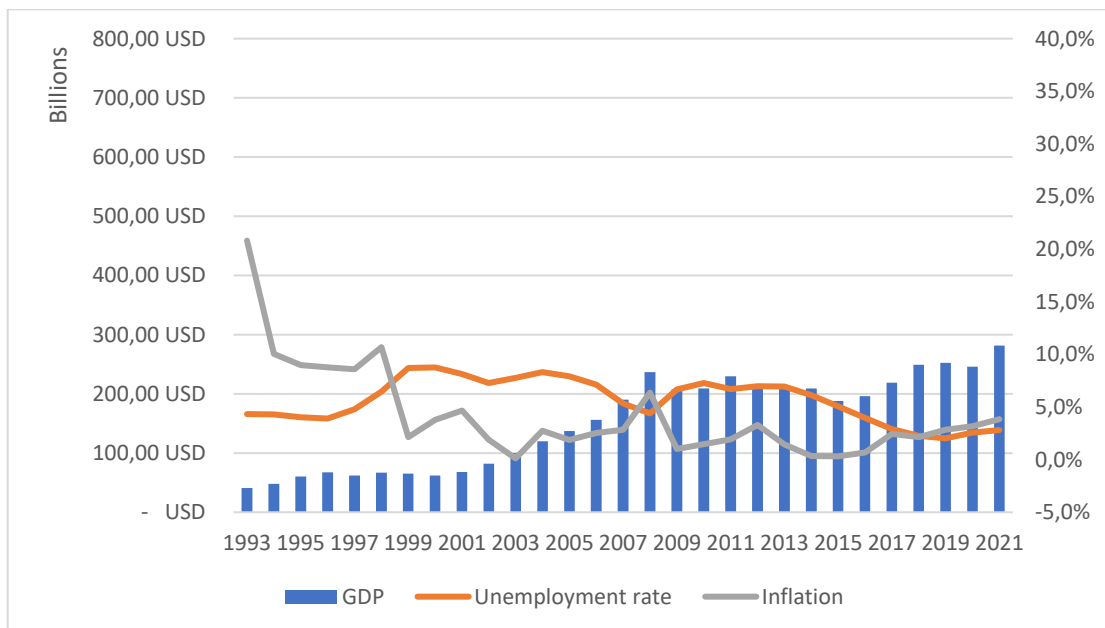
Chart 7 Economic Conditions in Czech Republic from 1993 to 2021

Source: own elaboration based on tables 17, 18 and 19

The Czech Republic is characterized by steady GDP growth since the early 1990s, with some slowdown in 2020 and a rebound in 2021. There is a low level of unemployment and stable inflation compared to other countries in the region, but also a decrease in the inflation rate over the years. A constant and stable economic situation with short-term disruptions, such as the slowdown

in 2020, and GDP growth in 2021 indicate the Czech economy's ability to bounce back after a crisis.

All four countries achieved significant economic growth since the 1990s, with some short-term disruptions. These countries achieved a stable economic situation during the examined period. (Gronkiewicz - Waltz, 1992)

A more detailed analysis of the above economic indicators for these countries can also be conducted, including:

1. Variability analysis.
2. Correlation analysis.

By conducting a variability analysis, we can check which country had the most stable economy based on the variability of economic indicators over the examined years.

To assess the variability of economic indicators over the years, we focus on the standard deviation of each indicator for each country. (Hubner & Lubinski, 1994) The standard deviation is a measure of the spread of data around the mean and will help understand which country had the most stable economy based on these indicators.

By conducting a variability analysis of economic indicators for Poland, the Czech Republic, Slovakia, and Hungary, standard deviations of the economic indicators for these countries were calculated, presented in Table 20.

Table 20 Standard Deviations of Economic Indicators for Central European Countries

Indicator	Poland	Hungary	Slovakia	Czech
GDP	$1{,}99 \times 10^{11}$ USD	$4{,}90 \times 10^{10}$ USD	$3{,}66 \times 10^{10}$ USD	$8{,}47 \times 10^{10}$ USD
Inflation	11,93%	7,86%	5,14%	4,83%
Unemployment rate	4,54%	2,81%	4,12%	2,13%

Source: own elaboration based on tables 17, 18 and 19

Based on the above data, several conclusions can be drawn from the variability analysis. Poland has the highest standard deviation in GDP, indicating greater fluctuations in GDP compared to the other countries. Hungary, Slovakia, and the Czech Republic have less significant standard deviations, suggesting less variability in GDP over the examined years. Poland also has the highest standard deviation in inflation, indicating greater fluctuations in the inflation rate compared to other countries. Hungary has the second highest deviation, while the Czech Republic has the smallest, indicating the most stable inflation rate during the period. Poland and Slovakia have similar standard deviations in the unemployment rate, which are higher than in the Czech Republic and Hungary. The Czech Republic has the smallest standard deviation, indicating the most stable

unemployment rate during this period. Overall, the Czech Republic seems to have the most stable economy based on these three indicators, while Poland shows the greatest variability in GDP and inflation.

The next step is the correlation analysis, which examines how economic indicators are interconnected. For example, does GDP growth correlate with lower unemployment? Does high inflation negatively impact GDP?

In Table 21, the correlations between economic indicators for Central European countries are presented.

Table 21 Correlations Between Economic Indicators for Central European Countries

Indicators correlation	Poland	Hungary	Slovakia	Czech Republic
GDP <> Inflation rate	-0,60	-0,70	-0,64	-0,39
GDP <> Unemployment rate	-0,74	-0,44	-0,63	-0,46
Inflation <> Unemployment rate	0,20	0,43	0,23	-0,34

Source: own work based on GDP, inflation, unemployment rate tables.

Based on the data contained in the above table, it was observed that in all the studied countries, an increase in the average value of GDP was accompanied by a decrease in the average value of inflation. A strong negative correlation was noted in Poland, Hungary, and Slovakia, while a moderate negative correlation was observed in the Czech Republic. The same interdependence was encountered in the case of GDP and unemployment. However, moderate negative correlations occurred in Hungary and the Czech Republic, while in Poland and Slovakia, there was a strong negative correlation, meaning that an increase in the average value of GDP was accompanied by a decrease in unemployment values. Regarding the correlation between the level of unemployment and the level of inflation, only Hungary exhibited a moderate level, whereas in the other countries, it was at a low level, noteworthy is that in the Czech Republic, it was a negative correlation.

In conclusion, for all countries, there is a negative correlation between GDP and both inflation and unemployment rate. This suggests that in periods of economic growth, inflation and unemployment tend to decrease in Central European countries. The correlation between inflation and unemployment rate varies depending on the country but is generally low, and only in the Czech economy is it negative.

Table 22 Shaping of Selected Dimensions of the Economic Environment of the Banking System in the Studied Countries

Poland

No.	Item	Mean	Standard Deviation	Median	Skewness	Kurtosis	Range	Minimum	Maximum
1	GDP	364,27	182,23	429,02	-0,03	-1,57	583,40	96,04	679,44
2	Unemployment	12,51%	4,30%	12,50%	-0,01	-0,76	14,80%	5,20%	20,00%
3	Inflation	6,78%	9,96%	3,38%	1,99	3,16	37,84%	-0,87%	36,96%

Hungary

No.	Item	Mean	Standard Deviation	Median	Skewness	Kurtosis	Range	Minimum	Maximum
1	GDP	105,97	46,2	125,17	-0,24	-1,49	142,15	40,12	182,28
2	Unemployment	7,57%	2,58%	7,41%	0,06	-1,19	8,68%	3,42%	12,10%
3	Inflation	7,73%	7,51%	5,11%	1,39	1,10	28,53%	-0,23%	28,31%

Slovak Republic

No.	Item	Mean	Standard Deviation	Median	Skewness	Kurtosis	Range	Minimum	Maximum
1	GDP	64,80	33,91	86,56	-0,24	-1,67	102,14	16,52	118,66
2	Unemployment	12,80%	3,79%	12,42%	-0,06	-0,63	13,39%	5,76%	19,15%
3	Inflation	4,92%	5,06%	3,61%	1,84	4,67	23,81%	-0,52%	23,29%

Czech Republic

No.	Item	Mean	Standard Deviation	Median	Skewness	Kurtosis	Range	Minimum	Maximum
1	GDP	145,21	75,20	172,15	-0,13	-1,72	211,68	40,87	252,55
2	Unemployment	5,72%	2,04%	6,28%	-0,28	-1,10	6,74%	2,02%	8,76%
3	Inflation	3,91%	4,48%	2,65%	2,20	5,97	20,69%	0,12%	20,81%

GDP – expressed in billions of dollars

Source: own elaboration

The analysis of the economic environment of banking systems in the studied countries was based on three main dimensions, namely GDP, inflation, and unemployment, whose levels are of fundamental importance for any economy. Regarding Poland, the average GDP level was $364.27 billion, which was 2-3 times higher than the GDP level in the other studied countries, with a similar situation occurring for the minimum and maximum values, and thus also the range. The standard deviation in all the studied countries was on a similar level, but Poland also had the largest level of standard deviation. In all the studied countries, the median GDP distribution was slightly higher than the average, indicating a leftward shift in the distributions. The GDP distributions in all the studied countries were platykurtic and exhibited very weak negative asymmetry.

Regarding the average level of unemployment, Poland and Slovakia had the highest values, while Hungary and the Czech Republic had the lowest, almost half as much, with a small standard deviation. The minimum and maximum values, as well as the range, were also similar in Poland and Slovakia and in Hungary and the Czech Republic. The unemployment distributions in all countries are rather symmetrical but exhibit more flattening than the normal distribution, with the highest platykurticity observed in the unemployment level distribution in Hungary.

Hungary experienced the highest average inflation level in the studied period, while the Czech Republic had the lowest, where the inflation risk level also had the largest standard deviation. The discussed distribution in all countries exhibits at least strong positive asymmetry, meaning a concentration around values lower than the average, and in the case of the Czech Republic and Slovakia, also very strong leptokurticity.

At this point, it is necessary to discuss the shaping of selected elements of banking systems operating in the four countries covered by the studies. Among the many indicators used in the process of evaluating banking systems that coexist in the literature, the author selected a group of seventeen, which allow for their characterization, analysis, and evaluation in a possibly comprehensive and multidimensional manner.

3.3.   Activity in the banking system and economic fluctuations

There is a significant relationship between activity in the banking sector and the dynamics of economic development. It can certainly be said that these phenomena mutually determine each other. (De Grauwe, 2003)

An indicator used to predict the level of activity in the banking sector is the Pengab index, published by Pentor in collaboration with the Polish Bank Association. It is calculated as the ratio of the sum of differences in responses to detailed research questions related to deposit and lending

activities, as well as about the overall economic situation of banks. This index takes values ranging from -100 to 100 points. The level of the index and its changes represent the economic climate in the banking sector in various periods. (Pentor, 2011)

The main goal of the study is to document the directions of changes in the basic areas of the banking services market, rather than predicting specific declines or increases in the dynamics of activity in the sector. The nature of this study provides the possibility to determine changes in the direction of current and future short-term trends. (Pentor, 2011)

Below, in Chart 8, the course of the index from 1993 to 2021 is presented, including monthly raw data and trend cycle values.
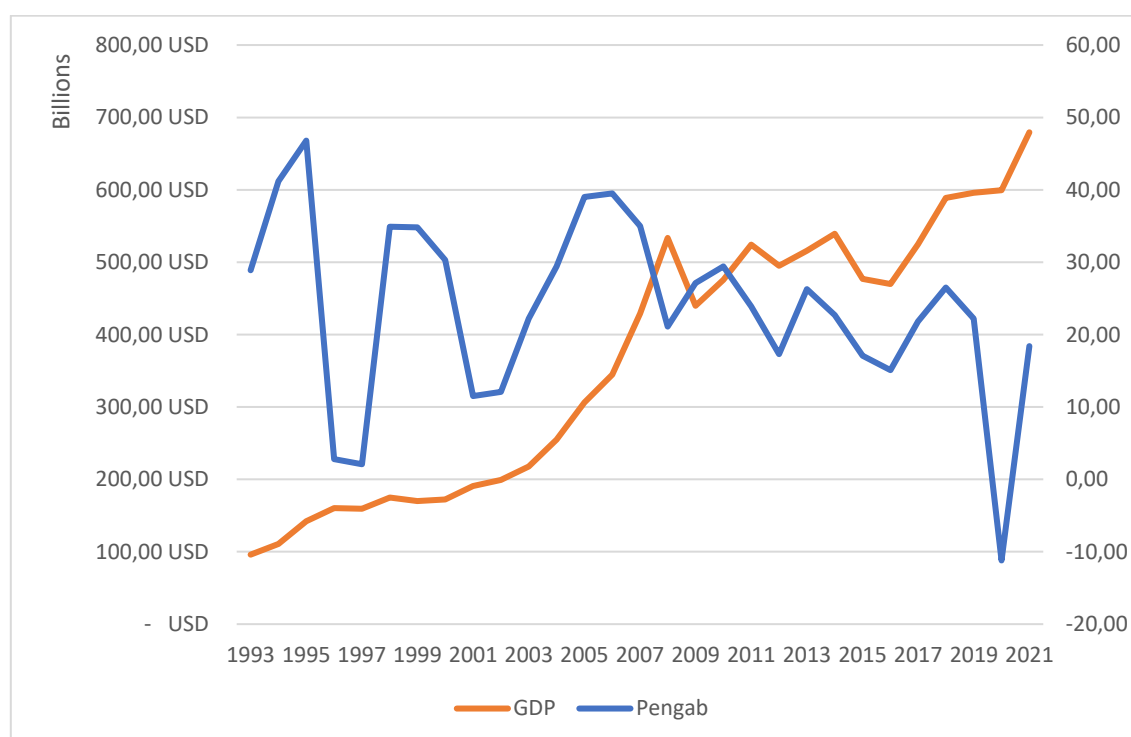
Chart 8 Pengab Index from 1993 to 2021 Against the Value of GDP

Source: own elaboration based on table 17 and (Związek Banków Polskich, 2023)

The Pengab Index was presented for 28 years. Based on data observation, it can be noticed that throughout the entire period under discussion, the index was in the realm of negative values in 2020, while in the realm of positive values, it never exceeded 50 points. The 1990s are characterized by relatively large variability of the Pengab Index values, with these values being predominantly positive.

The highest values of the analyzed index were achieved at the turn of 1994 – 1995 when the banking sector was experiencing a period of prosperity, and the index exceeded the level of 40 points. The beginning of the 21st century, specifically the years 2001-2002, is characterized by a

decrease in the index value, after which the values began to rise again. It is evident that the financial crisis of 2007-2008 influenced the decline of the Pengab Index in 2008.

Particular attention should be paid to the year 2020, which has an exceptionally low Pengab Index value (-11.20). This is likely the effect of the COVID-19 pandemic and its impact on the economy and banking sector. In 2021, there is some recovery and a return to positive values.

Based on the analysis of the presented chart, it can be noticed that there are cyclical changes in the course of the Pengab Index.

From the presented data, it is also clear that the banking sector's economic indicator has a very high correlation with the dynamics of GDP reflecting the state of the economy. The Pengab Index values on an annual average basis document the history of banking sector conditions in recent years very well.

The Pengab Index serves as a barometer of sentiments in the banking sector. Positive values indicate optimism, while negative values indicate pessimism.

The highest values of the Pengab Index in the 1990s indicate positive moods among banks and the expansion of this sector. Periods of decline in the Pengab Index value may indicate moments of uncertainty or problems in the sector, such as the financial crisis in 2008 or the pandemic in 2020. The increase in the index value after these crises indicates the adaptation and resilience of the banking sector in Poland.

Unfortunately, there is no data on the equivalent of the Pengab Index for the Czech Republic, Slovakia, and Hungary. However, a general characterization of the banking sector in these countries and any significant events that could have influenced activity in the banking sector can be presented.

After the dissolution of Czechoslovakia in 1993, the Czech Republic underwent a process of privatizing its banking sector, which was completed by the end of the 1990s. In the second half of the 1990s, some Czech banks experienced financial problems, requiring government intervention. After 2000, the Czech banking sector became more stable, and Czech banks were increasingly acquired by foreign financial institutions, mainly from European Union countries. (Barisitz, 2009) Like other countries, the Czech banking sector felt the impact of the global financial crisis in 2008 but generally coped better than banks in some other European countries.

Slovakia, like the Czech Republic, took steps towards privatizing the banking sector after the breakup of Czechoslovakia. Slovakia adopted the euro in 2009, which affected the banking sector, forcing it to adapt to the norms and standards of the eurozone. The Slovak banking sector also felt the impact of the financial crisis but joining the eurozone helped to some extent mitigate its impact.

The Hungarian banking sector in the 1990s was a scene of intense privatization and an influx of foreign capital. In 2008, during the global financial crisis, Hungary found itself in a difficult economic situation, requiring intervention from the International Monetary Fund. In the years following the crisis, the government introduced numerous regulations regarding the banking sector, impacting the operation of banks in Hungary.

All the analyzed countries underwent a process of transformation and privatization of the banking sector in the 1990s. The impact of the financial crisis in 2008 was felt across the region, but different countries coped with it in various ways. The banking sectors in the Czech Republic and Slovakia became relatively stable, while the Hungarian banking sector was more volatile, due to economic policy and regulations.

Another set of data indicating activity in the banking sector is undoubtedly the shaping of credit action and the level of deposits accepted by banks from the non-financial sector. (W. L. Jaworski, 1998)

Observing changes in the value of non-financial sector deposits is very important for determining the level of activity in the sector. This is partly because the primary source of funding for banks' lending activities is deposits, and unfavourable changes in their size can cause liquidity problems. (Borys, 1996)Moreover, a change in the structure of deposits, especially an increase in current deposits, may be associated with an increase in consumer demand throughout the economy (Keynes, 2003). Chart 9 illustrates the deposits of the banking sector in Central European countries and Chart 10 compares it to GDP from 1993 to 2021.
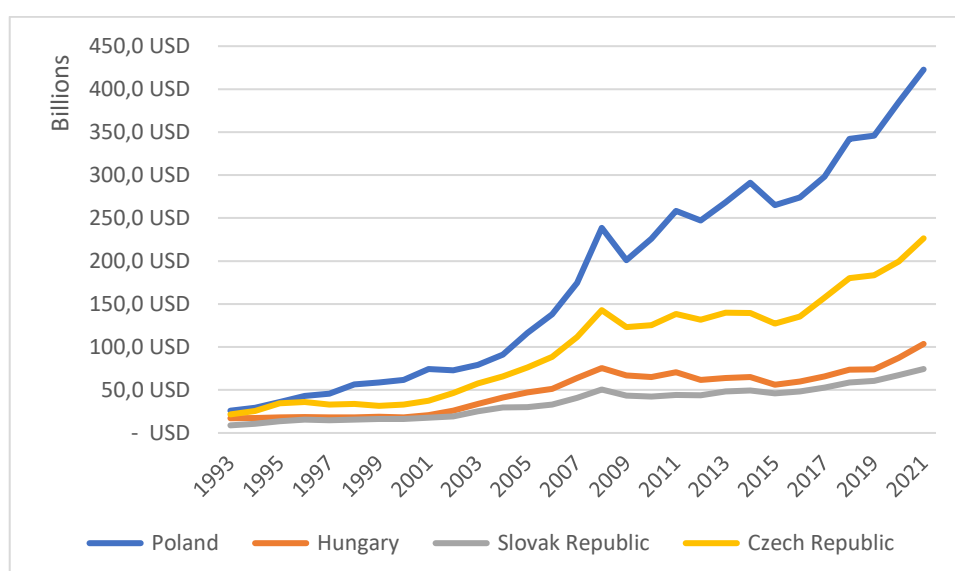
Chart 9 deposits of the banking sector in Central European countries compared to GDP from 1993 to 2021.

Source: own elaboration based on FRED, 2023 and The Global Economy, 2023

Deposits of the banking sector compared to GDP in Poland from 1993 to 2021
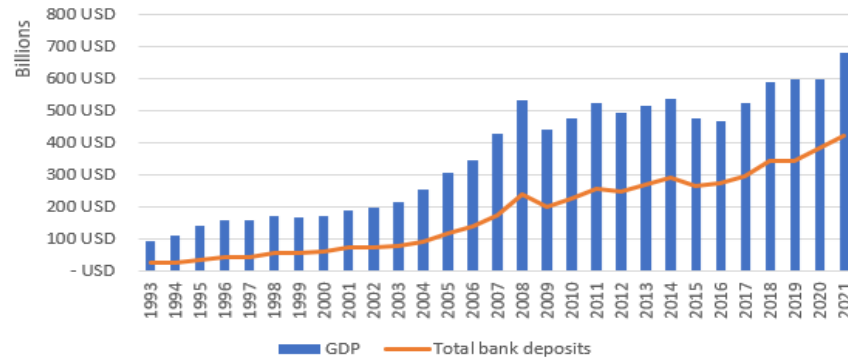
Deposits of the banking sector compared to GDP in Hungary from 1993 to 2021
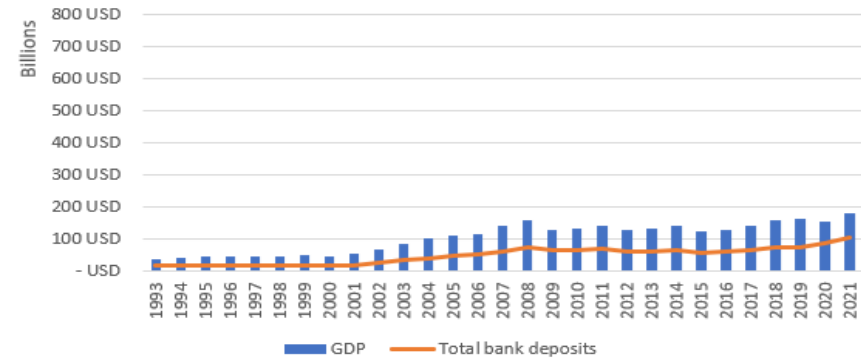
Deposits of the banking sector compared to GDP in Slovak Republic from 1993 to 2021
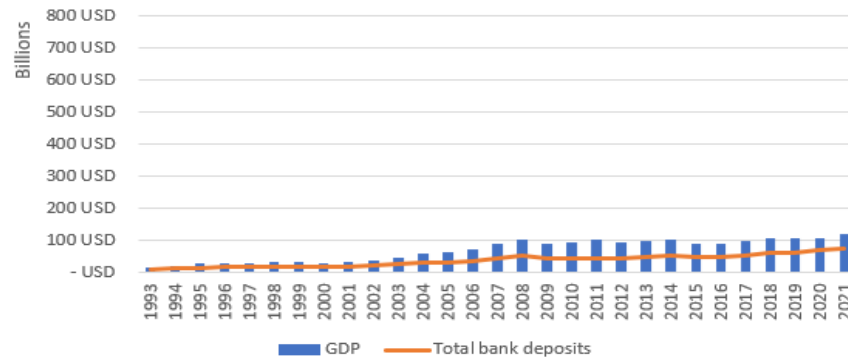
Deposits of the banking sector compared to GDP in Czech Republic from 1993 to 2021
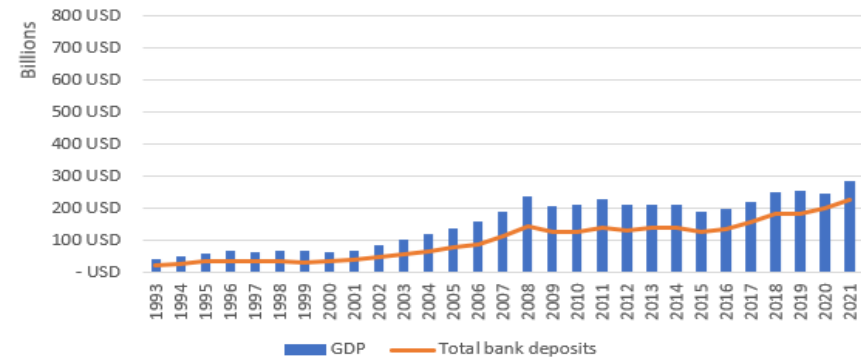
Chart 10 Deposits of the banking sectors compared to GDP

Source: own elaboration based on chart 9 and Table 17.

At the onset of the systemic transformation, the only financial products available to consumers were the simplest banking products, namely deposits. With the dynamic development of the financial services market, a downward trend in the dynamics of deposits can be observed, which is associated with investing free funds in other instruments offered on the market. (Koleśnik, 2011) However, the an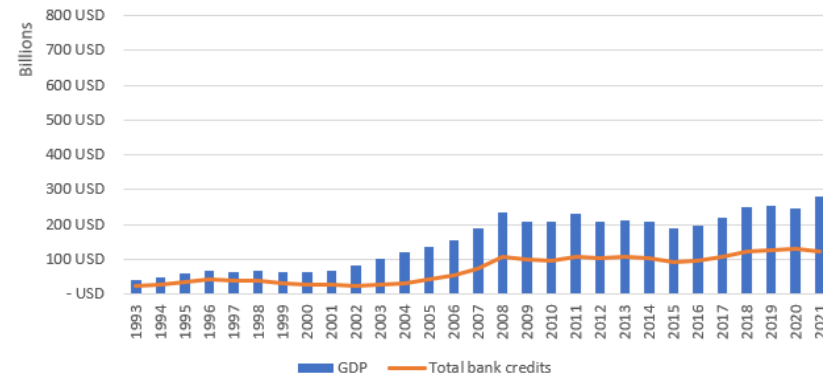alysis of changes in the value of deposits also allows us to see a certain dependence of their shaping on the course of the economic cycle.

All the analyzed countries have shown an increasing trend in deposits from 1993 to 2021. This means that the non-financial sector in these countries consistently accumulated larger amounts of funds in deposits over the analyzed period.

All four countries experienced a significant increase in deposits during the studied period. Poland started with a value of 25.94 billion USD in 1993 and reached 422.68 billion USD in 2021. The Czech Republic, starting from 21.61 billion USD, reached 226.45 billion USD in 2021. Hungary started from a lower value of 17.12 billion USD in 1993, and its deposits reached 103.60 billion USD in 2021. Slovakia had the lowest initial value in 1993 - 8.86 billion USD, and in 2021 the value was 74.41 billion USD.

The impact of the 2008 financial crisis on the deposits in these countries can be observed, especially in Poland, where deposits fell from 238.78 billion USD in 2008 to 200.99 billion USD in 2009. A decline was also observed in the Czech Republic in 2009, although it was not as drastic. Hungary and Slovakia did not experience such a drop, but the growth in deposits was slower in the years 2008-2010.

After the decline during the financial crisis years, all four countries experienced a steady increase in deposits. Poland and the Czech Republic, being larger economies, had higher deposit values compared to Hungary and Slovakia.

Poland and the Czech Republic generally had a higher pace of deposit growth compared to Hungary and Slovakia. Slovakia, despite starting from the lowest value in 1993, experienced significant growth, especially in the years after 2003. In Hungary, deposits grew at a relatively moderate pace until 2007, after which the growth rate slightly accelerated, but not to the extent seen in other countries. (Baszyński, 2014)

Deposits in Central European countries significantly increased over the analyzed period. All countries experienced the impact of the 2008 financial crisis, but generally, their deposits grew steadily over the years.

The favorable economic situation in 1997 and 1998 led to a significant increase in the dynamics of deposits. The growth in the propensity to save was a result of the improving financial-economic situation in the real sector and the favorable prospects for further income growth at that time. From

126

1999, due to the economic slowdown, there was a decline in disposable income and financial security in the real sector, which consequently had a negative impact on the decreasing dynamics of deposits. (Capiga et al., 2014) From the end of 2001, both due to the deteriorating economic situation and the announcement of the taxation of income earned from interest on deposits, the most significant change in the rate of increase in deposits can be seen. The most drastic decline (15.96 percentage points compared to the previous year) in the propensity to save in 2002 was undoubtedly caused by the introduction of taxation on interest income, deepened by decreasing nominal interest rates. As a result, the income from placing free funds in deposits became unattractive for clients, and they decided to shift their funds towards other types of assets. The situation began to stabilize in 2003, when for the first time in many years, the dynamics of non-financial sector deposits began to increase.

In 2008, due to unfavorable tendencies both in the Polish and the global financial system related to a significant decline in confidence in the banking sector, there was another significant decline in the dynamics of deposits by 9.7 percentage points compared to the previous year. The disturbances that occurred in the financial markets meant that in the following year, due to reduced access to market sources of financing, banks began to compete more intensely for stable sources of financing, such as deposits. As a result, their interest rates were significantly increased, which raised their attractiveness. Thanks to this, the dynamics of deposits in 2009 increased again by 5.72 percentage points compared to the previous year.

Poland and the Czech Republic seem to be the most stable in terms of deposit growth over the years, except for the decline in 2009. Both countries not only maintain continuous growth in deposits but also feature a relatively faster pace of growth compared to other countries.

Hungary initially had a slow growth of deposits in the 1990s, but the pace significantly increased after 2002, peaking in 2020.

Slovakia, although starting from the lowest values, shows a stable growth of deposits over the years, reaching a value close to Hungary in 2020.

In Hungary, after 2008, deposits started to fall, reaching the lowest level in 2010, then rising to 2020. This may indicate the impact of the financial crisis on the Hungarian economy and its slow rebound after the crisis.

Despite the overall upward trend, Slovakia's deposits declined in 2009, which may indicate the impact of the financial crisis.

A decline in deposits can be observed in 2009 compared to 2008 for all countries, likely due to the global financial crisis in 2007-2008.

Poland remains the leader in deposits in the region throughout the analyzed period, with the Czech Republic in second place, especially in the years after 2004.

The banking sector in Central European countries systematically increased its deposits from 1993 to 2020, except for the crisis year of 2009 when a decline was observed. Poland remains the leader in terms of deposits in the region, with the Czech Republic in second place.

As mentioned earlier, 2009 was an exceptional year for all four countries due to the decline in deposits. This is likely the result of the global financial crisis. However, it is interesting to note that all countries managed to rebound after it, indicating the resilience and regenerative capacity of the economies of the region.

The increase in deposits may indicate an improvement in the economic condition of the country, increased confidence in the banking sector, and growing wealth of the non-financial sector. (Solarz, 1993) This is consistent with the overall trend of economic growth in Central European countries over the analyzed period.

Central European countries, although differing in the pace of growth and level of deposits, show similar trends and reactions to global economic events, such as the 2007-2008 financial crisis. The resilience of these countries to such events, as well as their ability to regenerate, is evidence of the stability and strength of their economies. The increase in deposits over the analyzed period also indicates growing confidence in the banking sector and the increasing wealth of the non-financial sector. The growth of GDP from 1993 to 2021 was quite dynamic, which may explain the increasing deposits. Higher deposits, in turn, can drive investment and loans, supporting further GDP growth.

The growth of bank deposits and GDP are interrelated. When a country's economy grows, people have more confidence in the banking sector, which translates into higher deposits. Higher deposits can also drive the economy by increasing the availability of credit for businesses and consumers.

The stability of the banking sector is crucial for economic growth, as it affects the confidence of investors and consumers. (W. L. Jaworski, 2001)

Another very important factor determining activity in the financial sector is the level of loans granted to the non-financial sector.

The shaping of credits granted by the banking sector is presented in Chart 11.
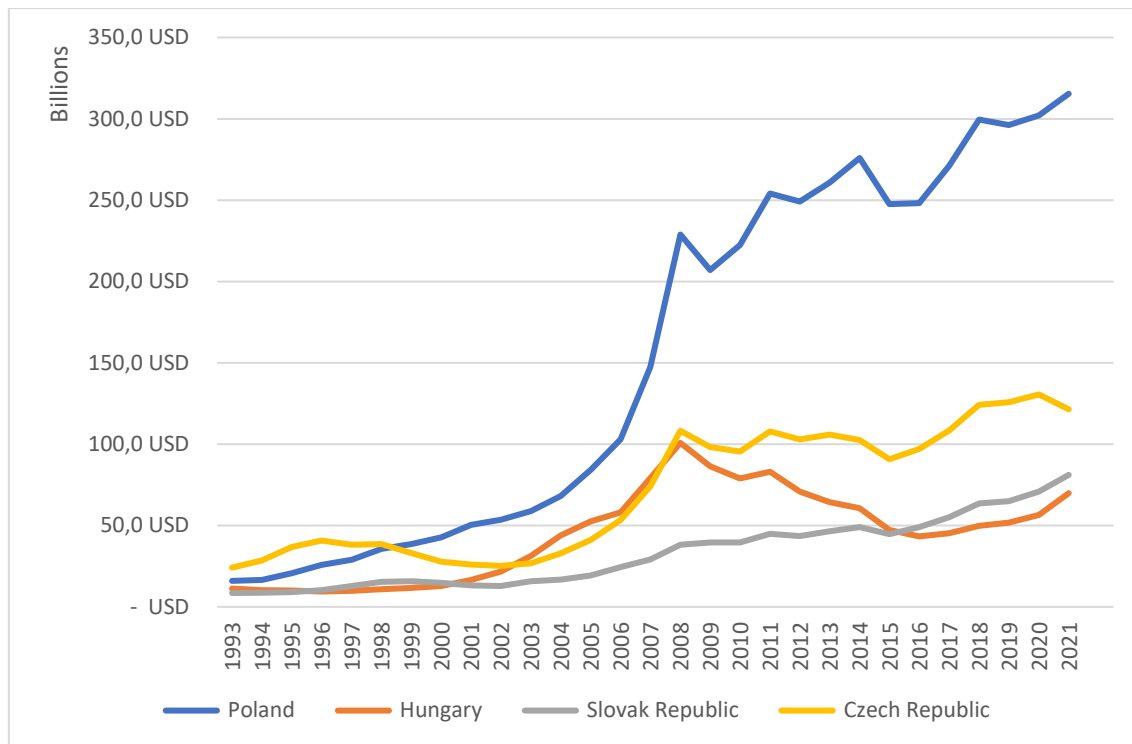
Chart 11 Banking Sector Credits in Central European Countries from 1993 to 2021

Source: own elaboration based on FRED, 2023 and Trading Economics, 2023

All four countries show a general upward trend in terms of loans from 1993 to 2021. They experienced a significant increase in loans in the first decade of the 21st century, especially in the years leading up to the 2008 financial crisis. After this crisis, most countries experienced a decrease or slower growth in credit action in 2009, but later began to gradually recover.

The Polish banking system recorded an increase in loans during the studied period, with loans rising from 15.976 billion USD in 1993 to 315.404 billion USD in 2021, an increase of 1874.24%. It can be noticed that the downward trend in GDP in 1997 - 1998 was associated with increasing dynamics of credit action by banks. This indicated that based on observations of dynamic economic growth in previous years, consumers expected the resulting income growth to be a lasting phenomenon and anticipated the continuation of this trend in the future. This situation led to an increase in consumption and also increased the propensity to further enhance it through loans. (Gruszecki & Bednarz, 2012) In response to increasing demand, banks also increased the size of their credit action, resulting in claims showing much greater dynamics than GDP growth.

Chart 12 Credits of the banking sectors compared to GDP

Source: own elaboration based on chart 11 and Table 17

Due to the entrenchment of negative economic trends in 1999, a decrease of 3 percentage points in the dynamics of loans granted by the banking sector compared to the previous year is visible. In 2000, there was a sharp decrease in the dynamics of granted loans by 7 percentage points compared to the previous year, determined by a further decline in the degree of economic development. Due to the worsening situation of entities in the real sector and the increase in consumption financing from available financial resources, the demand for credit decreased. The unfavorable trend in the dynamics of loans for the non-financial sector, associated with the observed economic slowdown, continued until 2002, when it only achieved a 2% increase in value compared to 2001.

With the gradual change in macroeconomic prospects associated with increased economic activity in 2003, the dynamics of loans granted by the banking sector reached 111.9%.

From 2005 onwards, due to improvements in the economy and an increasing sense of financial security in the real sector, a slight increase in loan dynamics of 10.50 percentage points compared to the previous year can be observed.

The biggest collapse in the credit market occurred in 2009, as a consequence of liquidity problems of banks and unfavorable forecasts for the global economies. Additionally, banks, fearing a deterioration in their clients' ability to service debt, significantly tightened their credit policy. As a result of these adverse changes, the dynamics of loans granted to the non-financial sector fell in comparison to 2008 by 32.97 percentage points.

A noticeable jump in loans occurred between 2006 and 2008, which likely reflects the country's economic development and the need for financing expansion before Poland's entry into the EU in 2004 and before the financial crisis in 2008.

Despite the financial crisis in 2008, the level of loans continued to increase, which may indicate the country's strong economy and ability to withstand difficult times.

Hungary recorded an increase in loans from 11.136 billion USD in 1993 to 69.809 billion USD in 2021, an increase of 526.88%. Similar to Poland, in 2001-2003, Hungary saw a significant increase in loan levels, which could have resulted from expectations related to EU membership in 2004.

Hungary reached a peak in loan levels in 2008, amounting to 100.8 billion USD. However, after 2008, loans in Hungary fell, likely due to the financial crisis, and then slowly grew until 2021.

The Czech Republic, like the other Central European countries, recorded an increase in loans from 24.113 billion USD in 1993 to 121.398 billion USD in 2021, an increase of 403.45%. As seen in Figure Y, there was also a steady increase in loans until 2008 in this country, but after the financial crisis, this growth was somewhat slowed down, with some fluctuations in the years 2010-2021. In

2020, the level of loans began to decline, possibly reflecting the impact of the COVID-19 pandemic on the Czech economy.

Loans in the Slovak banking system also recorded a significant increase from 8.495 billion USD in 1993 to 81.106 billion USD in 2021, an increase of 854.75%. Steady growth in the years 1997-2008, like in Poland, reflects economic development before joining the European Union. Similar to Poland, Slovakia continued to increase loans after the global financial crisis. Loans continued to grow after 2008, indicating the country's strong economy.

All four Visegrad Group countries recorded an increase in the level of loans during the analyzed period, but the rate of growth and exact trajectories varied depending on the country. Poland and Hungary, in particular, showed noticeable growth in the years 2000-2008, as did the Czech Republic and Slovakia. These countries experienced significant economic development in the 1990s and early 2000s, with growing needs of the entire economy requiring significant financing from the banking system. Joining the European Union in 2004 brought economic benefits and the need for larger investments, which also contributed to the increase in loans. Many countries experienced the effects of the global financial crisis in 2008, which could have affected the level of debt, and thus the level of loans in the studied countries.

The health and economic crisis caused by the COVID-19 pandemic also impacted the level of loans in recent years.

Poland and Slovakia recorded the most steady increase in loans during the analyzed period, while Hungary and the Czech Republic experienced more fluctuations, especially after 2008.

Growth in bank loans and GDP are interrelated. As the economy of a country grows, people have more confidence in the banking sector, which leads to higher loans. Higher loans can also drive the economy by increasing the availability of credit for businesses and consumers.

The stability of the banking sector is crucial for economic growth, as it affects investor and consumer confidence.

Table 23 Standard deviations of banking system activity indicators against GDP for Central European countries

Indicator	Poland	Hungary	Slovakia	Czech Republic
GDP	$1,99 \times 10^{11}$ USD	$4,90 \times 10^{10}$ USD	$3,66 \times 10^{10}$ USD	$8,47 \times 10^{10}$ USD
Deposits	$1,19 \times 10^{11}$ USD	$2,47 \times 10^{10}$ USD	$1,78 \times 10^{10}$ USD	$5,87 \times 10^{10}$ USD
Credits	$1,12 \times 10^{11}$ USD	$2,80 \times 10^{10}$ USD	$2,13 \times 10^{10}$ USD	$3,87 \times 10^{10}$ USD

Source: own elaboration based on charts 9, 11 and Table 17

The analysis of the variability of banking system activity indicators against GDP for Central European countries provides the following conclusions about the stability of the banking system:

- Higher GDP variability indicates greater economic fluctuations in a country. Such fluctuations can affect the countries' ability to service debt, which in turn can impact the stability of the banking system.
- Deposits are a key source of financing for banks. Higher variability in deposits may indicate instability in trust in banks or in the national economy. Lower deposit variability suggests greater public trust in banks and greater stability of the banking system.
- Credits are the main source of income for banks. Higher credit variability may indicate greater credit risk and potential problems with the quality of the bank's assets. Lower credit variability suggests a more conservative credit policy of banks and stability of the banking system.

Despite high GDP variability, medium variability in deposits and credits, the Polish banking system seems to be relatively stable. However, it is worth noting that similar variability in deposits and credits may suggest certain risk linkages between them.

The medium GDP variability and moderate variability in deposits and credits in Hungary's economy suggest moderate stability of the banking system.

Slovakia, like Hungary, shows moderate variability in deposits and credits combined with medium GDP variability, suggesting moderate stability of the banking system.

Despite high variability in GDP and deposits, medium credit variability in the Czech Republic suggests that banks may be pursuing a more conservative credit policy.

In the context of banking system stability, it is crucial to monitor variability in deposits and credits relative to GDP variability. (Matten, 2000) High variability in these indicators may indicate potential threats to the stability of the banking system. Conducting a correlation analysis by calculating correlation coefficients for each country between the total amount of bank deposits, total bank credits, and GDP can help understand the relationships between these variables for each country over a specific time period. The correlation coefficients for Central European countries are presented in Table 24.

Table 24 The correlation coefficients for Central European countries

Indicators correlation	Poland	Hungary	Slovakia	Czech Republic
GDP <> Deposits	0,8812	0,8843	0,8719	0,8793
GDP <> Credits	0,8847	0,872	0,8237	0,8603
Deposits <> Credits	0,8338	0,8606	0,8742	0,8621

Source: own elaboration based on charts 9, 11 and Table 17

133

Results for Poland suggest:

- The correlation coefficient between the total amount of bank deposits and GDP is approximately 0.8812, indicating a very strong positive linear dependency between them.
- The correlation coefficient between the total amount of bank credits and GDP is approximately 0.8847, also indicating a very strong positive linear dependency.
- The correlation coefficient between the total amount of bank deposits and total bank credits for Poland from 1993-2021 is about 0.8338, indicating a strong positive linear dependency between these two variables in Poland during the studied period.

The correlation analysis for Hungary showed:

- The correlation coefficient between deposits and GDP is about 0.8843, indicating a very strong positive linear dependency between them.
- The correlation coefficient between credits and GDP is about 0.8720, suggesting a strong positive linear dependency.
- The correlation coefficient between deposits and credits is about 0.8606, also indicating a strong positive linear dependency.

Similar results can be presented for Slovakia:

- The correlation coefficient between deposits and GDP is about 0.8719, indicating a very strong positive linear dependency between them.
- The correlation coefficient between credits and GDP is about 0.8237, suggesting a strong positive linear dependency.
- The correlation coefficient between deposits and credits is about 0.874, also indicating a very strong positive linear dependency.

For the Czech Republic, it can be observed that:

- The correlation coefficient between deposits and GDP is about 0.8793, indicating a very strong positive linear dependency between them.
- The correlation coefficient between credits and GDP is about 0.8603, also suggesting a strong positive linear dependency.
- The correlation coefficient between deposits and credits is about 0.8621, indicating a very strong positive linear dependency.

As seen, in all Central European countries, there is a strong or very strong positive correlation between bank deposits and GDP as well as between bank credits and GDP. This indicates that economic growth in a country is often associated with an increase in banking activity both in terms of deposits and credits. The correlation between bank deposits and bank credits varies depending on the country but is generally positive, indicating mutual linkages between these two types of banking activity.

In summary, the existence of a strong positive correlation between deposits and GDP means that GDP growth is often associated with an increase in bank deposits. This could suggest that as the economy grows, people and businesses have greater capacity to save, translating into higher deposits in banks. The stability of the banking system is linked to the level of social trust. If deposits grow along with GDP, it may indicate public confidence in the banking system in Central European countries.

The strong positive correlation between credits and GDP suggests that as the economy grows, banks grant more credits. This might indicate that banks have greater trust in the creditworthiness of customers during periods of economic growth. On the other hand, if credits grow faster than GDP, it might suggest excessive credit expansion, which could be a threat to the stability of the banking system in the longer term.(von Koeppen, 1999)

Meanwhile, the strong positive correlation between deposits and credits indicates that as deposits increase, banks have greater capacity to grant credits. This is a good sign for the stability of the banking system, as it indicates that banks have adequate sources of funding for their loans. If credits grow significantly faster than deposits, it could suggest potential liquidity tensions in the banking system, which might be a threat to its stability .

4. Reactions of the environments of banking sectors in Central European countries to economic fluctuations

4.1. Financial behaviors of households and enterprises resulting from changes in economic conditions and their impact on the banking sector

Household and enterprise behaviours are shaped by numerous current conditions as well as their plans related to the future. The high availability of various financial services, therefore, provides an opportunity that significantly facilitates planned and thoughtful actions, as well as those that arise under the influence of impulse or stimuli from the environment. The possibility of using various financial services greatly facilitates current consumption and helps in striving for goals that require limiting current consumption and accumulating savings. (Wojtyna, 2014) Therefore, services offered by the banking sector can either stimulate current consumption or contribute to its reduction.(W. L. Jaworski & Szelągowska, 2012)

Income theories of the business cycle provide guidance on behavior in different phases of the cycle. They focus on the fact that with the increase in income, there is also an increase in the saving rate. This statement allows us to conclude that an improvement in indicators characterizing the economic climate favors an increase in savings while simultaneously increasing the propensity to finance consumption and investment with credit. (Garczarczyk, 2009)

Over the last nearly thirty years, there has been a significant change in the socio-economic conditions in which all participants in economic life operate. (Szewczyk, 2004a) Services of the banking sector have also started to enjoy increasing trust and popularity. However, the difficulties in relating current changes to the common standard of living significantly limit the ability to interpret income changes, plan expenses, or savings in the long term by economic life participants. (Kozińska, 2018) Therefore, as can be seen in the charts below, the situation in the credit and savings market is mainly shaped by current events in the economy.

The chart below illustrates the financial behavior of households depending on the economic situation. The largest increase in deposit dynamics occurred in 1994 and 1995, reaching levels of 135.5% and 137.3% respectively. This situation could be associated with the fact that initially, households, uncertain about further income growth due to previous negative economic experiences, increased their propensity to save increased incomes. In the initial phase, saving is not based on plans, so households use the most accessible market products for this purpose - deposits. With the emergence of premises for the continuation of the upward income trend, there is an increase in consumption and also an increase in the value of credits. New trends in saving are also set, hence

the decrease in savings dynamics in 1996 to 130.6% and a significant reduction in the upward trend of savings dynamics in subsequent years.

A significant change in the dynamics of the discussed phenomena in the years 1997-2002 was also determined by a significant economic slowdown. Until 2002, there was a steady increase in deposit values, but the growth rate was decreasing with each period, reaching a level of 101% in 2002. During the same period, due to the decreasing ability of households to service debt as a consequence of the deteriorating financial situation, activity in the credit market also underwent unfavorable changes. The dynamics then fell from 149.8% in 1997 to 107.9% in 2002. More favorable changes in the economy's condition, starting in 2003, did not bring significant changes in the financial behaviors of the household sector. The downward trends of the discussed values were maintained, among others, due to the growing popularity of other financial instruments available on the market and the increase in the propensity to finance increasing consumption with credit. In 2003 and 2004, the dynamics of savings remained at the level of 98.5%. The dynamics of credits also remained unchanged during this period, increasing to 113.8% in 2003, but falling back to 111.7% in 2004.
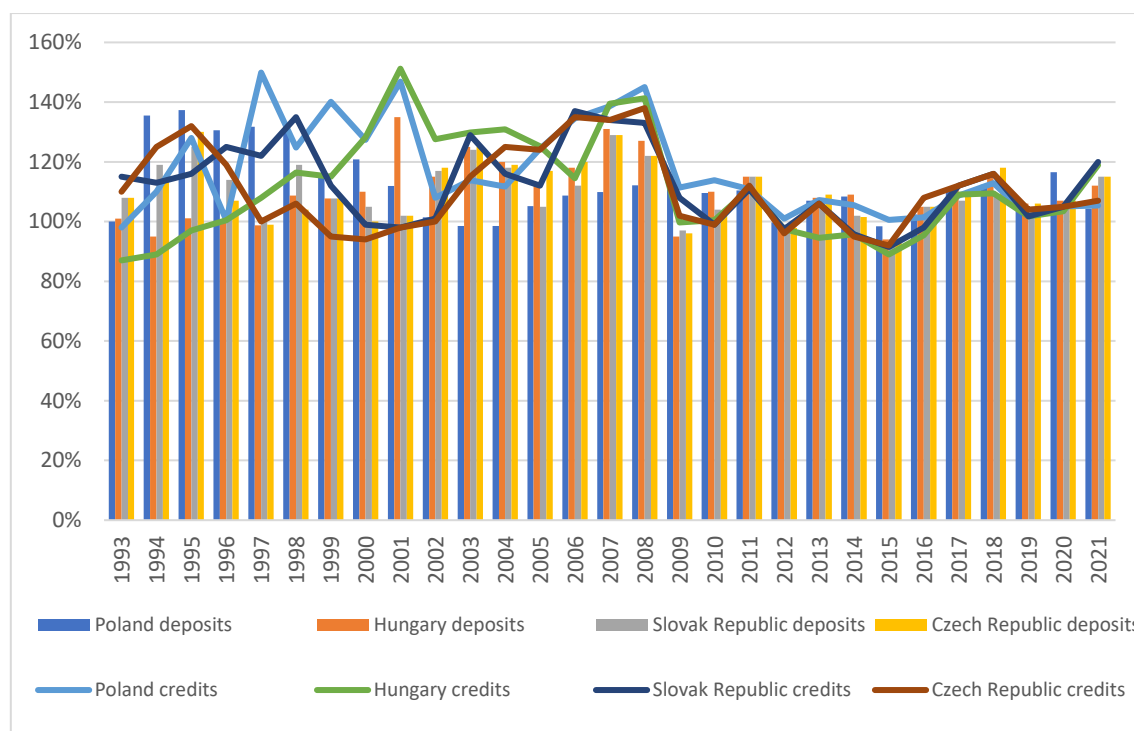
Chart 13 Development of the Dynamics of Deposits and Credits for Households for central European countries

Source: Own elaboration based on GDP, FRED, 2023, The Global Economy, 2023, NBP, 2023, CNB. 2023, NBS, 2023, MNB, 2023
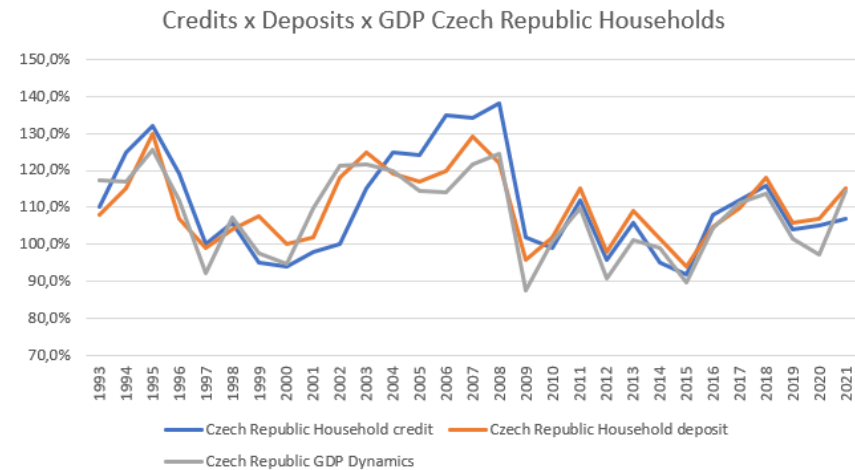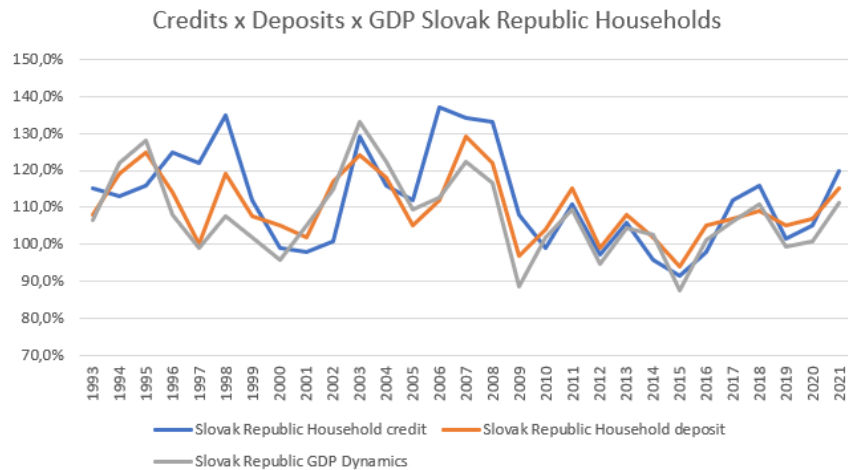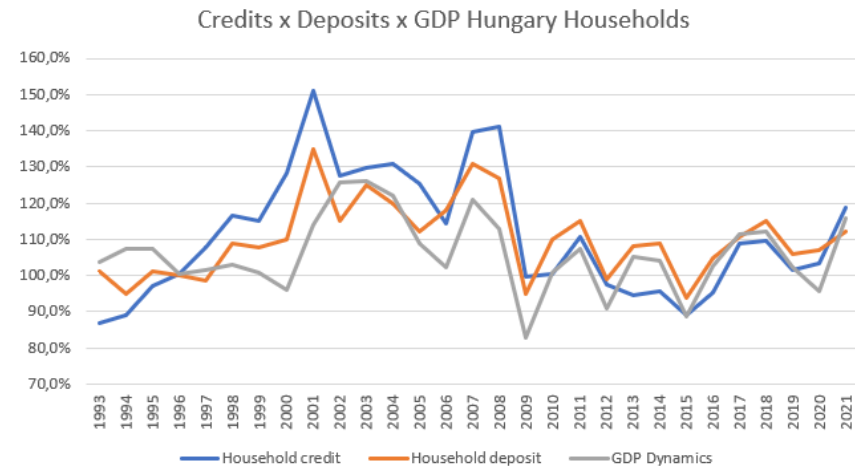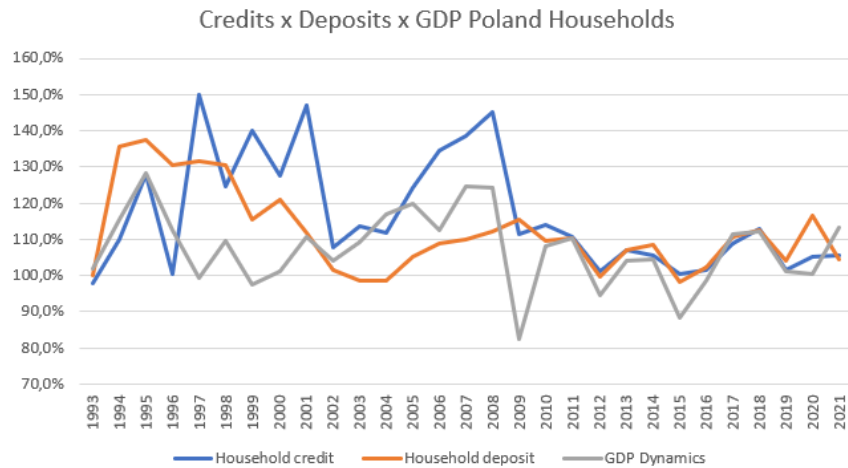
Chart 14 Development of the Dynamics of Deposits and Credits for Households Against Economic Fluctuations from 1993 to 2021

Source: Own elaboration based on GDP, FRED, 2023, The Global Economy, 2023, NBP, 2023, CNB. 2023, NBS, 2023, MNB, 2023

A significant improvement in the economic situation occurred after 2006, along with new favorable prospects appearing after Poland's accession to the EU structures. (Baka, 2005). However, with the further decrease in deposit interest rates and facilitations in taking out loans, there is a tendency to a significant decrease in the propensity to save while simultaneously increasing the propensity to take out loans. This is related to the situation when households, in a period of emerging growth trend of real incomes in the economy, can purchase larger baskets of goods and also change their content to more luxurious ones. (Gruszecki, 2004) Due to the difficulties in financing increasing and changing consumption from current incomes, there is a greater propensity for households to take out loans, even in a situation when their cost is steadily increasing. (Garczarczyk, 2009) The dynamics of granted credits then increased to a noticeably higher degree than deposits, respectively by 108.7% and 134.5% in 2006. This trend continued in the following years due to the banks' increasingly less restrictive credit policy and significant improvement in their operating conditions in the economy.

Phenomena indicating a deterioration in the economic situation appearing in 2008 initially did not cause significant changes in household behaviors. (Przybylska - Kapuścińska & Szyszko, 2012) This is due to the fact that households were not aware that the effects of this slowdown would also affect them. Moreover, those households that had not yet taken advantage of the fruits of prosperity during this period also wanted to take advantage of them, sensing that as a result of a possible collapse in the economy, they might become less accessible or more expensive. As a result, in the discussed year, further growth in the dynamics of deposits and credits was observed, respectively by 45% and 12.1% compared to 2007.

In 2009, we still observe an upward dynamics of the discussed indicators, however, it is no longer as high as in previous years. In that year, the dynamics of deposit growth decreased to 115.4% while the dynamics of deposits fell to 111.4%. The decrease in the amount of savings by 33.1% was undoubtedly caused by the significantly limited confidence in the banking sector as a result of events in the global financial markets and the decreasing incomes available to households. The reduction of these funds due to adverse changes in the economy, in turn, forced the susceptibility to take out loans, even in the face of emerging unfavorable prospects. Therefore, there is a further upward trend in financing households with credit and thus a willingness to bear increasingly higher interest rates compared to income, even for low-value loans. (Garczarczyk, 2009) This trend remained unchanged in 2010. Due to a slight improvement in the financial situation when the dynamics of credits increased to 113.9% while deposits decreased to 109.5%. Since then, these values have fluctuated, but generally, the dynamics of deposits have remained above 100%, with a noticeable increase in 2020 to 116.5%, followed by a slight decrease in 2021. The upward trend begins at 98.0% in 1993 and peaks in 1997 at 149.9%. In 2021, the value increases to 105.4%. There is a significant increase in credits for households in 1997, followed by a decrease and a

subsequent increase in 2001, then fluctuations with a general downward trend until a slight increase from 2016.

In Hungary, deposits initially fluctuated around 100%, except for a peak in 2001, when they reached 135%. Then, after a decrease in 2009 to 95%, the deposit values rose again, maintaining a level of around 110% in the years 2010-2017, with another increase in 2021 to 112%. Credits for households show an upward trend. Starting with a dynamic of 87.0% in 1993, reaching a peak in 2001 at 151.2%. The trend is quite variable, ending at 118.9% in 2021. A sharp increase occurs until 2001, then there is a decrease in the dynamics of these credits and a period of lower, more stable amounts with a slight increase in the last year.

In the Slovak Republic, household deposits generally grew, with several periods of stabilization. Particularly significant increases were noted in 1994, 1998, 2003, and 2007, with values exceeding 120%. Since 2009, there has been a decrease, but since then, deposits have remained stable, with a slight increase in 2021 to 115%. The upward trend in the dynamics of credits for households starts at 115.0% in 1993 and reaches the highest level of 137.0% in 2006. In 2021, it is 120.0%. There is a general upward trend until 2008, then a decline with a certain rebound until 2021.

In the Czech Republic, the dynamics of deposits were similar to those in Slovakia, with a clear increase in the mid-90s and stabilization around 100% in 2000. Then deposits rose again, peaking in 2018 at 118%, and in 2021 were at 115%. The dynamics of credits for households are characterized by an upward trend. Starting at 110.0% in 1993, with the highest level in 1995 at 132.0%. These credits and their dynamics are at the level of 107.0% in 2021. High values, occurring at the beginning of the period, transition into a decline to the lowest level in 2012, and from that period, there is a steady increase in credits for households.

Overall, all four Central European countries showed an increase in deposits in the first half of the 90s, followed by periods of stabilization and subsequent growth, with various fluctuations in subsequent years. The most variable situation is observed in Hungary, while in the Czech Republic and Slovakia, the upward trend was more uniform. In Poland, after the initial surge, deposits showed greater variability, but generally, there was an upward trend, especially in the last years of the analyzed period. In the late 90s and early 2000s, there was a significant increase in consumer credits, with peaks around 2001. The 2008 financial crisis seems to have an impact on consumer credits, with a visible decrease in growth rates immediately after it. After the crisis, the trend stabilized with moderate growth until 2021.

In summary, it can be stated that in connection with the development of the financial market and interest in new forms of savings allocation, interest in deposits among the household sector will continue to decrease. Consequently, since credits are often the only easily accessible means of

financing increasing consumption for households, their significance will maintain at the current level, undergoing only fluctuations related to changes in the economic climate.

The next chart illustrates the activity of business entities in the banking sector against economic fluctuations. Based on the analysis of the presented data, it is clear that the business sector is more sensitive to changes in the economic climate than the household sector, as its activity is directly dependent on it. The growth in economic activity caused by an increase in economic conditions directly increases the demand for additional financing sources due to increased production and interest in investments. (Kaźmierczak, 2000) Consequently, unlike households, businesses tend to maintain their resources and shape them under the influence of speculative rather than transactional motives. Low interest in loans in the early 1990s was undoubtedly caused by excessively high interest rates on loans for enterprises during the systemic transformation period. (Rytelewska, 2005) As a result, only a small percentage of business entities decided to use this form of financing their activities. Initially, the dynamics of deposits were at a high level, reaching 62% in 1994, undoubtedly due to favorable operating conditions and low availability of other products for saving in the context of the forming new financial market framework. Additionally, this high increase in the propensity to save income was also due to the fact that, initially, business entities did not treat economic growth as certain in the following years, thus wanting to retain part of their revenues. (Huerta de Soto, 2009)
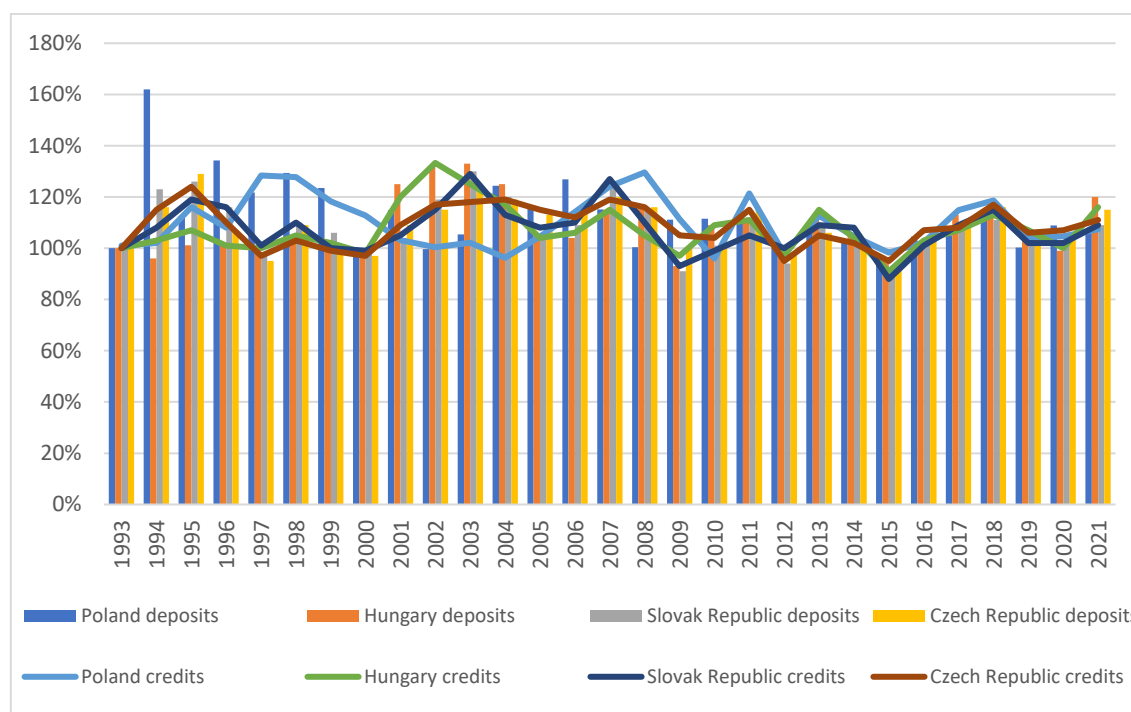
Chart 15 Development of the Dynamics of Deposits and Credits for Corporations

Source: Own elaboration based on GDP, FRED, 2023, The Global Economy, 2023, NBP, 2023, CNB. 2023, NBS, 2023, MNB, 2023
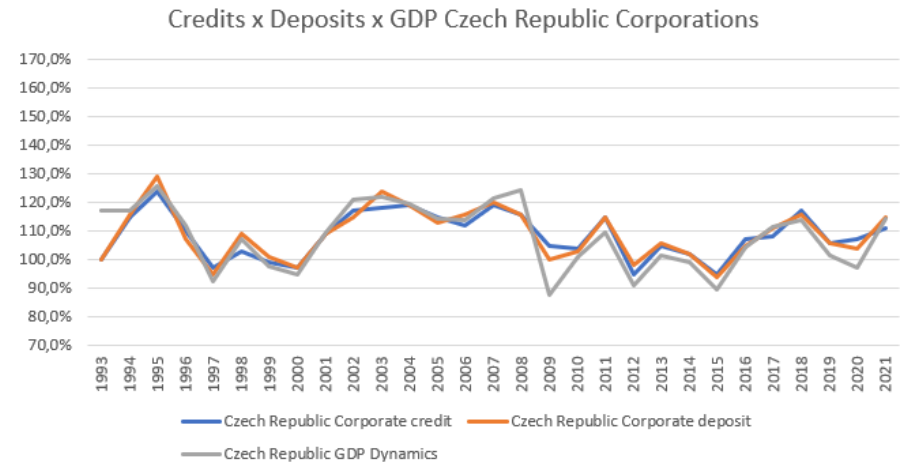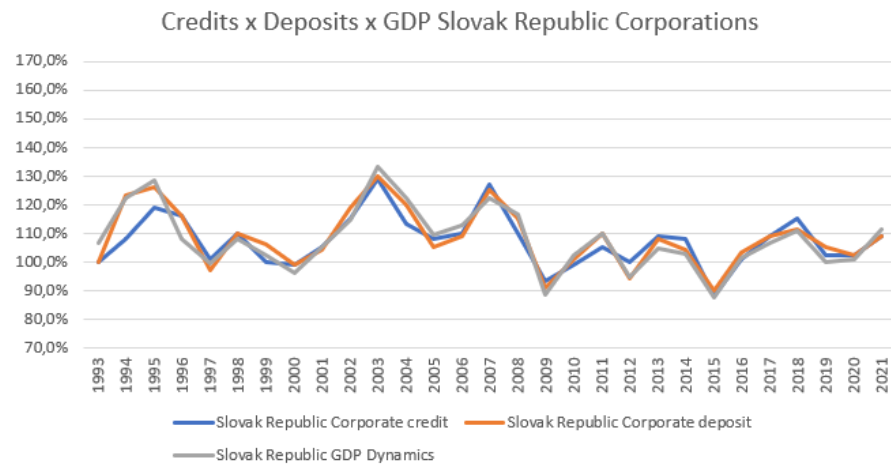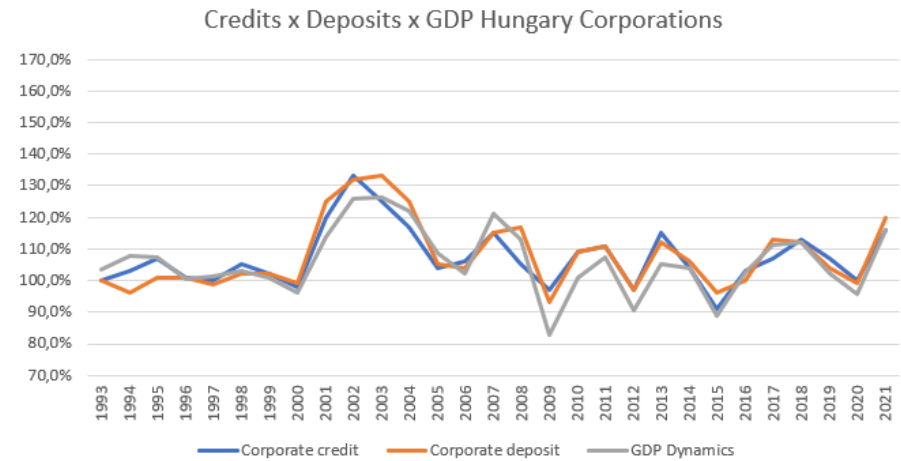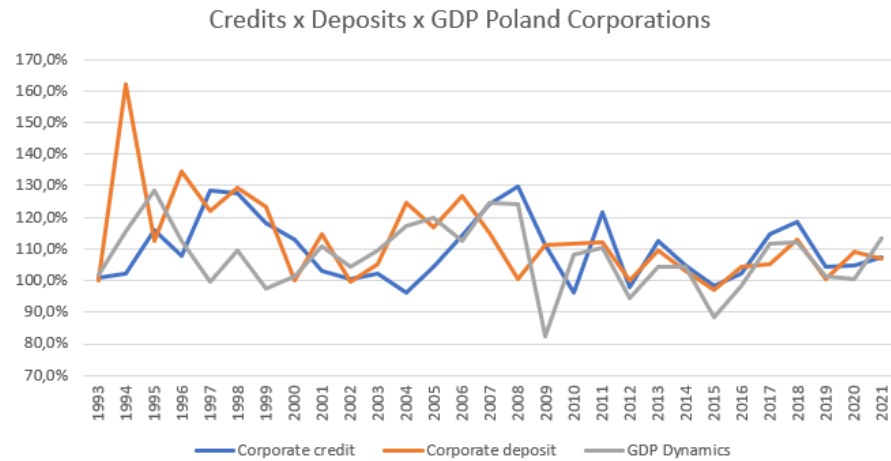
Chart 16 Development of the Dynamics of Deposits and Credits for Corporations Against Economic Fluctuations from 1993 to 2021

Source: Own elaboration based on GDP, FRED, 2023, The Global Economy, 2023, NBP, 2023, CNB. 2023, NBS, 2023, MNB, 2023

In the following years, the pace of deposit growth in the corporate sector remained positive, but the rate of this value decreased. This is related to the growing interest of enterprises in investments during times of economic development, hence the dynamics of loans reached 128.4% in 1997.

Another significant change occurred with the emerging economic slowdown in 1997, when a decrease in the pace of loan growth dynamics and greater interest in allocating savings in bank deposits, which increased by 29% compared to the previous year, was observed.

In the years 2001-2002, the effects of the earlier deterioration in economic conditions, which deepened and affected many business entities, became visible. Then, enterprises, treating low economic activity as a trend also for the following years, significantly reduced their investment expenditures. The modest 2% growth in the value of loans in the sector was caused by a forced tendency to take out working capital loans due to increasingly frequent difficulties in synchronizing inflows and expenditures. The savings of business entities also characterized by lower dynamics. In 2001, due to encouraging savings conditions, it increased by 14 percentage points compared to the previous year, but in 2002, due to further economic slowdown, it fell to 99.6%, taking the lowest value in the analyzed period.

Initially, the improvement in the economic situation visible from 2003 did not cause a significant change in the behavior of business entities, as they took into account the fact that these might be only temporary changes not causing a reversal of the existing economic trends. The dynamics of deposits changed slightly during this period, increasing by 5.4%. The situation in the loan market, due to significantly reduced abilities to service debt being the consequence of drastically deteriorated financial conditions of business entities, fell in 2004 to 96.3% compared to the previous year.

In the following years, there was again a revival in the loan market and a decrease in interest in bank deposits. The growing dynamics of loans were undoubtedly due to favorable prospects for conducting international business activity in connection with Poland's entry into the European Union. Since many companies were making investments at that time to increase their competitiveness in the common European market, the dynamics of loans increased by 4.5 percentage points compared to the previous year despite temporary problems appearing in the economy.

In 2006, a significant improvement in the conditions of the domestic economy occurred. Initially, not being sure of such a trend, enterprises saved part of their income, but the dynamics of savings in 2006-2008, along with the growing popularity of other financial instruments offered on the common European market, were no longer characterized by such high increases as in previous years and decreased by about 10 percentage points each year. With the further favorable development of the economy, enterprises in 2008, being more certain of its continued upward

trend, significantly increased their interest in investments, which due to favorable forecasts had a greater chance of implementation. Consequently, the propensity to take out loans for this purpose increased significantly by 29.6% compared to the previous year. Interest in investment activity is also confirmed by the low propensity to save, with the dynamics of savings in 2008 being only 0.4 percentage points.

On the other hand, in 2009, with the collapse of global financial markets, pulling significant economic slowdown, business entities were forced to reduce their activity in the financial market. (Barczyk et al., 2014) With the increasing risk of investing funds in other financial market instruments and uncertainty as to the shaping of further business conditions, there is an increased propensity to save, especially using one of the safer products of the banking sector - deposits. At this time, there is an increase in this size by 11.2% compared to the previous year. Interest in investment activity financed by bank loans also decreased significantly due to increasing risk in business activity and in 2009, its dynamics fell to the level of 111.43%, showing a decrease of 18.8 percentage points compared to 2008. The decrease in loan dynamics was additionally determined by the restrictive credit policy of banks, which to a greater extent were guided by the criteria of their own and borrowers' safety than in previous years. The following year, with the still noticeable effects of the economic slowdown, the situation does not change. The dynamics of loans fell in 2010 to 95.95%, reaching the lowest level in history, while the dynamics of deposits remained at the same level as in 2009 - 111%. The final years of the analyzed period show a moderate increase in deposits, to reach the level of 106.8% at the end of the period, in 2021. In 2010, there was a sharp drop to 96% of loans taken by enterprises, which may indicate the negative impact of the financial crisis on this sector of the economy. After the decline in 2012, the dynamics of loans increased again, reaching a peak in 2018 (118.7%). The last years show stabilization with a slight upward trend in this area.

In the case of Hungary, the dynamics of deposits are less turbulent than in Poland. After the initial decline in 1994 to 96.0%, there is a period of relative stability with an upward trend, reaching a peak in 2003 at 133.0%. After 2003, there is instability with a downward trend until 2015, after which deposits slowly increase, reaching 120.0% in 2021. The enormous increase in corporate loans in 2002 (133.3%) indicates a dynamic increase in corporate lending. After 2002, there was stabilization in this area with a downward trend until the crisis in 2009. The increase in the dynamics of corporate loans after 2010 was unfortunately quickly stopped in 2012, and then there was stabilization with an upward trend from 2016.

In Slovakia, as in Poland and Hungary, there is a gradual increase until 2003, reaching the level of 130.0%. In the following years, we observe some irregularity with a downward trend, with a clear decline during the financial crisis in 2009. In subsequent years, there is a gradual increase, ending

the period at 109.0% in 2021, which may indicate changes in economic policy and a revival in the corporate sector. Corporate loans showed an increase from 1994 to 2003, reaching 129%. There is relative stability in this area, except for a decline during the financial crisis in 2009. From 2010 to 2021, values fluctuate around the 1993 level.

The Czech Republic is characterized by the dynamics of corporate deposits at the level of 116% in 1994, which may suggest a significant inflow of capital to the enterprise sector and positive changes in the economy. The dynamics of deposits are quite stable with several periods of increase. The lowest level is 95% in 1997, which may indicate some economic difficulties and a decrease in trust in banks. The highest level was recorded in 1995 and amounted to 129%. During the financial crisis in 2007-2009, there is relative stability of deposits with a slight decline in 2009 to 100%, which suggests that the Czech corporate sector survived the crisis better than many other Central European countries. In 2021, the value of deposits increases again, reaching 115%, which may indicate an economic recovery and an increase in corporate activity in the Czech Republic. The Czech Republic has the most stable dynamics of deposits among all the analyzed countries, with deposit values usually remaining above 100%, with minor fluctuations. Looking at the dynamics of corporate loans in the analyzed period, it can be seen that the highest dynamics of lending occurred in 1994-1995, exceeding 124%. After 1995, there is a gradual decline until the crisis in 2009. From 2010, there is relative stability in the dynamics of lending with minor fluctuations around 100%.

Overall, it can be noticed that corporate loans in Central European countries were characterized by various trends. In Poland and Hungary, we observe upward trends with occasional declines, especially during the financial crisis. In the Slovak and Czech Republics, a more uniform increase to the pre-crisis level is visible, after which values stabilize with minor fluctuations in recent years. The financial crisis of 2008-2009 had a significant impact on the dynamics of corporate loans in all analyzed countries.

In summary, due to greater expectations related to the achieved income and increasing willingness to take risks, banking sector services, especially among larger enterprises, are becoming less popular. (Barczyk et al., 2006) With the development and increased availability of new financial services, there has been a change in the preferences of the business sector regarding the choice of instruments providing financing sources or savings. (Kałuzińska, 2013) Currently, there are many alternatives to traditional financing and allocating financial surpluses in banks available on the capital market. Therefore, the share of deposits and loans granted to the business sector will significantly decrease in bank balances in the coming years.

4.2. Responses of the government and financial market regulatory institutions to economic cycle changes and their impact on the banking system

The risk that continuously accompanies the operation of the financial system brings significant challenges for public institutions whose goal is to maintain the stability of the financial system. (Szpunar, 2000) The government, the central bank, and their subordinate institutions possess the most significant instruments for influencing the level of economic activity, which also significantly impact the banking system as a whole. (Daniluk, 1996) The state can stabilize the economy primarily through fiscal and monetary policy. (Kałuzińska, 2013) However, monetary policy, which is conducted by the central bank independently from the government based on the current situation, has a more significant impact on the banking sector. (Jurkowska - Zeidler, 2008) The central bank makes decisions related to the use of monetary policy instruments, such as the mandatory reserve system, Lombard and refinancing loans, and open market operations, which significantly determine (stimulate or restrict) the activities of commercial banks. (F. S. Mishkin, 2002)

The primary element of monetary policy is interest rates. The central bank sets their values for transactions to be carried out with commercial banks, as they are one of the most important economic indicators affecting the economy's condition. (Duwendag et al., 1995) This is due to their role in shaping the interest rates of transactions carried out in the money market, credit-deposit market, and subsequently, the interest rates of transactions conducted by commercial banks with their clients. With changes in the central bank's base interest rates, appropriate adjustments are made to other interest rates set for various types of financial transactions. (Sikorski & Mikulska, 2013) Therefore, it can be observed that they can cause significant changes in the real economy.

The interest rate policy conducted by the central banks of Central European countries influences the level and structure of interest rates in such a way as to achieve the desired degree of realization of the so-called final goals of economic policy, which are particularly considered to be a low level of inflation and a high level of economic growth. (Schumpeter, 2021)Achieving a certain level of interest rates is treated as a so-called intermediate goal, which can play a key role in achieving the ultimate goal. Therefore, changes in the central bank's interest rates are treated as an announcement of future decisions that can significantly affect the economic climate. (Friedman et al., 2017) Fluctuations in the level of basic interest rates have a significant impact on the real sphere by shaping the decisions of the banking sector regarding credit and deposit policies, thus indirectly influencing the behaviour of investors and consumers. (Baka, 2001)
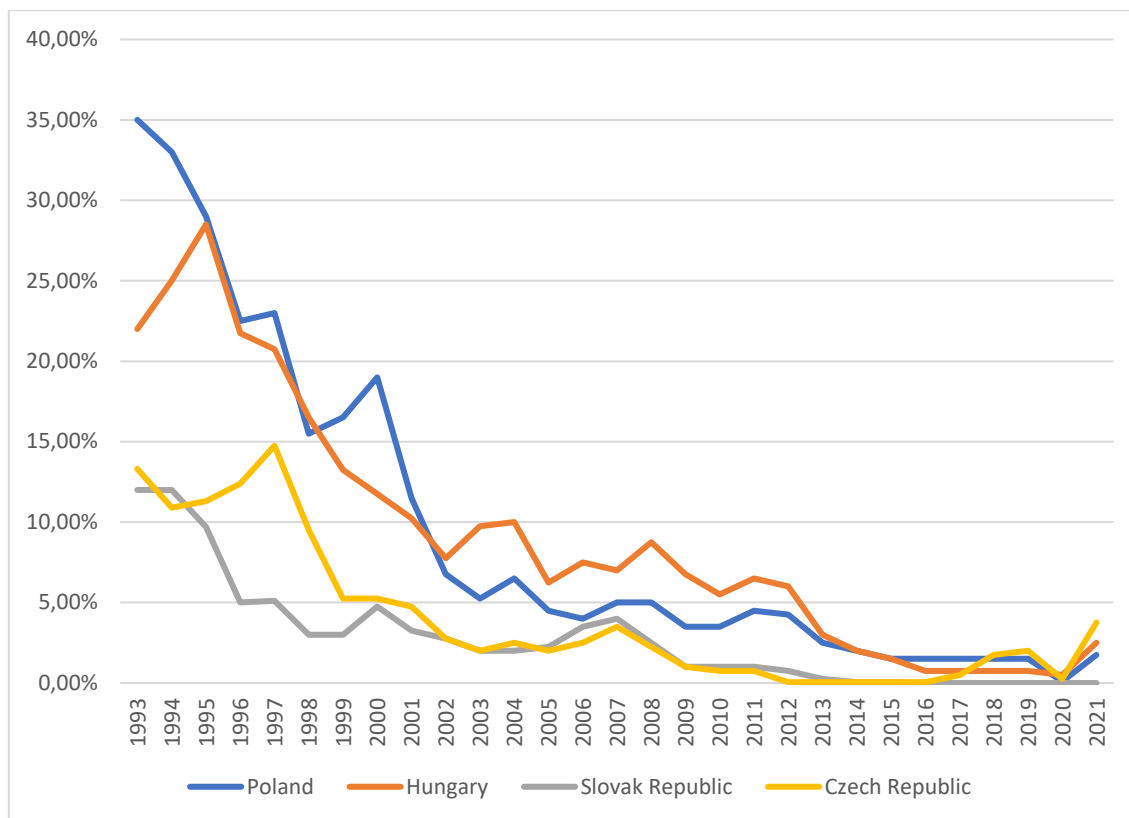
Chart 17 Reference Rate of Central Banks in Central European Countries from 1993 - 2021

Source: Own elaboration based on NBP, 2023, CNB. 2023, NBS, 2023, MNB, 2023, Statista, 2023

One of the main principles of the monetary policy conducted by the central banks of Central European countries is to ensure that the real interest rate is positive. Therefore, one of the fundamental factors that determine changes in the central bank's interest rates is inflation, as the real interest rate can only be positive when the nominal interest rate is higher than the level of price increases. (Iwanicz - Drozdowska, 2008) By not allowing situations where the real interest rate takes negative values, there are premises for saving, as the nominal income from interest obtained at a given time exceeds the inflation in the same period. (F. A. von (Friedrich A. Hayek & Klausinger, 2012) In the case of taking loans, it means that the lender receives a certain profit in exchange for leaving a certain amount at the borrower's disposal, and this profit is not lower than the price increase occurring in that period.

From the early 1990s to 2021, Poland's economic policy and the actions of the National Bank of Poland (NBP) were a response to a series of economic challenges and changes in the business cycle. After the fall of communism, Poland underwent a rapid transformation from a planned to a market economy. During this period, many sectors of the economy, including banks, were privatized. (Olszak, 2011) The NBP implemented a policy of tight monetary tightening to combat hyperinflation. High-interest rates affected the profitability of banks and the formation of their credit portfolios. (Freixas & Rochet, 2007)
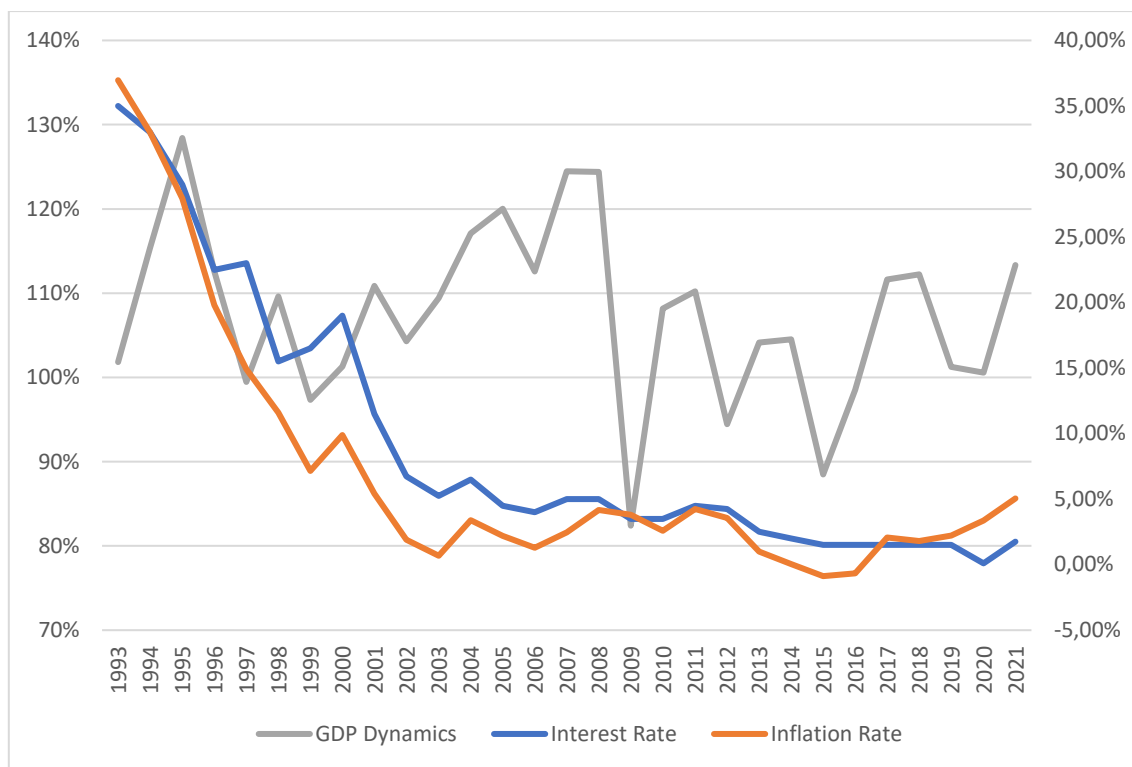
Chart 18 The Interest Rates of Narodowy Bank Polski (National Bank of Poland) Against GDP and Inflation from 1993 to 2021

Source: Own elaboration based on Table 17,19 and chart 17

As shown in the chart 18, from 1993 to 2021, when inflation was very high, high-interest rates accompanied it. To avoid a situation where real interest rates would be negative, the central bank's interest rates were set at the highest level during the analyzed period. Establishing a high reference rate at high inflation prevented situations where instead of motivation to save free funds, there would be a justified necessity to allocate these funds for current consumption to avoid potential losses when interest might not cover the price increase. For lenders, it means the possibility of obtaining a premium exceeding the price increase in a given period in exchange for making funds available to the borrower, enabling them to consume in advance of the price increase. These actions have a real impact on the economy's condition, as they stimulate both investment and consumer demand, guaranteeing its development. However, the loans offered by banks were still very expensive during this period, and inflationary pressure still posed a threat.

In 1999, the reference rate was lowered to 13%. As a result of an overly expansionary monetary policy, there was a stimulated demand for loans with a simultaneous decrease in deposits, which also had an impact on the increase in inflation. Therefore, interest rates were raised this year, increasing costs and making access to loans more difficult. (Cicirko, 2012) This trend also continued in 2000 when interest rates were raised again.

Between 2001 and 2003, there was a relaxation of monetary policy and associated frequent changes in interest rates, each time extremely cautious. Since each time these changes were small, they did not significantly revive the economy, as evidenced by the low economic growth during this period. (Matthews & Thompson, 2007) This may result from the situation that decisions on interest rate changes were made when investment and consumer demand, guaranteeing its development, had already been suppressed due to earlier market events. Factors significantly reducing their growth were not only the high cost of loans offered by banks but also the unfavorable financial situation in the real sector due to the economic slowdown. The economy began to stabilize, and inflation was falling. The NBP gradually lowered interest rates, leading to increased credit activity. Poland's accession to the European Union in 2004 accelerated the inflow of investments and the development of the banking sector. (Gospodarowicz & Nosowski, 2012)

In the following years, due to the improvement of the business climate and the decrease in inflation in 2005, monetary policy began to be relaxed again. During this period, due to the relatively low pace of economic growth and the stable and low level of the consumer price index, interest rates were reduced five times. This situation was conducive to lowering the cost of loan interest, making them more accessible and their use favorably affecting the shape of the economy. However, the economic recovery occurred in 2006 as a result of the consolidation of favorable trends in the economy and the improvement of conditions for the real sector. Then, to continue stimulating economic development, interest rates were lowered again.

In 2007, due to the increase in inflation and to prevent a situation where the observed increase in loans granted by banks could cause a rapid collapse of the business climate, the Monetary Policy Council raised interest rates.

In the first half of 2008, the domestic economy was characterized by high growth covering all its sectors. Similar to previous years, dynamic consumption and increasingly credit-financed investment played a significant role in its growth. However, due to disturbances in global financial markets in the middle of the year, a serious shock was observed, changing the previously favourable business climate. This situation led to a slowdown in GDP growth and a deterioration in the conditions of the real sector, significantly reducing the propensity for consumption and investment. The consequences of these events significantly affected the quality of the banking sector's assets, which is why it reduced the dynamics of its credit activity. Therefore, at the end of the year, the MPC decided to lower interest rates.

Due to the unfavourable events in the global economies resulting from the crisis that deepened in the financial markets, monetary policy was used in 2009 to mitigate the effects of the situation. At the beginning of the period in question, the deepening of the deterioration in the business climate, which began in previous years, was observed, reflected in a significant drop in GDP. The

weakening of economic activity was undoubtedly contributed to by the problem with the availability of loans and their increasing cost caused by the tightening of policy conditions and the increase in risk premiums for lending by banks, expressed in their interest rates during an uncertain period. (Czerwińska & Jajuga, 2016) Although the Polish banking system was not directly exposed to the subprime crisis in the USA, global financial tensions affected the Polish economy. The NBP implemented monetary easing, lowering interest rates. The government also introduced stimulus packages to mitigate the recession's effects.

The Polish banking system proved to be relatively resilient to the crisis thanks to cautious lending practices and strong oversight. (Gliniecka, 2004) Therefore, in 2009, to stimulate further economic development, the base interest rates were lowered four times to the lowest level in history at that time. Due to the unfavorable trends in the economy that persisted in 2010, the Monetary Policy Council decided to leave interest rates unchanged.

Poland's economy quickly rebounded after the crisis, and the banking system continued to expand, benefiting from low-interest rates. In response to low inflation and attempts to stimulate the economy, the NBP maintained low interest rates.

In the face of the global recession caused by the COVID-19 pandemic, the NBP lowered interest rates to a record low. The government introduced aid packages for businesses and households to mitigate the economic effects of lockdowns. Many customers took advantage of a moratorium on loan repayments. Despite initial concerns, the Polish banking system turned out to be quite resilient to the effects of the crisis. (Zaleska, 2021)

The government and the institutions under its jurisdiction also have the task of establishing rules for the safe operation of banks using prudential norms, which can neutralize or prevent increasing risk and adverse phenomena. Due to the natural fluctuations in economic activity, the government and supervisory institutions respond to the changing economic reality also by working on new laws, improving existing ones, issuing regulations, recommendations, and using other instruments binding the banking sector, whose compliance is required.

The changes forced by the low GDP dynamics and the changing economic reality began in 1989. (Dobaczewska, 1998) Then, the framework for the functioning of the resurrecting banking system was defined by the Act on the National Bank of Poland and the Banking Law. Due to the hyperinflationary processes threatening the stability of the banking sector, the Act on Credit was adopted, abolishing the previously applicable credit preferences and, most importantly, linking the interest rate to the inflation rate. (Góral, 2011)

In the early 90s, legislative activity focused primarily on creating a solid foundation for banking activities, mainly aimed at overcoming the collapse of the national banking system due to

unfavorable economic trends. (Szpringer, 2000) To stimulate the development of banks and thus the economy in the 90s, mainly administrative instruments were used, such as credit limits and recommendations regarding their distribution, as well as credit ceilings. At the same time, the regulations governing the banking sector changed along with the progress made in reforming the national economy and fulfilling obligations to important international institutions. (Niewiadoma, 2008) Another important argument for making decisions about changes was the economic situation of the banks, which, due to unfavorable trends in the economy, were affected by problems requiring special legal regulations. Therefore, in 1993, the Act on the Financial Restructuring of Enterprises and Banks was adopted. This document created a solid basis for counteracting crisis situations in the state segment of the banking sector and solving the problem of so-called bad loans, which were the main reason for the crisis in the banking system at the beginning of the nineties. (Zaleska, 1999) Moreover, since the symptoms of the then banking crisis were most externalized in the cooperative banking sector, in 1994 the Act on the Restructuring of Cooperative Banks and BGK was enacted, which significantly improved the capital conditions of this sector and thus increased its efficiency and safety. Due to the still low level of trust in the banking sector, rooted in its problems arising during the economic recession, the Act on the Banking Guarantee Fund was also enacted, regulating the issues of guaranteeing deposits and assisting banks in the event of a threat to their solvency. (Davies & Green, 2010) The enactment of this act closed the stage of banking law reform related to the crisis. In the next stage, new acts were enacted or existing laws were amended in response to the immediate needs of the national economy and adapting the applicable law to international standards. (Stefański, 2005)

Changes introduced in subsequent years were determined both by external conditions and the economic situation in the country. Due to the desire to take advantage of favorable changes in the economy and cause a more dynamic banking sector, it became necessary to create and modify legal acts going beyond the framework established in the applicable banking law. In 1997, influenced by the changing risk in the banking sector and its development, the banking law was changed again. As a result, it was more in line with the current economic situation and provided greater opportunities. (O. Kowalewski, 2011)

Amid deteriorating economic conditions in 1999, the Banking Supervision Commission thrice amended the resolution on the principles for banks to create reserves for risks associated with their operations. This is an excellent example of the supervisory authorities' response to changing conditions adversely affecting the banking market at that time. Due to the increasing risk, recommendations were also issued regarding interest rate risk management in banks and currency risk management, as well as recommendations from the President of the NBP related to the operation of banks in the capital market. (Rzeczycka, 2002)

In 2001, legislative activity was directed at creating new prudential regulations adequate to the increasing risk in a slowing economy, mainly in issuing prudential regulations by the General Inspectorate of Banking Supervision to limit risk in the banking system. (Koleśnik, 2014)

In 2004, the focus of regulatory activity was on adapting the Polish banking sector to operate in the open competition on the European common market. Due to the continued economic upturn, no regulations were created that directly related to economic events. (Pawłowska, 2014) Likewise, legislative activity in 2005 was not directly related to the economic situation but was the result of the New Capital Agreement and the CDR Directive. As a result, work (mainly by the GINB-General Inspectorate of Banking Supervision) focused on introducing changes to national legal regulations. (Capiga et al., 2011)

In 2006, the banking supervision prepared drafts of prudential regulations in the form of resolutions of the Banking Supervision Commission as executive acts to the amended Banking Law. (Capiga et al., 2013) These resolutions proposed solutions that were adopted after prior consultation with banks in response to the changing economic reality. An important document adopted by the KNB (Banking Supervision Commission) was Recommendation "S", which set good practices in the area of mortgage-backed credit exposures. It created a framework for better identification, supervision, and management of changing credit risk conditions. (Żółtkowski, 2007)

In 2007, legislative activity in the area of prudential norms affecting the banking sector again mainly resulted from the need to adapt national law to EU standards and was not directly related to economic events. (Białas & Mazur, 2013)

Although Polish banks were relatively well-capitalized and had limited exposure to "toxic" assets, the KNF introduced additional prudential measures to ensure sector stability. (Galbarczyk & Świderska, 2011) Cooperation between KNF and NBP was key in monitoring the situation and responding to potential threats to financial stability. In response to the financial crisis and in response to international initiatives, KNF introduced a series of new regulations aimed at strengthening banks' resilience to potential financial shocks. These included higher capital requirements and regulations on loans denominated in foreign currencies. (Capiga, 2010)

The most important document issued in 2008 in response to events in the global financial markets was the so-called Confidence Package announced in October by the National Bank of Poland. This document presented monetary policy instruments to restore the normal functioning of the entire financial market, including trust in the interbank market. The package guaranteed banks the possibility of obtaining PLN funds for periods longer than one day, assistance in obtaining foreign currency funds, and expanding the possibilities for banks to obtain PLN liquidity by expanding collateral operations with the central bank. This document positively influenced the sense of

security regarding the situation in the banking sector thanks to its assurance of readiness to undertake further actions aimed at increasing stability in the banking system. (NBP, 2008)

In response to the spreading crisis in the global financial markets, legislative actions were taken that could significantly affect its safety. In 2009, the Act on Guarantees and Sureties Granted by the State Treasury and Certain Legal Persons and the Act on the Bank Gospodarstwa Krajowego were amended. These works were forced by the increasing risk of bankruptcy in the business sector due to the economic slowdown and aimed to facilitate access to external financing in the form of loans, especially for small and medium-sized enterprises. (Zaleska, 2018)

Another significant legislative change was the enactment of the Act on State Treasury Support for Financial Institutions in 2009. Its purpose was to create legal possibilities for the State Treasury to assist financial institutions, especially during economic downturns, in maintaining liquidity. Additionally, during this period, the Polish Financial Supervision Authority (KNF) recommended that banks retain their earned profits instead of paying out dividends. This was to prevent the weakening of the capital base in a situation of increased uncertainty and risk in the financial markets.

In 2010, the KNF issued a series of recommendations, mainly related to risk management, which arose due to the crisis in the financial markets. The most important of these concerned operational risk management, liquidity, currency, concentration of commitments, and transactions by banks in the derivatives market, which now carry higher risk than before. All these recommendations aim to ensure the proper functioning of the financial market in an environment that still feels the effects of the last crisis.

In response to the economic challenges posed by the COVID-19 pandemic, the KNF took measures to support liquidity in the banking sector and applied certain regulatory reliefs. Cooperation with the National Bank of Poland (NBP) was essential in providing tools to stimulate lending and support the economy.

The Banking Guarantee Fund (BFG) is a key institution in Poland responsible for guaranteeing deposits and supporting the stability of the banking sector. Its activities from 1993 to 2021 were crucial in maintaining confidence in the banking system, especially during crises.

The BFG was established in 1995 as part of the reforms of the banking system in Poland to increase trust in the sector. From its inception, the BFG guaranteed customer deposits in the event of bank insolvency. (Smithson et al., 2000) Over the years, the limit of guaranteed deposits has been raised several times in response to changing market conditions, inflation, and compliance with EU standards. This was to maintain confidence in the banking system and adapt to the growing balances of banks. While the Polish banking sector did not suffer as severely in the 2008 financial

crisis as in other countries, the BFG played a significant role in maintaining confidence in banks during this difficult period. In response to the crisis, the BFG intensified its information activities towards customers, emphasizing the safety of their deposits.

After the financial crisis, in the context of EU regulations (BRRD Directive), the BFG gained new powers and tools to ensure financial stability. The BFG could now actively participate in the restructuring process of financially troubled banks, not just paying out guaranteed deposits. The BFG also played an important role in maintaining stability and confidence in the banking system during the COVID-19 pandemic. Although the banking sector in Poland remained relatively stable, the BFG continued its information activities and monitored the situation in banks to be prepared for potential disruptions.

Overall, the BFG played a key role in ensuring the stability of the banking system in Poland from 1993 to 2021, adapting to changing economic conditions and market challenges. The actions of the BFG were crucial in maintaining public confidence in banks and ensuring the safety of their savings, adapting to evolving economic and financial challenges.

In summary, from 1993 to 2021, the Polish banking system witnessed significant changes in economic conditions, to which the financial market regulatory institutions responded appropriately. Their actions focused on ensuring the stability of the banking system in Poland. Overall, the Polish banking system proved to be resilient to various challenges, thanks to, among other things, appropriate NBP policy, effective supervision, and cautious banking practices.
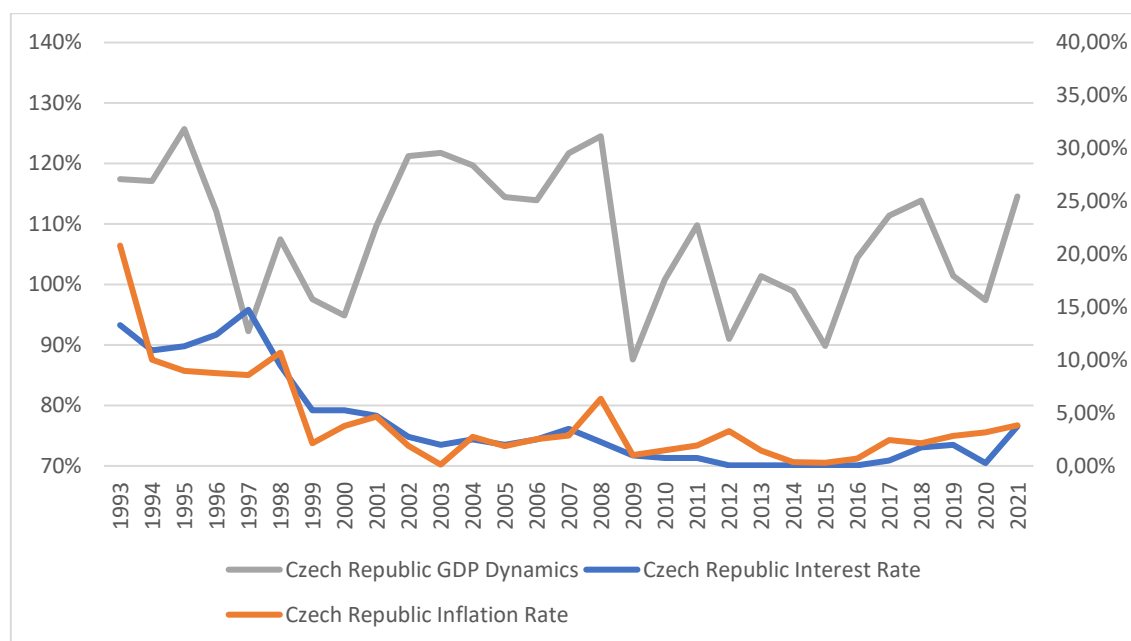
Chart 19 The Interest Rates of Česká Národní Banka (Czech National Bank) Against GDP and Inflation from 1993 to 2021

Source: Own elaboration based on table 17,19 and chart 17

Just like Poland, the Czech Republic underwent a rapid economic transformation in the 1990s and faced various economic fluctuations in the following years.

The Czech Republic relies on a model where the central bank also serves as the main financial supervisory authority. This model differs from the one in Poland, where the Financial Supervision Authority is a separate entity from the central bank (National Bank of Poland). Česká národní banka (CNB), although the central bank of the Czech Republic, also functions as the financial market supervisor. CNB is responsible for regulating and supervising banks, insurance companies, capital markets, and other financial institutions. The main actions of the government and CNB in response to these economic fluctuations and their impact on the banking system from 1993 to 2021 can be presented.

After the dissolution of Czechoslovakia in 1993, the Czech Republic underwent a transformation from a planned to a market economy. The central bank, CNB, played a key role in stabilizing the currency and combating inflation. The introduction of the Czech koruna in 1993 was an important step towards economic independence. Banks and other key economic sectors were privatized.

In the 1990s, several Czech commercial banks failed or faced serious financial difficulties. In response to these crises, the Deposit Guarantee Fund (FGv) played a significant role in paying out insured deposits, which helped maintain trust in the country's banking sector. After the Czech Republic joined the European Union in 2004, FGv was adapted to EU standards regarding deposit guarantees. This included increasing the limit of guaranteed deposits and adjusting operational procedures. Like many countries, the Czech banking sector was also affected by the financial crisis. However, thanks to earlier reforms and stable sector management, Czech banks proved relatively resilient. Nevertheless, FGv continued to play an important role in maintaining trust in the sector by guaranteeing deposits. Similar to other countries, the COVID-19 pandemic posed challenges for the banking sector. FGv continued its key role in guaranteeing deposits, which was important for maintaining client confidence during uncertain times. In summary, from 1993 to 2021, the Czech Deposit Guarantee Fund played a significant role in ensuring the stability of the banking sector, responding to various crises and changing market conditions. FGv's actions were crucial in protecting client savings and maintaining trust in the Czech banking system. The Czech banking system, like Poland's, proved relatively resilient to the effects of the crisis. The central bank successively lowered interest rates, and since 2016, zero interest rates have been in effect. In conclusion, from 1993 to 2021, the Czech banking system went through various challenges, to which the regulatory institutions, especially the ČNB, responded in a coordinated and thoughtful manner. Their actions were focused on ensuring financial stability, securing citizens' deposits, and adapting to international standards and practices in banking supervision. Overall, the Czech

banking system proved stable and capable of surviving both economic crises and changes in the economic climate.
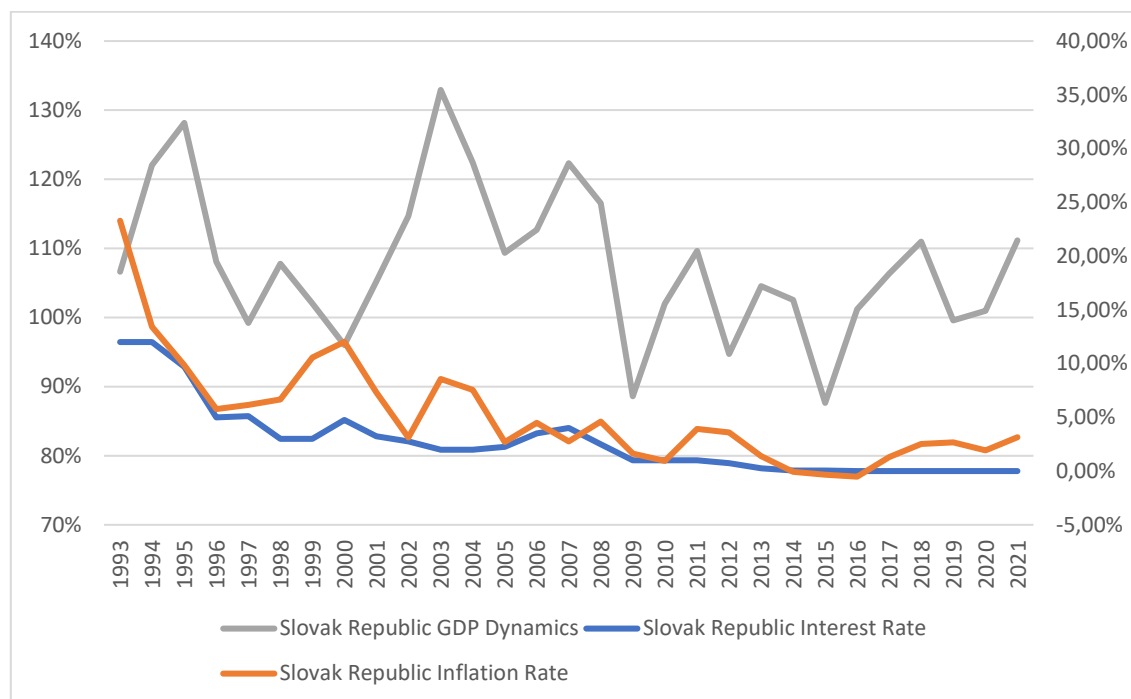
Chart 20 The Interest Rates of the Národná Banka Slovenska (National Bank of Slovakia) Against GDP and Inflation from 1993 to 2021

Source: Own elaboration based on table 17,19 and chart 17

Slovakia, like the Czech Republic, relies on a model in which the central bank also serves as the main financial supervisory authority. Like other Central European countries, it experienced a series of economic transformations and challenges between 1993 and 2021. The responses of the Slovak government and its central bank, Národná Banka Slovenska (NBS), to economic fluctuations influenced the banking system.

After the dissolution of Czechoslovakia in 1993, Slovakia became an independent state. The transition from a planned economy to a market economy, as in other countries in the region, was challenging.

The National Bank of Slovakia (NBS) was established as the country's central bank and played a key role in stabilizing the new currency – the Slovak koruna.

During this period, banks were privatized, but the sector remained vulnerable to non-performing loans and weak corporate practices. The Slovak banking sector encountered problems related to non-performing loans and poor oversight. The government undertook a restructuring of the banking sector, selling some of the largest banks to foreign investors and introducing better regulations and supervisory practices. (Rothbard, 2007)

Slovakia joined the European Union in 2004, which required further adjustments in financial regulation and positively influenced investor confidence and economic growth. The government and NBS took measures to meet the convergence criteria and preparations for adopting the euro. Slovakia adopted the euro as its official currency on January 1, 2009, necessitating a strict adjustment of monetary and fiscal policy to Eurozone requirements.

Although Slovakia was not as severely affected by the 2008-2009 financial crisis as some other countries, its economy felt the impact of the global recession. The NBS, as part of the European Central Bank system, implemented measures to ensure liquidity and support for banks. The NBS also collaborated with European institutions to coordinate actions for financial stability in the region.

After the financial crisis, the Slovak economy began to stabilize, and the banking sector remained healthy, with moderate credit growth and a low level of non-performing loans. The common currency and strict EU-level regulations played a role in maintaining the stability of the banking sector. In response to the crisis and new international standards (such as Basel III), the NBS introduced a series of new regulations on capital, liquidity, and risk management. (Liberadzki & Liberadzki, 2019) There was an enhancement of supervision over the financial sector and increased international cooperation, especially within the European Union.

In response to the COVID-19 pandemic, the NBS introduced a range of measures to support the economy and the banking system, including interest rate cuts and capital requirement reliefs for banks. The government introduced support packages for businesses and households. The NBS, in coordination with the European Central Bank, took measures to support liquidity in the banking system. These actions were coordinated with other institutions in the Eurozone and at the national level to support borrowers and ensure financial stability.

In Slovakia, the main institution responsible for guaranteeing bank deposits is the Bank Deposit Guarantee Fund (Fond na garanciu vkladov - FGV). This fund was a key component of support for the country's banking sector stability, especially in times of economic and financial uncertainty. The FGV was established in 1996 as a response to the need to provide greater protection for depositors and increase confidence in the banking sector.

In the late 1990s, Slovakia experienced a crisis in some banks. In response to these events, the FGV played a key role in ensuring the payout of guaranteed deposits, which helped limit panic among bank customers.

After Slovakia's accession to the European Union in 2004 and the subsequent adoption of the euro in 2009, the FGV underwent a process of adaptation to EU standards. The limits of guaranteed deposits were increased, and new operating procedures were introduced.

Although the Slovak banking system proved relatively resilient to the global financial crisis, the presence of the FGV was significant in maintaining confidence in the banks. The Fund confirmed its readiness to intervene and pay out guaranteed deposits if necessary.

During the global pandemic, the FGV continued to play a role in guaranteeing deposits. Although the Slovak banking sector remained relatively stable, the presence of the FGV was important for maintaining confidence in uncertain times.

The Bank Deposit Guarantee Fund in Slovakia played an important role in ensuring the stability of the country's banking sector. During periods of financial and economic uncertainty, the FGV provided essential support, helping to maintain confidence in Slovakia's banking system.

In summary, between 1993 and 2021, Slovak financial regulatory institutions, primarily the NBS, responded to various challenges, adapting regulations and policies to ensure stability and growth in the banking system. These actions helped secure Slovakia's financial system against major shocks and prepared the country for integration with the European financial system. Over these years, Slovakia went through many stages of development and challenges, but thanks to effective supervision, reforms, and external support, it managed to maintain stability and health in the banking sector.
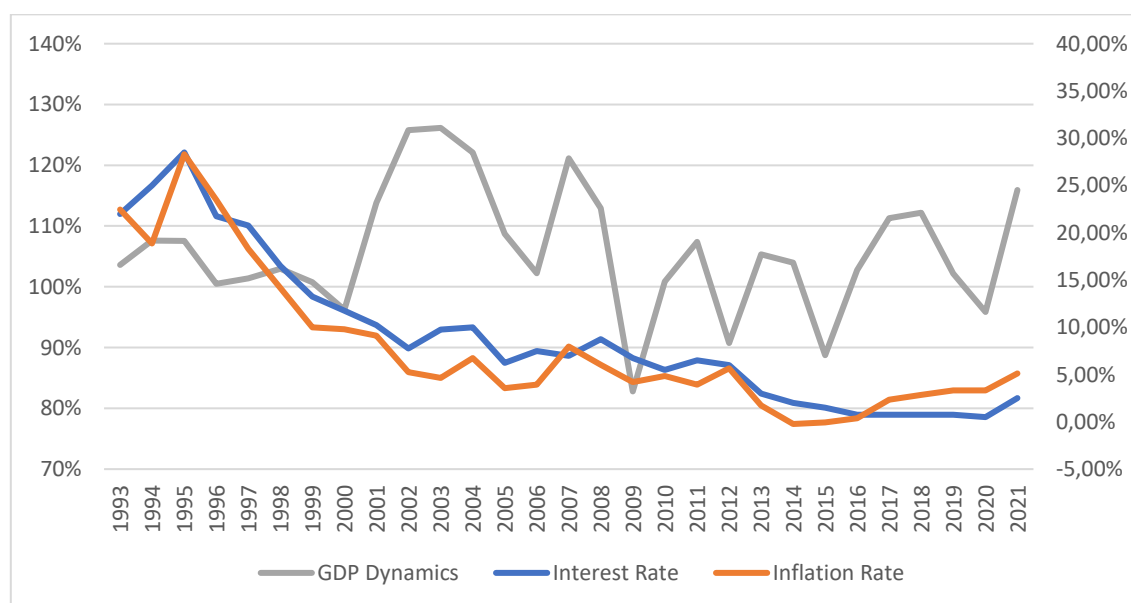
Chart 21 The Interest Rates of the Magyar Nemzeti Bank (National Bank of Hungary) Against GDP and Inflation from 1993 to 2021
Source: Own elaboration based on table 17,19 and chart 17

Hungary, like the Czech Republic and Slovakia, is based on a model in which the central bank also serves as the main financial supervisory authority. Like many Central European countries, Hungary

experienced a series of economic fluctuations from 1993 to 2021. The responses of the government and the Magyar Nemzeti Bank (MNB) had an impact on the banking system.

After the fall of communism in 1989, Hungary began the transition from a planned economy to a market economy. The 1990s continued with privatization, market liberalization, and structural reforms. The MNB focused on financial stabilization, controlling inflation, and supporting the newly formed banking sector. It also played a key role in stabilizing the currency (forint) and in introducing new supervisory standards for the banking sector.

Global financial crises in the late 1990s impacted the Hungarian economy by reducing foreign investment and decreasing demand for Hungarian exports. The government and MNB responded with currency interventions and interest rate reductions to support economic growth.

Hungary joined the European Union in 2004, positively impacting investment and trade. The MNB focused on economic convergence, preparing the country for future adoption of the euro (although Hungary had not yet adopted the euro by 2021).

The Hungarian economy was affected by the 2008-2009 financial crisis, leading to a recession and banking sector problems. The country received international assistance, including a financial package from the International Monetary Fund (IMF), the EU, and the World Bank. In return for financial assistance, Hungary agreed to an austerity program. The MNB lowered interest rates and introduced measures to support bank liquidity and household debt restructuring programs. After the crisis, the Hungarian economy began to slowly recover, but many challenges remained, including a high level of public debt. The MNB and other regulatory institutions introduced new requirements for capital, liquidity, and risk management.

From 2010-2021, under Viktor Orbán's government, Hungary introduced several controversial reforms in the financial sector. These included taxing banks, national mortgage restructuring programs, and attempts to reduce the influence of foreign capital in the banking sector.

In response to the crisis caused by the COVID-19 pandemic, the MNB introduced a range of measures to support the economy, including interest rate cuts, asset purchase programs, and credit support for businesses. The government also introduced stimulus packages and support measures for businesses and households. These decisions had both positive and negative effects on the banking system but generally increased state control over the financial sector.

In Hungary, the National Deposit Insurance Fund (Országos Betétbiztosítási Alap, OBA) is responsible for guaranteeing deposits. The fund aims to protect the deposits of customers of financial institutions in case of their insolvency. The OBA was established in 1993 to protect depositors and increase confidence in the banking sector. It served as the primary deposit guarantee mechanism in Hungarian banks. Like many European countries, the OBA gradually increased the

limit of guaranteed deposits, adjusting for inflation, the country's economic development, and EU regulations.

The Hungarian banking sector, like those in other countries, was affected by the 2008-2009 global financial crisis. The OBA played a key role in maintaining confidence in the banking system, guaranteeing deposit payouts in case of financial problems in some banks.

In the context of adapting to European regulations on deposit guarantees, the OBA continued to modernize and adjust its procedures to meet EU requirements.

Although the Hungarian banking sector proved relatively resilient to the economic effects of the COVID-19 pandemic, the presence of the OBA was important for maintaining customer confidence. The Fund ensured the continuity of deposit guarantees and was ready to intervene if necessary.

Overall, the OBA played an important role in ensuring Hungary's financial stability during the studied period. The actions of the Fund were key in maintaining public confidence in the Hungarian banking sector, especially during financial crises.

In summary, from 1993-2021, Hungary faced a series of economic challenges, to which the government and the central bank responded with various strategies. The financial market regulating institutions in Hungary, particularly the MNB, were actively involved in responding to diverse challenges, adapting to changing economic and political conditions. Their decisions and actions had a profound impact on the shape and functioning of Hungary's banking system. The country's banking system, although exposed to various types of shocks over these years, remained largely stable thanks to interventions and reforms.

Currently, it is recognized that state intervention in each phase of the economic cycle, i.e., curbing growth in the event of potential overheating of the economy and stimulating its growth in the downturn phase using both monetary policy and legislative regulations, can have the greatest impact on ensuring appropriate conditions for economic development in the long term. (Lucas, 1991) However, it should be remembered that these actions are not able to ensure its development and sometimes they themselves are initiators of cyclical fluctuations. Hence, there is currently a tendency in economic policy to limit the role of the state in shaping market economic processes. (Kwiatkowski & Milewski, 2018)

Discussing the actions of the central bank in conditions of economic fluctuations, it is necessary to perform an analysis of volatility. Volatility analysis helps to understand monetary policy and inflationary pressures (Table 25).

Table 25 Standard deviations of banking system activity indicators against the backdrop of GDP for Central European countries

Indicator	Poland	Hungary	Slovakia	Czech Republic
Interest rates	10,25%	7,94%	3,37%	4,51%
GDP (in billions)	182,30 USD	46,19 USD	33,91 USD	77,82 USD
Inflation	9,96%	7,52%	5,06%	4,40%

Source: Own elaboration based on table 17,19 and chart 17

The following conclusions can be drawn from the volatility analysis:

- High deviation in interest rates and inflation suggests that Poland has higher interest rates and inflation compared to the average for other Central European countries. This may indicate attempts to combat inflation by raising interest rates.

- Although Hungary's GDP is below average, their interest rates and inflation are close to the average. This may suggest that Hungary has a relatively stable monetary policy compared to other countries.

- Slovakia has lower interest rates and inflation compared to the average, which may indicate low economic growth and attempts to stimulate the economy through lower interest rates.

- Although the Czech Republic's GDP is close to the average, their interest rates and inflation are below average, which may indicate attempts to stimulate the economy while keeping inflation at a low level.

4.3. Competition in the banking sector and economic fluctuations

The competition of the banking sector in Central European countries has significantly increased in recent years. This rise in importance is due to changes occurring in global financial markets, primarily driven by globalization, liberalization, deregulation, and securitization. (Korenik, 2002) The increasing removal of barriers to access to financial markets has led to the emergence of new entities, which also operate in the banking services market and contribute to increasing competition. (W. Jaworski & Zawadzka, 2005) New challenges facing the banking sector compel it to use innovative solutions that enhance its efficiency, ultimately improving its competitive abilities. The most efficient banks in this respect set a level of prices for the rest of the banking sector based on a relatively low level of their own costs. (Raju & Zhang, 2010) Competitive pressure forces banks to adapt to this imposed price level by making efforts to reduce their own operational costs, which consequently also leads to a narrowing of the difference between the interest charged on loans and the interest paid on deposits received – known as the interest margin. The Net Interest Margin (NIM) is a financial indicator used to assess the efficiency of banks and other financial institutions in generating profits from their assets and liabilities. It is calculated as

the difference between interest income and interest costs, divided by the average value of earning assets. (Holliwell, 2001)

The following chart presents the banking margin as the ratio of interest income to average assets reduced by interest due on impaired receivables. In recent years, we can observe a continuous narrowing of the interest margin in the banking sector. This situation is undoubtedly related to increasing competition in the banking sector, which forces banks to engage in fierce competitive struggles at the expense of the size of the margins achieved.
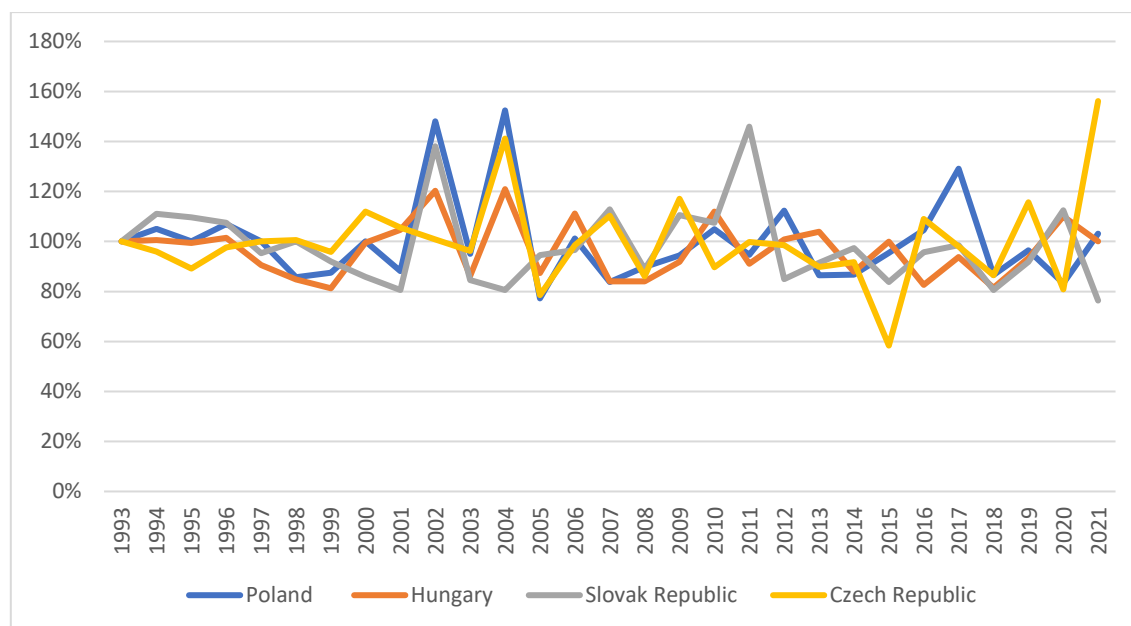
Chart 22 Net interest margin for Central European countries from 1993 to 2021

Source: Own elaboration based on Fred, 2023, Trading Economics, 2023

Initially, the survival of banks, particularly in the early 1990s, depended on competing to attract deposits. At that time, little importance was attached to the costs of acquiring them, as in the unfavorable conditions for the development of the banking sector, more importance was given to gaining new, regular customers. After some time, intensifying competition could also be observed in the credit market. As a result of the continuously unfavorable prospects for the development of the sector at that time, and the poor financial condition of the real sector, increasing the number of banks offering credit financing, competition for customers ultimately led to a significant reduction in the interest margin. (Wierzba, 2001) Analyzing the presented figure in 1998, we can notice a significant reduction in the interest margin by 14.29 percentage points compared to the previous year. This collapse is a consequence of a significant economic slowdown, during which banks, fighting for customer deposits, raised their interest rates while lowering credit interest rates due to the decreasing demand for them.
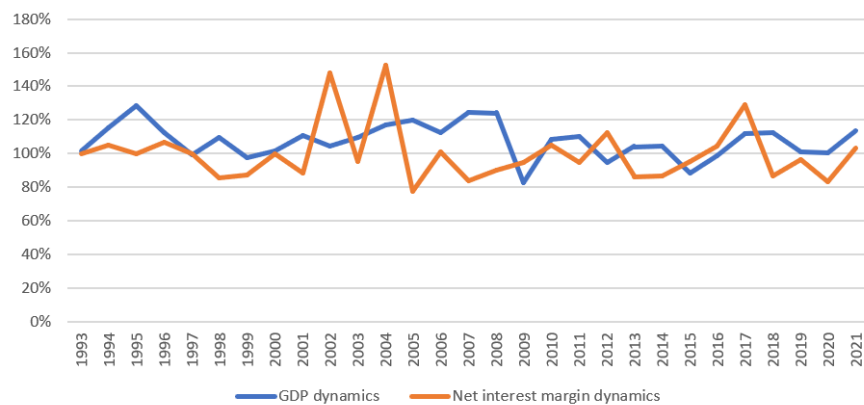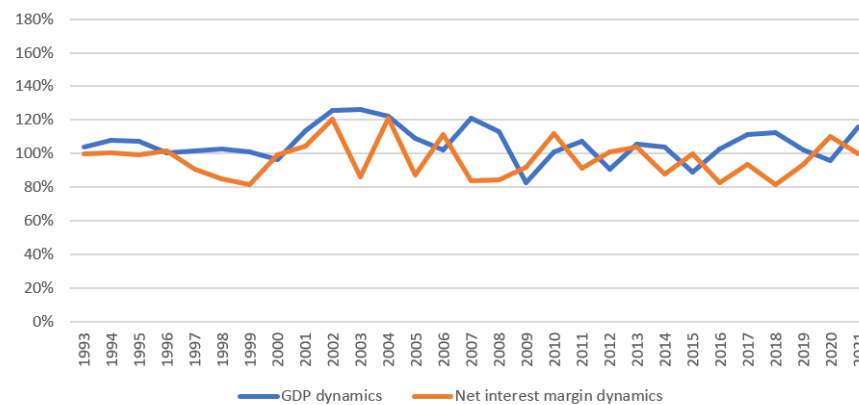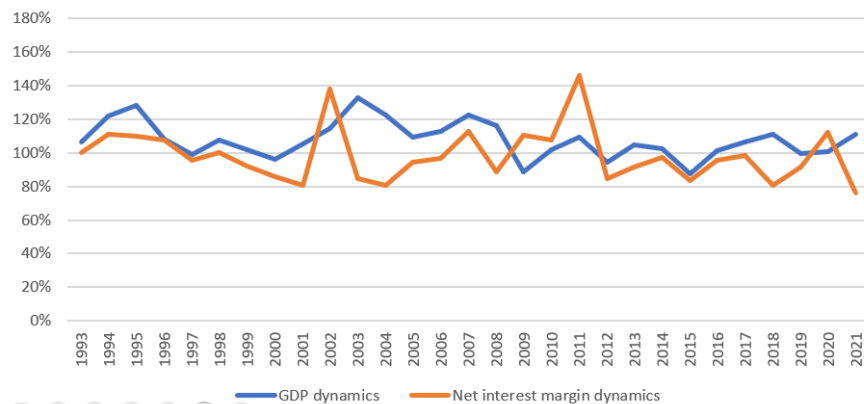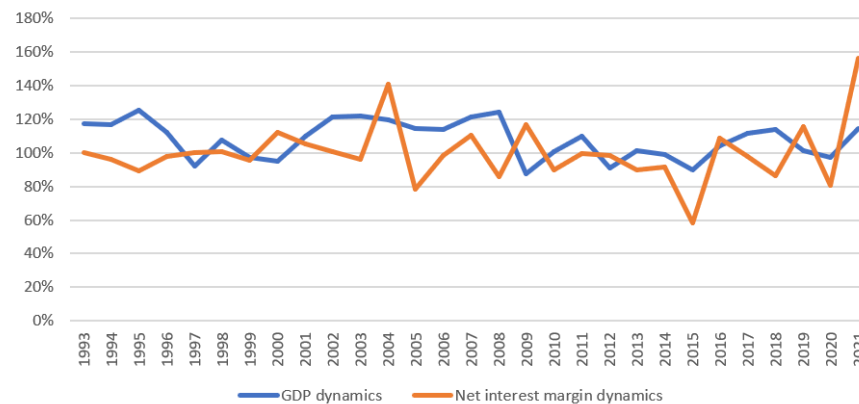
Chart 23 Net interest margin for Central European countries from 1993 to 2021

Source: Own elaboration based on table 17 and chart 22

Additionally, as a result of unfavorable economic trends, the share of non-performing assets and overdue interest due to risky receivables increased in the bank's balance sheet, which also contributed to the decrease in the interest margin. (Szpunar, 2016) In the following years, with the improvement of the economic situation, a slowdown in the downward trend of this indicator is observed. More favorable prospects for the real sector encourage it both to greater savings or consumption financed by credit. Thanks to the increased demand for financial services in times of prosperity, the share of performing assets in the balance sheets of banks increases. (Wiśniewska, 2013) Additionally, as the demand for services provided by the banking sector increases, the intensity of competitive struggle decreases. With the increasing demand for its services, there is a greater possibility of setting the margin spread at a satisfactory level.

In 2001, there was another decline in the interest margin due to a further deterioration in the economic situation; the interest margin was then reduced by 11.9% compared to the previous year. This was due to increasing competition in the banking sector for stable sources of financing, which appeared during the economic slowdown, during which there was also a decrease in interest income due to the increase in lower-interest receivables and due to the increasing share of doubtful and lost receivables constituting non-performing assets in the loan portfolio. (Czech - Rogosz et al., 2009) In the following years, the interest margin decreased by another 8.11% and 5.88%. The main factors influencing its reduction include the increase in credit risk associated with the economic downturn, increasing financing costs, and a decrease in the dynamics of the credit campaign. Additionally, as a result of the increase in competition for deposits, there is an increase in their interest rates, which, together with the decreasing demand for banking services and increasing competition in the sector, leads to a reduction in the interest margin.

In 2004, the interest margin, on the other hand, increased by 3.13% compared to the previous year. Undoubtedly, this was related to the more favourable prospects appearing with economic growth. Additionally, the situation was influenced by the reduction of banks' operating costs and an increase in revenues and volume of receivables, which completely neutralized the rising interest costs. (KNF, 2004) The next collapse in the economy that appeared in 2005 did not have a significant impact on the level of the interest margin. Although interest rates rose at that time, the interest on deposits increased less than the interest on loans, therefore the interest margin remained at 3.3%. In 2007, the interest income increased compared to previous periods, it was a year with the highest values of the interest margin.

As a result of unfavourable events in the global financial market and the global decline in trust in the banking sector, coupled with the increased cost of raising money in the market, the net interest margin in 2009 experienced the largest drop in the analyzed period. It decreased by 18.75% compared to the previous year. The most significant impact on the decreasing interest margin was

the prolonged lowering of interest rates, a stable and low inflation rate, and the pursuit of reducing costs. (NBP, n.d.) Additionally, due to the increased costs of raising market funds and a decrease in its availability, the competition for deposits from non-financial entities in the domestic market increased. This led to an increase in their interest rates during the analyzed period. This situation resulted in a reduction in the net interest margin achieved and an increase in banks' credit margins, which was further exacerbated by the risk arising from the collapse in financial markets. This significantly limited banks' inclination to increase credit activity, which could have had an adverse effect on economic growth in the country.

The interest margin in Poland shows significant changes in individual years, with clear peaks in 2002 and 2017. In recent years, there has been a downward trend.

In Hungary, the interest margin has been generally decreasing since 2002, with several increases and decreases in specific years.

Slovakia shows fairly stable values of the interest margin over the years, except for a clear peak in 2002.

The interest margin in the Czech Republic also shows variability, with the highest point in 2021.

A stable and high net interest margin can increase a bank's ability to absorb losses and cope with adverse market conditions, contributing to the stability of the banking system. (Morishima, 1957)The net interest margin can also be an indicator of credit risk. Banks with a lower net interest margin may be more inclined to take on higher risk in search of higher profits, which can threaten the stability of the banking system. (C. A. E. Goodhart et al., 2012)

Stable and high net interest margins can enable banks to generate profits that can then be reinvested to increase equity, which also contributes to financial stability. (Paluszak, 2001)

The net interest margin plays a crucial role in the financial stability of the banking system. Both too low and too high a net interest margin can pose a threat to stability, so it is important for banks to manage their net interest margins in a balanced manner. (El-Erian, 2016)

It is acknowledged that while bank branches have been largely supplanted by electronic banking over time, they remain a subject of study. Given the scope of this research, which spans over 20 years, it was essential to include an examination of traditional bank branches. This inclusion ensures a comprehensive understanding of the banking sector's evolution, highlighting the transition from physical to digital banking solutions and its impact on both customers and banking practices.

The number of bank branches in a country can have a significant impact on the competitiveness of the banking system and its stability. The relationship between the number of bank branches and

competitiveness and stability of the banking system is complex and depends on many factors, including regulations, the economic condition of the country, consumer behavior, and the business strategies of banks. The right balance between increasing competitiveness and ensuring stability is crucial for the safe development of the banking sector. (Dunning Macleod, 2022b)

A greater number of bank branches can lead to increased competition in the market, which in turn can lead to better conditions for consumers, lower fees, and more innovative financial products. (Conrad, 2022) The distribution of bank branches can improve the availability of banking services, especially in less developed regions, which can contribute to economic development. On one hand, increased competition can lead to lower margins and increased risk (e.g., through excessive lending). On the other hand, it can also lead to efficiency and innovation, which can strengthen the stability of the financial system. (Denham, 2022)
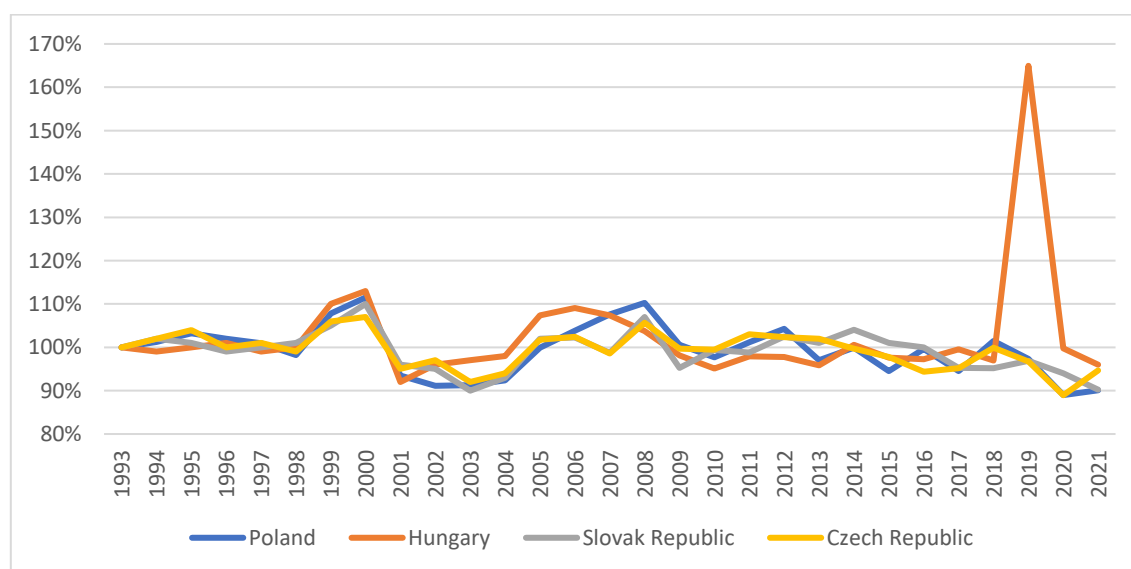
Chart 24 Dynamics of the Bank Branches in Central European countries from 1993 to 2021
Source: own elaboration based on Fred, 2023 and Trading Economics, 2023

Based on the below illustrations, it can be concluded that there is a fairly obvious relationship between the economic situation and the number of operating bank branches in the banking sector in Central European countries.

In the early 1990s, an increase in the number of operating bank branches was observed. This was associated with intensive changes in the banking sector bringing more favorable development prospects and improving economic conditions. The economic downturn in 1996 led to a decrease in competition in the sector, impacting the reduction in the number of operating branches. Subsequent years, in which the economic situation stabilized, brought a very dynamic increase in the number of branches.

166
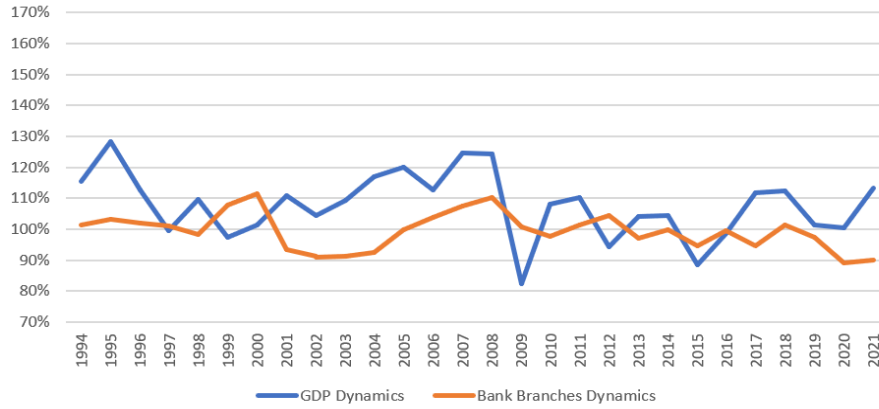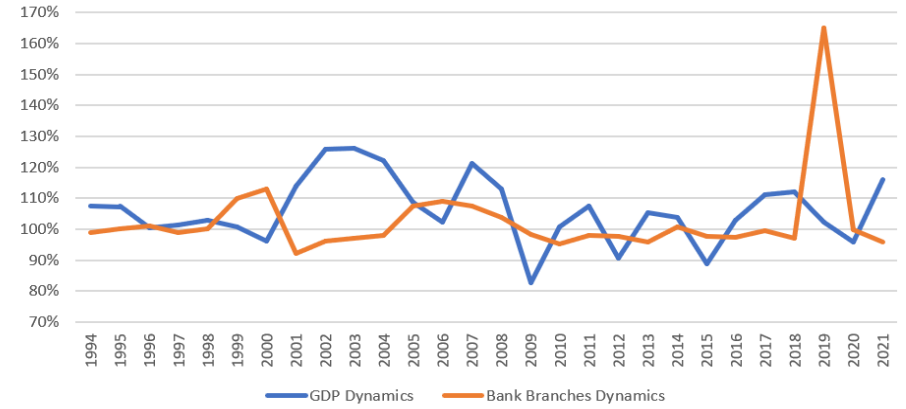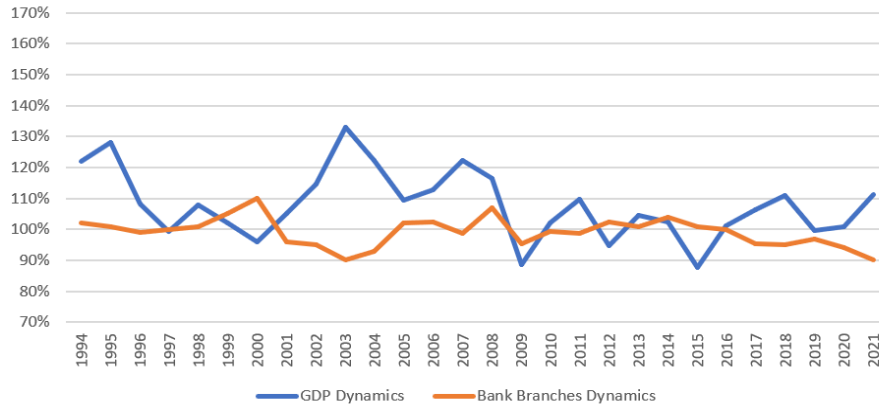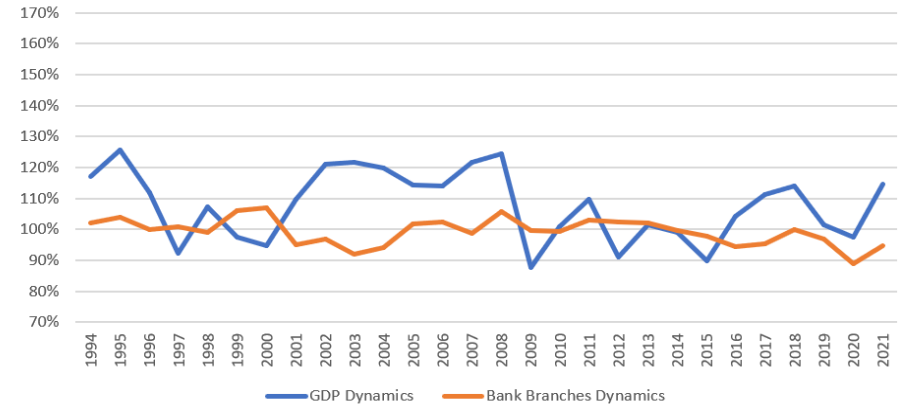
Chart 25 Dynamics of Bank Branches and Economic Conditions in Central European Countries from 1993 to 2021

Source: Own elaboration based on table 17 and chart 24

This situation was undoubtedly related to the very dynamic development of the banking sector, increasing capital resources due to the appearance of strategic investors, and dynamic technical and information progress. A serious economic downturn in 2001-2002 resulted in a weakening of the trend to increase competition in the sector. At that time, a significant decline in the dynamics of the number of bank branches is noticeable.

The increase in the number of bank branches after 2005 is undoubtedly related to new opportunities arising in connection with the entry of Central European countries into the European Union. Despite the unfavorable economic prospects, increased access to the domestic financial market influenced its attractiveness, causing an increase in competition in the sector. Therefore, the opening of new branches by foreign banks also influenced the increase in competition in the sector. This trend continued until 2008, when, due to unfavorable economic prospects, many branches were closed, leading to a 10.77% decrease in the number of branches. Since then, there have been fluctuations with a downward trend. The maximum dynamics of bank branches in Poland: 111% (2000), the minimum: 89% (2020).

In Hungary, similar to Poland, the biggest drop in GDP dynamics occurs in 2009. Fluctuations in the dynamics of bank branches with a noticeable decrease in 1999-2000, and then a generally stable situation with a downward trend after 2018. The maximum dynamics of bank branches in Hungary: 165% (2019), while the minimum: 92% (2001).

The Slovak Republic also experienced the largest drop in GDP in 2009. The dynamics of bank branches are characterized by an overall growth trend until 2000, followed by fluctuations with a downward trend. The maximum dynamics of bank branches in Slovakia: 110% (2000) and the minimum: 90% (2003).

The Czech Republic, like other countries, is characterized by a stable increase in GDP except for a drop in 2009. The dynamics of bank branches also show fluctuations with a downward trend, especially after 2008. The maximum dynamics of bank branches in the Czech Republic: 107% (2000), while the minimum: 89% (2020).

As can be seen, the financial crisis in 2009 had a significant impact on the dynamics of GDP in all countries, but the impact on the dynamics of bank branches was less clear-cut. The downward trend in the number of bank branches can be attributed to several causes, including technological development, changes in customer preferences, and cost optimization. The growing popularity of online and mobile banking can lead to a reduced need to maintain a number of physical bank branches. Clients are starting to prefer fast and convenient online services instead of visiting branches. Banks are closing branches to reduce costs and increase efficiency. However, this can affect the availability of banking services, especially in less urbanized areas, and lead to job reductions in the banking sector.

Each Central European country shows unique features in its data, suggesting that local economic and regulatory factors may play an important role.

Therefore, it can be seen that competition in the sector is significantly dependent on current economic trends and prospects for activities related to breakthrough events in the financial services market. Thus, the creation of bank branches that deal with diversified activities and serve various customer segments is a necessary and costly investment that increases competitive ability in changing market conditions. Appropriately diversified activities have a definite positive impact on achieving expected results in banking activities, and on the other hand, appropriately shape the size of the bank's assets, even during unfavourable changes in financial markets. (Iwanicz - Drozdowska, 2015)

In conclusion, in the context of ever-increasing competition in the financial services market and the increasingly common phenomenon of banks being displaced from the role of traditional financial intermediaries, the most important element of the competition strategy becomes efficiency, the size of the bank and the number of its branches, and its ability to adapt to changing external conditions. Also important, from the point of view of competitiveness, is the ability to acquire and retain customers. Furthermore, in order to mitigate the effects of decreasing bank margins due to increased competition in the sector, banks should focus on formulating new development strategies to increase operational efficiency and shape the optimal structure for assets and liabilities, also through expanded product offerings and the use of new distribution channels. (Solarz, 1996)

As a result of the volatility analysis, standard deviations were calculated, presented in Table 26.

Table 26 Coefficient of variation for the dynamics of GDP and bank branches in Central European countries from 1993 to 2021

Indicator	Poland	Hungary	Slovakia	Czech Republic
GDP Dynamics	9,80%	9,90%	10,30%	10,40%
Bank branches dynamics	6,00%	12,90%	4,80%	4,40%

Source: own elaboration based on data above

Based on the analysis of variability, the following conclusions can be drawn:

- The relatively low variability of Poland's GDP may reflect stable economic growth, market maturity, and effective macroeconomic policy; the low variability in the number of bank branches suggests a gradual adaptation of the sector to new market and technological conditions.

- In Hungary, as in Poland, the relatively low variability of GDP might be the result of stable macroeconomic and political conditions; the high level of standard deviation could reflect

169

dynamic changes in the banking sector, associated with regulatory changes, market consolidation, or faster adoption of digital technologies.

- The slightly higher variability of GDP in Slovakia, compared to Poland and Hungary, might stem from the smaller size of the economy and a greater dependence on specific sectors, such as automotive; the low level of standard deviation indicates a stable and gradual development of the banking sector, possibly less susceptible to rapid technological and market changes.

- In the Czech Republic, similar to Slovakia, the slightly higher variability of GDP could be related to the smaller economy and greater dependency on certain economic sectors; very low variability in the banking sector suggests stability and gradual adaptation to new conditions, such as digitization.

In summary, the low variability of GDP in all four countries indicates general economic stability and effective macroeconomic management. Differences in standard deviations in the banking sector may reflect different rates of adaptation to new technologies, different risk management strategies, and different approaches to regulation.

5. Banking systems of Central European countries and their stability throughout the business cycle

5.1. Impact of economic cycles on the financing structure of the banking sector

The capital structure is perceived as the proportions in which capital from various sources is used to finance current operations. (Kopiński, 2008) There are two basic forms of financing: through the engagement of equity capital created by contributions or shares, and the use of borrowed capital. The shape of the financing structure has a decisive impact on the cost and risk incurred in current operations. Therefore, optimizing the proportions of capital use requires balancing the impact exerted by profitability growth related to increased use of borrowed capital in financing and the increasing risk associated with excessive debt financing. (Kosiński, 1997)

Banks are institutions with a very high share of borrowed capital in financing, which is why their activity is associated with a high level of financial leverage. (Iwanicz - Drozdowska, 2012b) This undoubtedly results from the fact that the essence of these entities' activities is mainly the use of borrowed funds, while equity capital constitutes only a small percentage of liabilities (in opposition to other non-financial entities). For this reason, analyzing the financing structure comes down to using a narrow range of indicators such as the equity capital ratio, the liabilities ratio in the total balance sheet, and the debt or self-financing ratio. (Marcinkowska, 2007)

The most important tasks of equity capital indicated in finance theory are both financing the conducted activity and protection against potential losses. In the case of bank activities, the first of the arguments mentioned above is of marginal significance since the essence of these institutions' activities is based on the skillful use of borrowed capital, mainly in the form of deposits. However, it is also necessary to point out the indirect significance of equity capital, which to a large extent conditions the ability to acquire funds from other entities, which they entrust only when they are convinced that the bank has an appropriate capital base. (Ostalecka, 2009b) In this case, equity capital performs a protective (guarantee) function, highly related to banks' ability to gain trust. However, the issue of the potential to absorb losses is more significant. In such situations, capital is a buffer absorbing unexpected losses and thus providing protection against, among others, the risk of insolvency related to losses incurred in connection with any type of banking risk and economic cycle changes. (Marcinkowska, 2010)

The specificity of banking activities requires that equity capital has the smallest possible share in the total balance sheet, as this guarantees the achievement of positive effects of financial leverage.
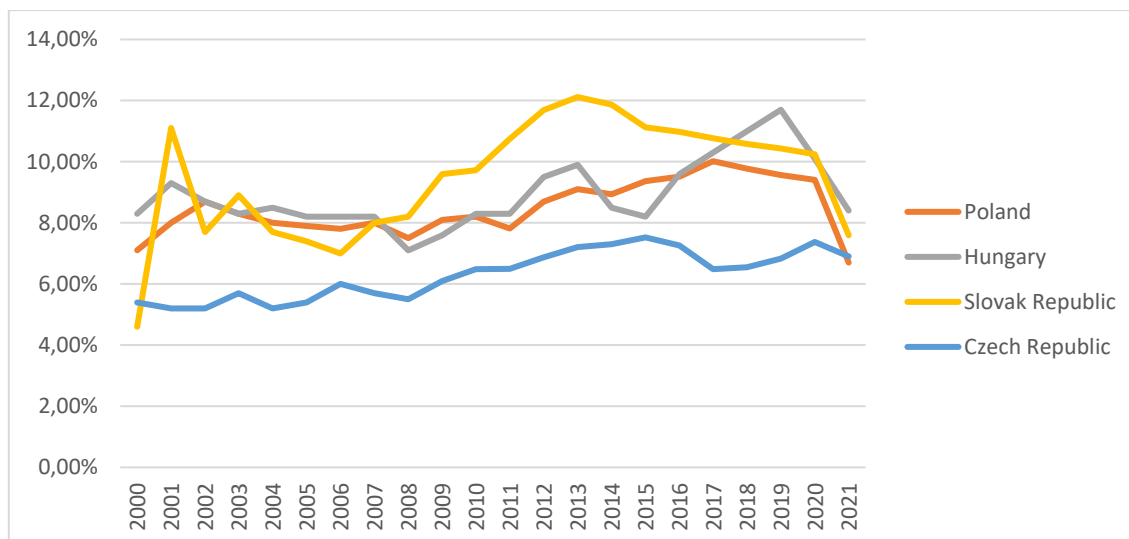
Chart 26 **The ratio of equity capital in the total balance sheet in Central European countries from 2000 to 2021**

Source: Own elaboration based on Fred, 2023, The Global Economy, 2023, Our World In Data, 2023

In Poland in the 1990s, the share of equity in the total balance sheet was very low, but this phenomenon cannot be fully assessed positively, as it was mainly due to banks having a weak capital base. This was undoubtedly a consequence of the difficult financial situation in previous years (due to problems with systemic transformation) that further deteriorated the banks' capital base. Thanks to actions taken by the government aimed at restructuring banks and rehabilitation with the help of foreign capital, the situation began to improve in the following years. At the same time, the ratio of liabilities to total balance sheet was at the highest level in history. This situation significantly increased the risk of operations, even in the face of a favourable economic climate that was shaping up in those years.

The largest increase in the share of equity in the total balance sheet of the Polish banking sector occurred between 2000 and 2003. This phenomenon should not be viewed negatively, as it was associated with a strong tendency to recapitalize banks with foreign capital, which made them more competitive and also more secure in their operations. During this period, the equity share index increased from 7.1% in 2000 to 8.30% in 2003. With the dynamic growth of equity, the share of liabilities in the analyzed period decreased. This situation was also related to banks limiting the degree of financial leverage use in the face of an unfavorably evolving economic climate at that time.

172

GDP dynamics to ratio of equity capita in total balance sheet for Poland from 2000 to 2021
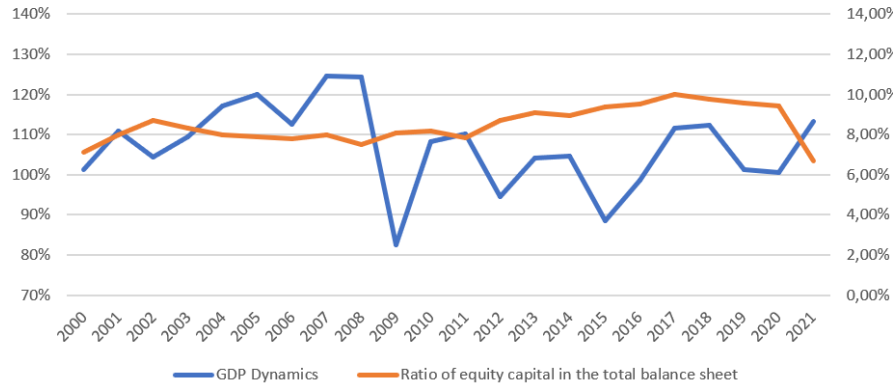
GDP dynamics to ratio of equity capita in total balance sheet for Hungary from 2000 to 2021
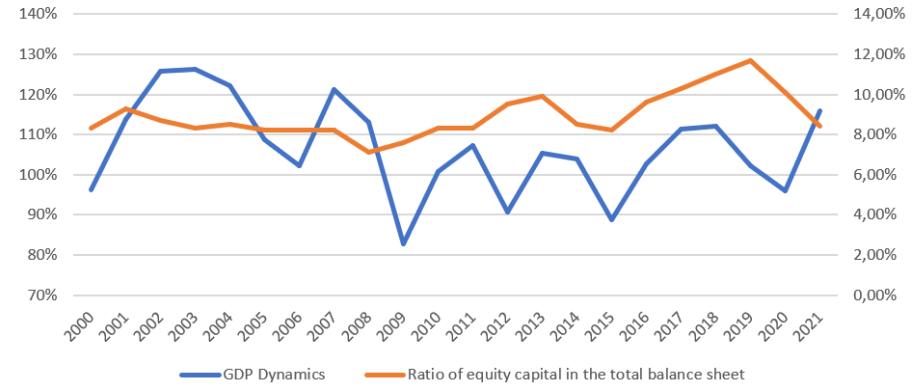
GDP dynamics to ratio of equity capita in total balance sheet for Slovak Republic from 2000 to 2021
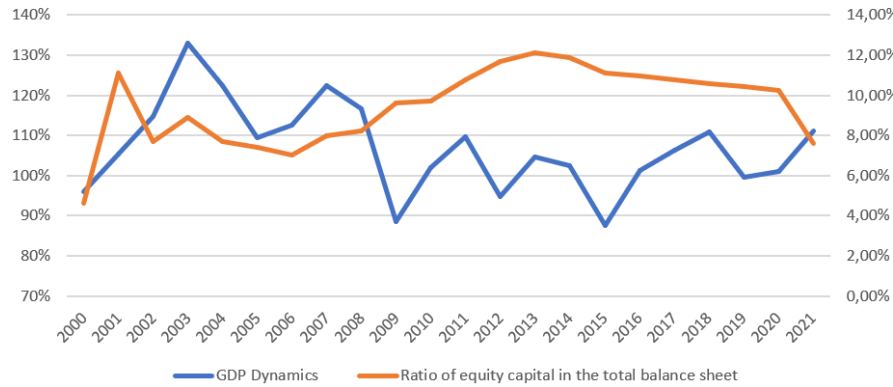
GDP dynamics to ratio of equity capita in total balance sheet for Czech Republic from 2000 to 2021
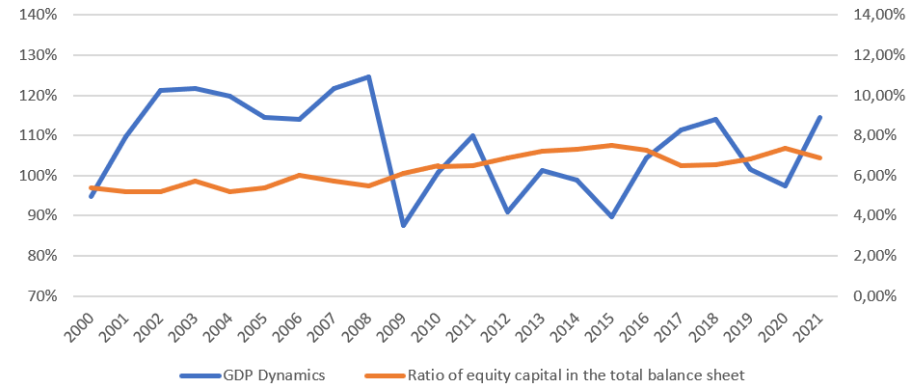
Chart 27 The ratio of equity capital in the total balance sheet in comparison to GDP dynamics in Central European countries from 2000 to 2021

Source: Own elaboration based on table 17 and chart 26
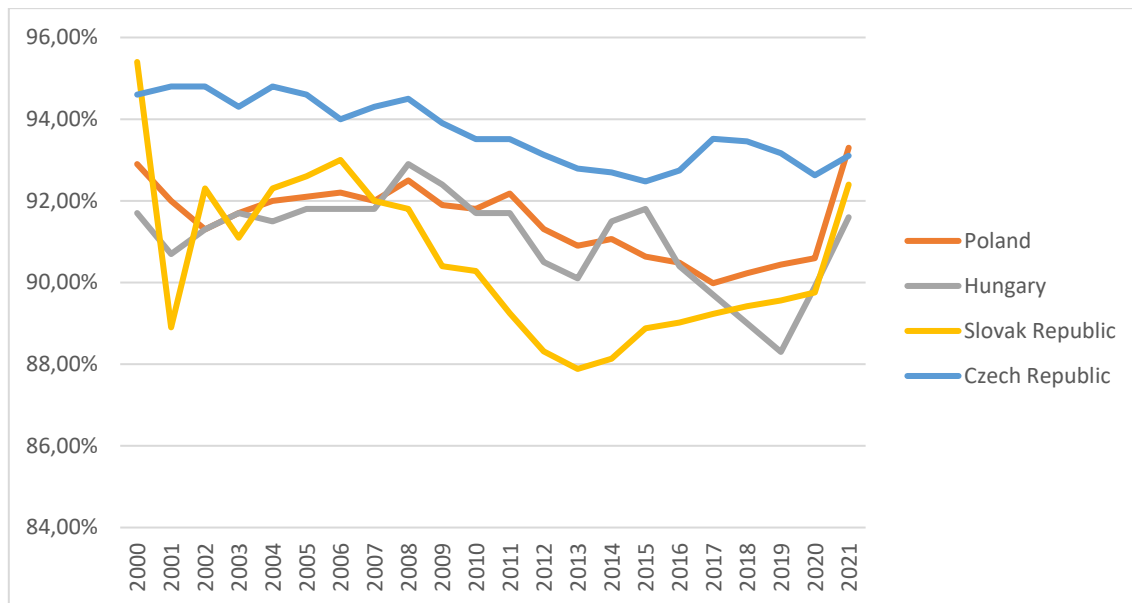
Chart 28 Ratio of liabilities to total balance sheet of the banking system in Central European countries in the years 2000 - 2021

Source : own elaboration based on World Bank, 2023

With the improvement of the macroeconomic situation and the consolidation of positive trends in the economy from 2004 onwards, a very dynamic increase in the share of liabilities in the total balance sheet of banks can be observed. With the emergence of new strategic investors interested in the development of banks, which were increasing their potential in the face of Poland's accession to the European Union, there was also a further increase in equity in the banks' liabilities.

In 2006, there was a change in the shaping of these indicators. At that time, banks tried to reduce the share of equity in the total balance sheet. Utilizing the upward economic trends and thereby increasingly favourable operating conditions, banks aimed to increase the level of leverage to enhance the return on invested capital. Consequently, the ratio of equity to the size of liabilities held by the banking sector began to decrease, and in 2005, it accounted for 7.90% of the total balance sheet. In the following years, with the dynamic development of the economy, this trend continued, so in 2007, this indicator was at 8.00%, and in 2008 it was 7.50%. However, it should be noted that this phenomenon was also significantly determined by a more dynamic increase in liabilities compared to a lower degree of bank recapitalization. Due to a significant improvement in the operating conditions of banks and the economic and financial situation of their clients, a very intense increase in the share of liabilities in the total balance sheet could be observed in this period. In 2005, it reached a level of 92.10%, in 2006 – 92.20%, in 2007 – 92.00%, while in 2008 – 92.50%, reaching one of the highest levels in history.
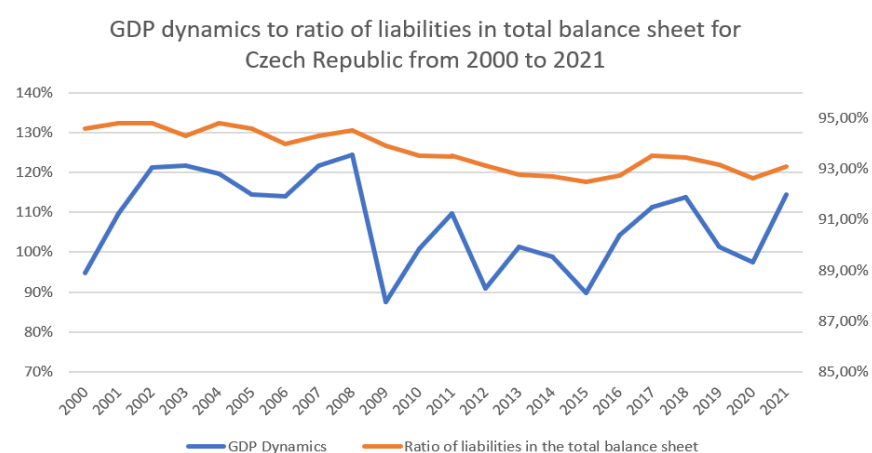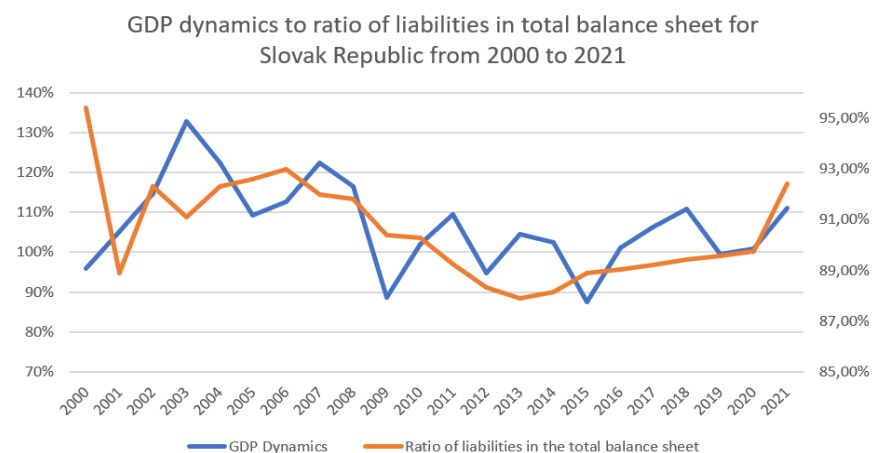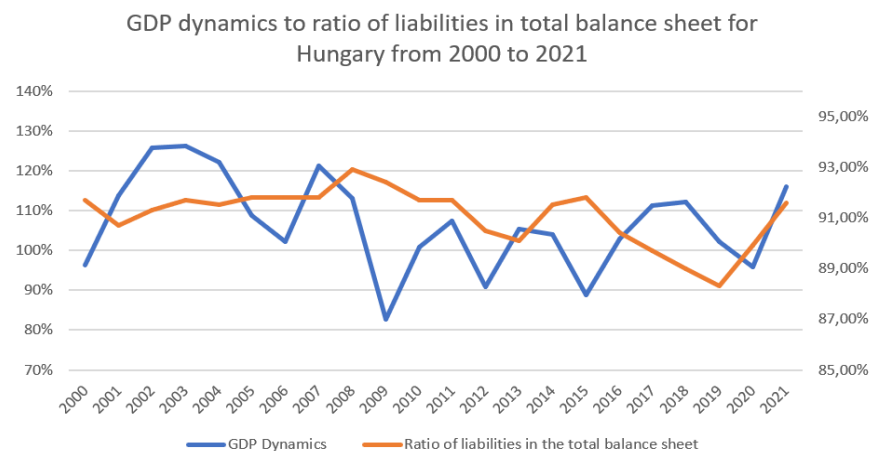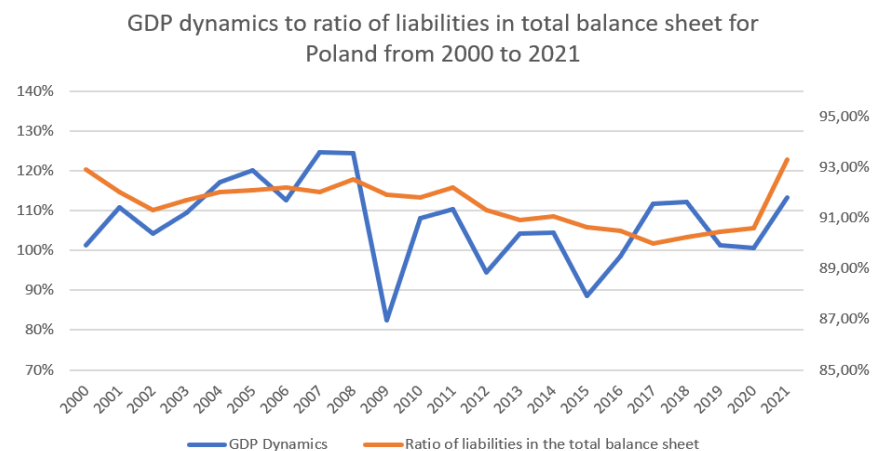
Chart 29 Ratio of liabilities to total balance sheet of the banking system in comparison to GDP dynamics in Central European countries from 2000 to 2021

Source: own elaboration based on table 17 and chart 28

In 2009, when the effects of adverse events in the financial markets began to be fully felt in the economy, the situation for the banking sector changed again. In this period, the ratio of equity to liabilities increased to 8.10%. As a result of the economic slowdown and difficulties appearing in the financial markets, the total balance sheet showed less growth dynamics than before, which had a significant impact on the observed situation. Moreover, in the face of emerging difficulties, banks sought to increase the size of their equity due to its potential to absorb losses from operations on so-called toxic securities and difficult loans. Consequently, banks also reduced the share of liabilities in their liabilities to 91.90%.

In the following year, with unchanged, unfavorable economic development prospects, the share of equity in the total balance sheet increases, while the share of liabilities in the bank's liabilities decreases. This is associated with a more intense search for capital and a conscious reduction in the degree of financial leverage in the face of a deteriorating environment.

In the subsequent years in Poland, the equity ratio remained at a relatively stable level with an upward trend until 2017, followed by a decline in 2021. The stable equity ratio for most of the analyzed period indicates the banking sector's consistent ability to manage risk and maintain financial stability. The slight correlation with GDP dynamics suggests that the stability of the banking system was independent of cyclical changes in the economy, which is a positive sign for the country's financial stability.

Analyzing the causes and effects of changes in the equity to total balance sheet ratio in the Hungarian banking system between 2000-2021, several trends and possible influencing factors can be identified. From 2000-2003, this ratio remained at a relatively stable level of about 8-9%. This could indicate a period of stabilization in the banking system after the systemic transformations of the 90s and the introduction of reforms that increased banks' capital. The stability of the ratio between 2004-2006 could result from the favorable economic situation in Europe, increased investor confidence, and credit expansion, positively affecting the growth of bank assets financed with equity.

The decrease in the ratio in 2008, though not as significant as in other countries, could be a result of the onset of the global financial crisis and the associated need to increase loan loss provisions in the Hungarian banking sector.

From 2009-2011, the ratio again increases, which may indicate relatively good risk management in the banking system and measures taken to increase banks' equity in response to the financial crisis. The strong growth of the ratio between 2012-2014 suggests the continuation of actions aimed at strengthening banks' equity in response to new regulatory requirements (e.g., Basel III), which introduced more stringent capital requirements. Between 2015-2016, this ratio increases again, reflecting the improved economic situation, higher profitability of banks, and the continuation of

the trend of increasing equity. The stabilization of the ratio between 2017-2019 at about 10-11% indicates the ongoing good condition of the banking sector and effective actions aimed at strengthening its stability.

In contrast, the decline in the ratio in 2020 is likely due to the global COVID-19 pandemic, which led to an increase in risk costs and the need for greater loan loss provisions.

In 2021, there is a slight increase in the ratio, suggesting that the banking system began to gradually recover from the pandemic losses thanks to the economic revival and state interventions supporting the banking sector. The negative correlation with GDP may indicate that the banking system strengthened its equity during times of economic uncertainty, which could be seen as a precaution against potential turmoil.

The equity to total balance sheet ratio of the Slovak banking system starts from a low level in 2000 and shows significant growth, which may result from the restructuring of the banking sector after the economic transformation. Joining the European Union in 2004 increased the confidence of domestic investors and influenced the growth of equity in the banking sector. The stable growth of this ratio from 2005 to 2007 indicates the mature development of the banking sector and favorable economic conditions that allowed for the growth of banks' equity.

The decline in 2008 aligns with the global trend caused by the financial crisis. Banks in Slovakia, like in other countries, had to increase reserves for potential borrower insolvency, which reduced the equity ratio.

The noticeable increase in the ratio from 2009 to 2013 reflects the response to the financial crisis – both in terms of tightening prudential regulations and banks' actions aimed at strengthening equity. From 2014 to 2016, the ratio remains at a relatively stable level, resulting from consolidation in the banking sector and maintaining healthy equity to balance sheet total proportions. The increase in the ratio from 2017 to 2019 is associated with the continuation of stable economic growth, good financial results of banks, and further strengthening of capital in preparation for the full implementation of Basel III regulations.

The decline in the ratio in 2020 is likely related to the COVID-19 pandemic, which caused an increase in credit risk and the need to increase loan loss provisions, negatively affecting the amount of equity.

A slight increase in the equity to total balance sheet ratio of the banking system in 2021 indicates the beginning of recovery from the crisis caused by the pandemic and the strengthening of the banking sector thanks to the improvement in the economic situation and support from the government and the National Bank of Slovakia. The banking sector in Slovakia showed an increase in the equity share ratio in the total balance sheet, especially until 2013, indicating the sector's

growing resilience to external shocks. The moderate positive correlation with GDP dynamics may mean that Slovak banks were able to support economic growth through active lending during periods of prosperity.

Analyzing the equity to total balance sheet ratio of the Czech banking system from 2000-2021, various trends can be observed, and attempts can be made to link them to specific economic and regulatory events.

At the beginning of the period (2000-2003), the ratio is relatively low, which may reflect the situation after the economic transformation, where the banking sector was in a phase of stabilization and modernization. The introduction of Western banking standards could influence actions related to increasing equity. The years 2004-2007, before the financial crisis, are characterized by a slight increase in the ratio. The Czech Republic's entry into the European Union in 2004 contributed to increased stability and confidence in the banking system, resulting in an increase in banks' equity.

The noticeable decrease in the ratio in 2008 can be directly related to the global financial crisis, which forced banks to increase reserves for potential losses, lowering the equity ratio.

The stable increase in these years 2009-2013 suggests that Czech banks could effectively manage their balance sheets after the crisis, likely due to strict banking regulations and increasing capital reserves in response to new European regulations, such as Basel III. From 2014-2016, the equity to total balance sheet ratio in the banking system remains at a stable level, indicating the maturity and stability of the Czech banking system and effective market regulation. The increase in the ratio from 2017-2019 may reflect the continuation of positive trends in the Czech economy, profitability growth of the banking sector, and the result of cautious credit policy and good economic situation.

The decline in the ratio in 2020 indicates the impact of the COVID-19 pandemic, which caused significant disruptions in the economy, increased uncertainty levels, and forced banks to create additional reserves for loan losses.

In 2021, there was a slight rebound in the ratio, which may signal the beginning of the banking system's recovery after the pandemic, supported by monetary and fiscal policy, as well as gradual economic revival. The Czech banking sector maintained a lower equity ratio than the other countries. Similar to Slovakia, the moderate positive correlation with GDP dynamics indicates that the banking sector could contribute to economic growth while maintaining an adequate level of capital to avoid instability.

In Poland, the average equity share ratio in the total balance sheet was 8.48%, in Hungary 8.92%, Slovakia had a ratio of 9.46%, and the Czech Republic 6.30%. The analysis indicates that Slovakia has the highest average equity share ratio in the total balance sheet, suggesting a relatively greater

resilience of the banking sector to potential losses. The Czech Republic, on the other hand, has the lowest average value of this ratio, which may suggest less capital buffer of banks against banking risk.

The liability to total balance sheet ratio in the banking system is a measure that shows what percentage of a bank's total assets are liabilities. A higher proportion of liabilities in assets may indicate that a bank is financed to a greater extent from external sources, such as deposits or loans, and to a lesser extent from equity. This ratio can also provide some indications of a bank's liquidity, i.e., the ability to cover short-term liabilities. A bank with high liabilities may be more exposed to liquidity risk if deposits are massively withdrawn. Banks with a larger share of liabilities may be riskier, as liabilities typically have to be settled at specific times, which can create financial risk if the bank's assets (e.g., loans) are not repaid on time. A higher liabilities ratio may also indicate a business model based on greater use of financial leverage, which can lead to higher profitability but also higher risk.

In all four Central European countries, the liability ratio in the total balance sheet remains at a relatively stable level, with minor fluctuations year-to-year. The liability share ratio in Poland started at a high level in 2000 (92.90%) and remained relatively constant with a slight downward trend until 2021 (93.30%), reflecting the global financial crisis followed by a rebound.

Analyzing the liability to total balance sheet ratio of the Polish banking system from 2000-2021, we can observe a high and stable level of the ratio from 2000-2008, preceding the financial crisis. This could indicate strong economic growth in Poland and an increasing tendency to take out loans in both the household sector and among businesses. This stability may also suggest a healthy financing structure of banks, where most liabilities were deposits.

The relatively minor impact of the global financial crisis on Poland is evident from only a slight decrease in the ratio in 2009. This could indicate the good condition of the Polish banking system and effective regulatory actions during this period. Poland's economy, as one of the few in Europe, maintained economic growth, which could have influenced banks' lesser reliance on liabilities relative to assets.

The ratio begins to gently decline after the crisis in 2010-2014, which may indicate increased caution among banks in lending, improvements in the quality of the loan portfolio, and possible increases in the quality of banks' equity. The introduction of Basel III regulations in Europe required banks to maintain higher quality capital, which would have affected the ratio.

From 2015, the ratio begins to stabilize with a tendency to slightly increase. This period was a time of good economic growth in Poland, which could translate into greater lending activity by banks

and associated liabilities. Economic growth led to increased investment and consumption, which, in turn, could encourage households and businesses to make more use of banking products.

The increase in the ratio in 2021 was directly related to the COVID-19 pandemic and the associated crisis. Banks increased their level of liabilities to finance aid and stimulus actions for the economy. Government aid programs and the central bank's credit actions could have influenced the increase in the ratio during these years.

Decisions by the National Bank of Poland regarding interest rates had a direct impact on the level of banks' liabilities. New regulations and financial supervision could affect the structure of bank balance sheets, especially in the context of capital and liquidity requirements. Changes in credit preferences and capabilities, an increase in savings, and investments also affected the level of bank liabilities. In Hungary, the liability share ratio also started high in 2000 (91.70%), with minor fluctuations in the following years but generally showing a downward trend, reaching 91.60% in 2021.

The liability share ratio in the Slovak Republic was the highest in 2000 (95.40%) and showed some declines, reaching 92.40% in 2021, which may indicate specific economic circumstances or reforms.

In the Czech Republic, the liability share ratio started at 94.60% in 2000 and remained relatively stable with a slight upward trend to 93.10% in 2021.

The liability to total balance sheet ratio in the banking system indicates what percentage of bank assets are liabilities, which is an important indicator of liquidity, risk, and the capital structure of banks. This ratio generally decreased in the first few years of this period and then remained at a relatively stable level with some fluctuations. Changes in interest rates, inflation levels, and tax policy could influence saving and lending behaviors, which directly affects the balance sheet structure of banks. The introduction of new regulations related to capital and liquidity, such as the Basel III requirements, forced banks to change the structure of their balance sheets.

The liability to total balance sheet ratio in the Hungarian banking system shows what percentage of bank assets are liabilities, an important indicator of liquidity, risk, and the capital structure of banks. Until 2007, the liability to total balance sheet ratio in the banking system was quite stable with a tendency to slightly decrease. Financial stability before the financial crisis and relative caution in credit expansion could have contributed to this stability. Changes in interest rates, inflation levels, and tax policy could influence saving and lending behaviors, which directly affects the balance sheet structure of banks. Hungary's accession to the European Union in 2004 increased investor confidence, stabilizing the banking sector.

In 2008, we observe an increase in the ratio, which is characteristic of the crisis period where banks increase liabilities to ensure liquidity and respond to increased credit risk. A potentially increased amount of bad debt could have increased liabilities on banks' balance sheets.

In the post-crisis period (2010-2014), we see a trend of stabilization and a gentle decrease in the ratio, which may reflect the rebuilding of confidence in the banking system and improvement in the quality of the loan portfolio. Hungarian banks strengthened their capital positions, which led to a slight reduction in the share of liabilities.

From 2015-2018, we observe a further decrease in the ratio, indicating the implementation of structural reforms in the banking sector. Debt problems in other European countries could have affected the Hungarian banking system, especially through international credit and investment connections. Reforms and changes in legal regulations aimed to strengthen bank capital and limit risk.

At the end of the analyzed period, especially in 2021, an increase in the ratio is visible, which may be a result of the monetary policy response to the COVID-19 pandemic, where central banks worldwide implemented stimulus programs, increasing liquidity in the financial system. Analyzing the liability to total balance sheet ratio of the Slovak banking system from 2000-2021, we can see a high initial level of the ratio in 2000 (95.40%), which could result from the economic transformation phase after the dissolution of Czechoslovakia and changes in the banking system adapting to new market and regulatory realities. Simultaneously, accession to the European Union in 2004 contributed to increased investor confidence and the stabilization of the financial sector.

A decrease in the ratio in the years following EU accession suggests greater caution regarding liabilities and perhaps better quality of banks' loan portfolios. During the financial crisis in 2008, the ratio dropped to 91.80%, which may indicate that Slovak banks were relatively less exposed to the direct effects of the crisis compared to other countries and simultaneously applied effective remedial measures.

The stabilization of the ratio at about 90% after the crisis could have been the result of both government and central bank policies and the banking sector's self-regulation, striving to strengthen capital positions and reduce dependence on external financing sources. From 2015, the ratio began to gradually increase, which may indicate increased lending during improved economic conditions, resulting in an increase in liabilities. The increase in the ratio in 2021 (to 92.40%) can be associated with the COVID-19 pandemic, where banks may have increased liabilities to ensure greater liquidity and support for the economy. Fluctuations in the prices of goods that Slovakia exports influenced changes in the demand for credit domestically and abroad. The dynamics of the real estate sector in Slovakia could affect the level of banks' liabilities through mortgage loans, impacting the structure of banks' balance sheets.

The liability to total balance sheet ratio of the Czech banking system shows what portion of banks' balance sheets are liabilities relative to their assets. At the beginning of the 21st century, this ratio remained at a high level, indicating stable growth of the banking sector and a large amount of deposits relative to bank assets. The Czech banking system, after transitioning from a planned economy, became more stable and attracted both domestic and foreign deposits.

The stability of the ratio in the pre-crisis period (2005-2008) indicates continued economic growth and a certain balance between liabilities and bank assets. The growing economy and good growth prospects could encourage increased lending activity while maintaining a healthy ratio of deposits to loans. During the financial crisis in 2008, the ratio remained relatively stable, suggesting that Czech banks were less exposed to the crisis and simultaneously applied effective risk management strategies. This stability might also result from a conservative approach to balance sheet management and a less aggressive lending policy compared to other countries.

The ratio remained stable in the post-crisis period (2010-2013), indicating effective remedial actions in the banking system and a moderate lending policy. The introduction of financial regulations across Europe, including new capital requirements, contributed to strengthening banks' balance sheets. Minor fluctuations in the ratio from 2014-2019 could reflect normal economic variances and changes in borrowing behaviors of both firms and households.

The COVID-19 pandemic also impacted the level of this ratio. Its slight decrease in 2020 might result from increased demand for loans from businesses and households in the face of the pandemic. The year 2021 shows a slight increase in the ratio, suggesting that banks increased the level of liabilities to support the economy by mitigating the effects of the pandemic, e.g., through loan programs for businesses.

The Czech Republic was seen as a country with a relatively stable macroeconomic situation, which could favor the ratio's stability. Actions by the Czech National Bank regarding monetary policy, interest rates, and other tools had a direct impact on the banking sector. The introduction and adherence to new banking regulations could also influence banks' liabilities and assets.

It can be observed that there is no clear correlation between the liability ratio and GDP dynamics. For example, despite GDP growth in some years, the liability ratio could slightly decrease or vice versa. This situation is typical because the liability ratio reflects the level of bank debt relative to their assets, and GDP dynamics measure overall economic growth, which may not be directly related. Bank debt can result from many other factors, such as credit policy, banking regulations, or changes in the economy, which are not always synchronous with GDP changes.

The banking systems of all four Central European countries generally maintained a stable level of equity share in the total balance sheet, which is a good sign for financial stability. However, each

country shows different tendencies, which may result from various banking policies, regulations, and the overall economic condition. It's worth noting that the stability of the banking sector is not merely a function of economic growth but also a result of conscious regulatory policy and risk management in banks.

In summary, the amount of equity itself, its share in the total balance sheet, and the share of liabilities in the banks' liabilities do not have a straightforward impact on assessing the efficiency and stability of bank operations. However, they provide valuable information by referring to the scale and type of risk undertaken, also in relation to the current economic climate. (Kokoszczyński, 2004)

The analysis of financing structure should also consider the self-financing ratio and indebtedness of the banking sector. (Marcinkowska, 2007)

The self-financing and debt ratio in the banking system shows the banks' ability to finance their operations from their own funds and the level of their dependence on external financing sources. The assessment of the self-financing ratio is used to analyze and evaluate banks' policies concerning strengthening capital bases. It indicates the relationship in which the bank is able to meet its obligations from its capital reserves, and its increase strengthens the safety of operations. The self-financing ratio is obtained by comparing equity with total liabilities. (Marcinkowska, 2007)

The shaping of the self-financing ratio is presented in the charts below.
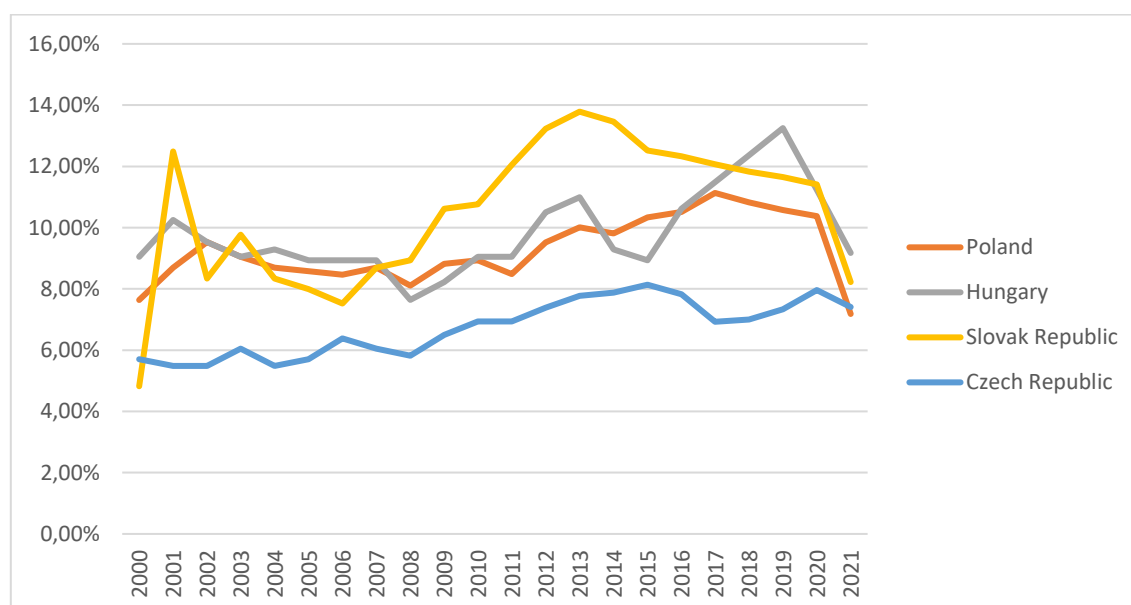
Chart 30 Self-financing ratio in Central European countries in 2000 – 2021

Source: own elaboration based on Fred, 2023, Statista, 2023, Trading Economics, 2023, IMF, 2023
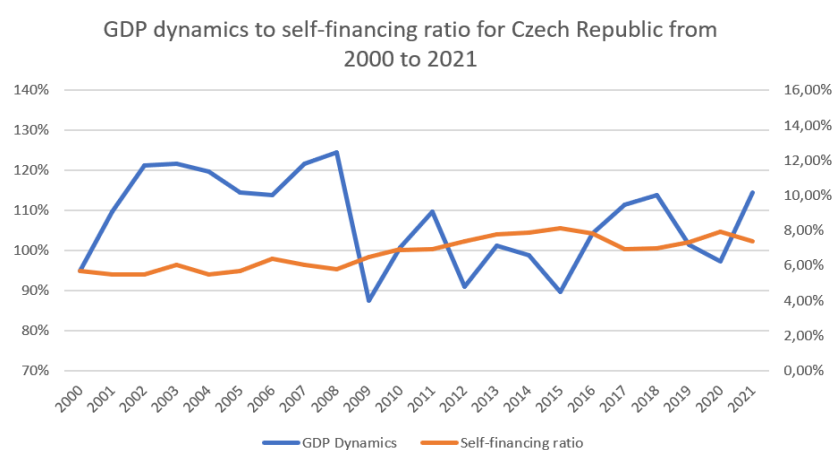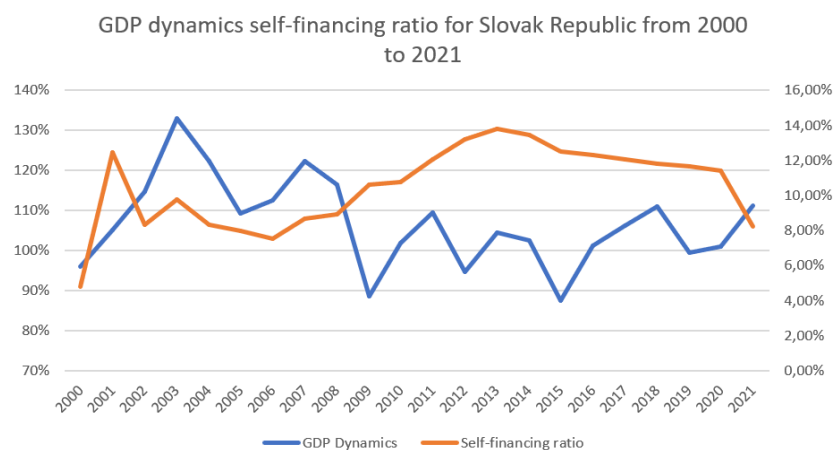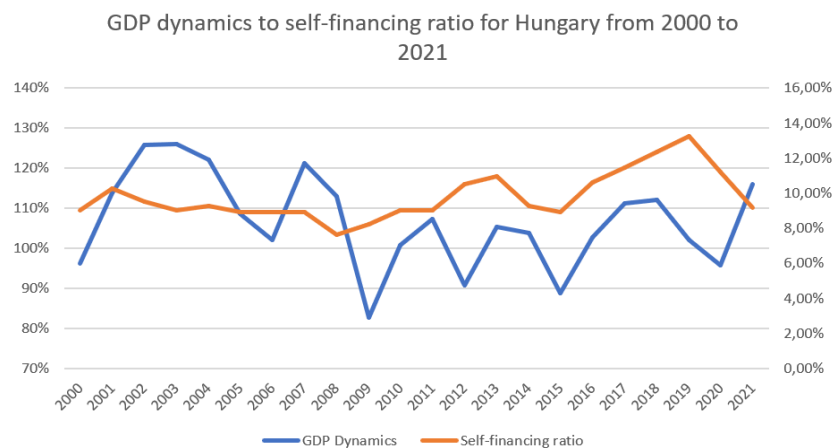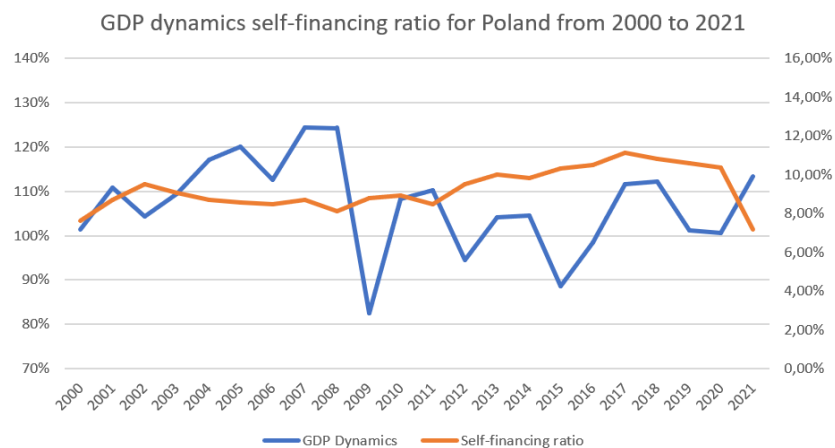
Chart 31 Self-financing ratio in comparison to GDP dynamics in Central European countries in 2000 – 2021

Source: own elaboration based on table 17 and chart 30

Another typical measure used in the analysis of financing structure is the debt ratio. This is the ratio of external capital to equity, indicating the multiple of external capital. (Marcinkowska, 2007)The debt ratio shows how large the share of debt is in financing the bank's assets.

The development of the debt ratio is presented in the charts below.
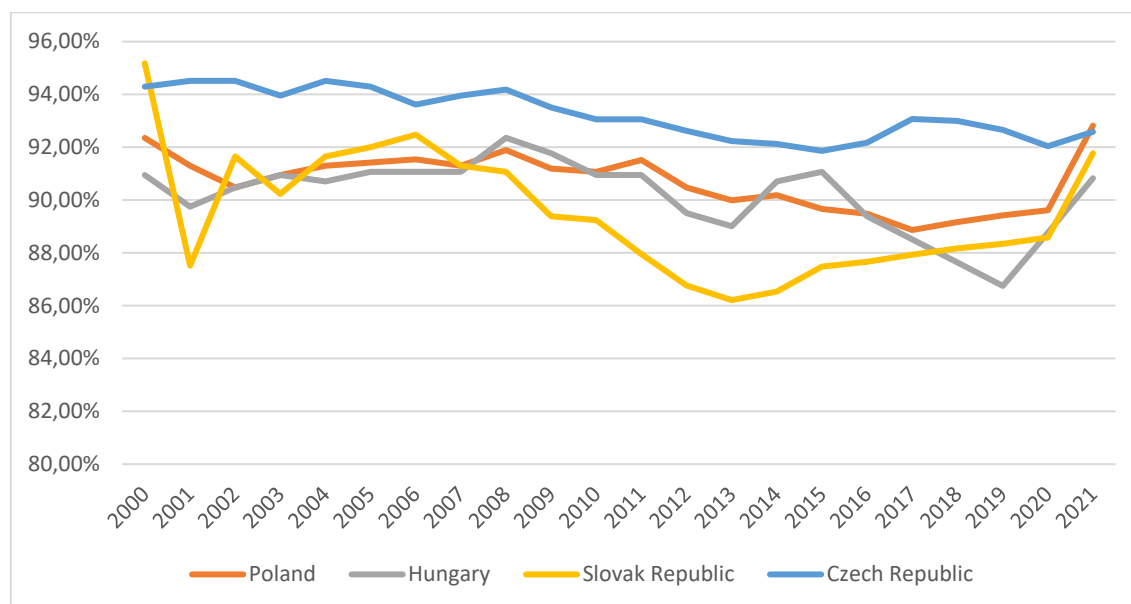
Chart 32 The development of the debt ratio in Central European countries in 2000 – 2021

Source: own elaboration based on Fred, 2023, Trading Economics, 2023 and Global Economy, 2023

In the mid-90s, the self-financing ratio's growth was characterized by significant dynamism, undoubtedly related to the restructuring of banks after a turbulent period of systemic transformation. Additionally, these changes were favored by a good economic climate, which, with higher demand for banking services, guaranteed profit generation by the sector. Changes in the economy that took place in the Polish banking sector after the capital transformation period made the banking sector more attractive, thereby attracting investors to recapitalize banks. These trends were also clearly visible in the shaping of the banking sector's debt ratio. High debt in the 90s resulted from the previously mentioned capital weakness of banks and indicated a high risk of their operations. In the following years, there was a gradual reduction of this ratio, which was also associated with an increase in the self-financing ratio. (Dudek, 2008)

This trend halted in 2000 due to unfavorable operating conditions that emerged with the economic slowdown. Then, as a result of the low dynamic increase in equity relative to liabilities, the self-financing ratio decreased to 7.64%, while the overall debt fell to 92.36%, reaching the lowest level in history.
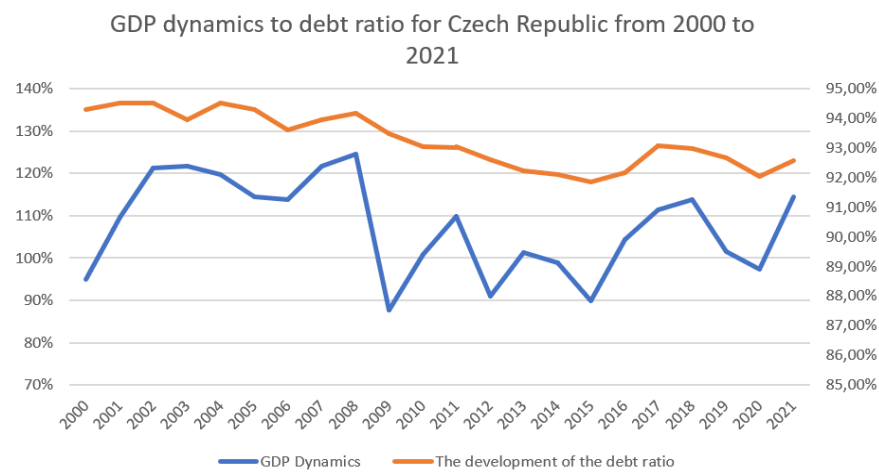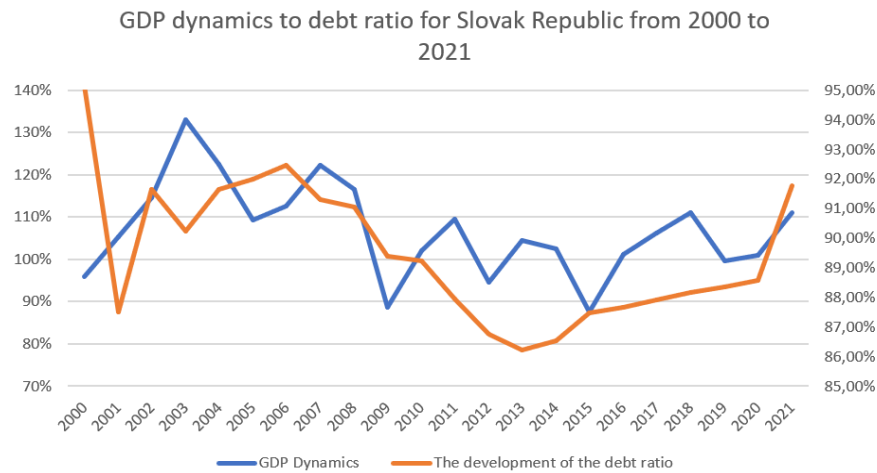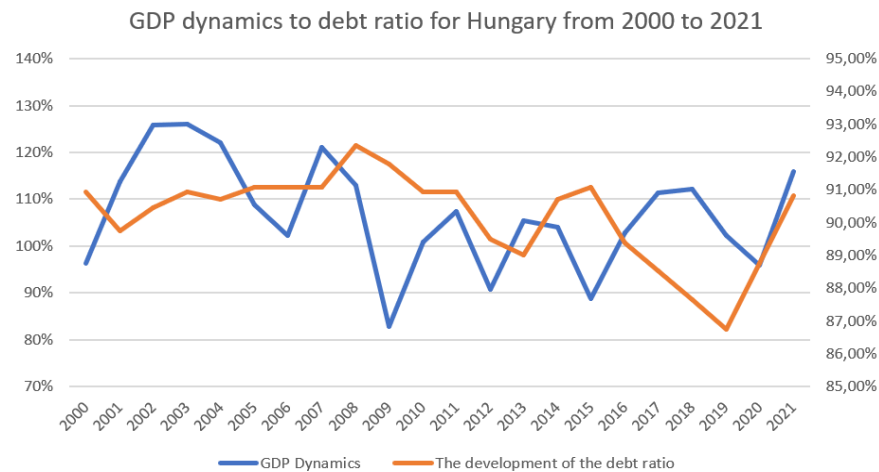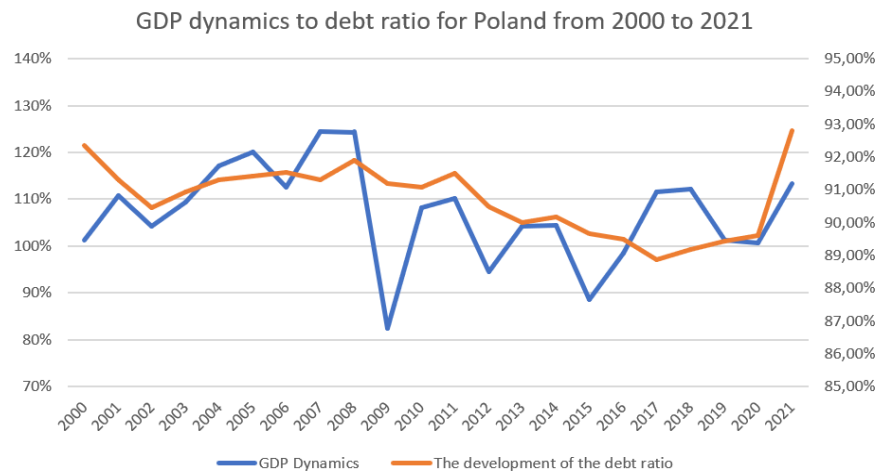
Chart 33 The development of the debt ratio in comparison to GDP dynamics in Central European countries in 2000 – 2021

Source: own elaboration based on table 17 and chart 32

Analyzing the self-financing and debt ratios of the banking system in the context of GDP dynamics allows for assessing the condition of the banking sector in Central European countries over the years 2000-2021. Analyzing these data, one can notice the impact of general economic trends on the financial stability of banks.

The self-financing ratio illustrates the extent to which banks can generate capital from their own activities, instead of relying on external financing sources.

The growth of the self-financing ratio in the Polish banking system in the following years was related to the economic slowdown in 2000 – 2003, which meant that banks were trying to pay more attention to the safety and stability of their functioning. As a result, the self-financing ratio reached its highest level in the analyzed period in 2002 – 9.53%. At the same time, the overall debt ratio continued to show a decreasing trend due to the unfavourable economic situation.

After 2004, favourable changes related to Poland's accession to the European Union and the adoption of Western capital management models led to a decrease in the propensity to use one's assets in current operations, which was reflected by a decrease in the analyzed self-financing ratio. Thanks to expanding the capital base, despite favourable development prospects in a dynamically and favorably changing reality, the debt ratio was characterized by less dynamism than before and amounted to 91.3%.

In 2009, with the emerging effects of the crisis, one can observe that banks were basing their operations more on equity, which guaranteed greater safety. There is an upward trend until 2013, followed by slight fluctuations with a clear decline in 2021. This may suggest that Polish banks during the crisis period (COVID-19 pandemic) were forced to increase external capital acquisition or had lower profits.

The debt ratio also significantly decreases, which is related to the decline in trust in the banking sector due to events in the global financial markets and a lower propensity to save using deposits. In 2009, the debt ratio fell to 91.19% compared to the previous year.

In 2010, banks gradually emerging from the crisis increased their equity, which led to a decrease in the debt ratio, while the self-financing ratio rose to 8.93%, enhancing their stability in the face of still unstable economic conditions.

The downward trend in the ratio until the year may reflect the progressive deleveraging of the banking sector after the financial crisis and the introduction of more stringent capital and regulatory requirements (e.g., Basel III). The subsequent increase in debt from 2018-2021 resulted from the need to ensure liquidity and support the economy during the pandemic. Banks may have increased their debt levels to finance aid programs and counteract the effects of the crisis.

The behavior of both ratios indicates that the banking sector in Poland can adapt to changing macroeconomic and political conditions. Significant events like the 2008 financial crisis and the COVID-19 pandemic had a substantial impact on both banks' self-financing abilities and their level of debt.

The self-financing ratio in Hungary increased from 9.05% in 2000 to 13.25% in 2019, then fell to 9.17% in 2021. The relative stability of the ratio with some fluctuations from 2000-2008 reflects Hungary's integration process with the EU and adaptation to European standards. The 2008 financial crisis, which caused global turmoil, also impacted the Hungarian banking sector, as seen in the ratio's decrease that year.

The progressive increase in the ratio from 2009-2019 may indicate an improvement in banks' profitability, the rebuilding of their equity, and stabilization after the financial crisis. During this period, Hungary also carried out several structural reforms that could have positively impacted the banking sector.

The ratio's decrease in 2020-2021 results from the COVID-19 pandemic and its impact on the economy. The need to create reserves for potential loan losses and reduced revenues due to the economic recession could have led to a decrease in banks' equity.

The debt ratio of Hungarian banks in 2000 was 90.95% and tended to decrease to 86.75% in 2019, then rose to 90.83% in 2021. The stability of the debt ratio from 2000-2008 may indicate the banking sector's ability to maintain an appropriate level of financial leverage, even despite credit expansion before the financial crisis.

The gradual decrease in the debt ratio from 2009-2019 may reflect actions taken by banks to reduce dependence on external financing sources. This could have been caused by the introduction of stricter banking regulations and efforts to strengthen financial stability.

In 2020-2021, similar to the self-financing ratio, the increase in the debt ratio in the last two years may be related to the banks' response to the pandemic, where banks increased external debt to ensure liquidity and economic support.

Changes in both ratios for Hungary can be linked to cyclical changes in the economy, reactions to economic crises, and regulatory policy. The increase in the self-financing ratio and the decrease in debt from 2009-2019 indicate an improvement in the financial stability of the banking sector in Hungary. Conversely, the observed decrease in the self-financing ratio and the increase in debt in 2020-2021 are likely related to the effects of the COVID-19 pandemic, which forced banks to rely more on external financing.

The analysis of self-financing and debt ratios in the Slovak banking system from 2000-2021 sheds light on changes in the way banks finance themselves and their financial condition during this period. The self-financing ratio increased significantly from 4.82% in 2000 to 13.79% in 2013, then stabilized, slightly decreasing to 8.23% in 2021. The early years after the association agreements with the EU came into effect contributed to the inflow of foreign investments and the growth of investor confidence, allowing banks to increase self-financing.

The steady increase in the self-financing ratio from 2005-2013 resulted from the continuation of positive economic trends and effective management in the banking sector. Slovakia's entry into the eurozone in 2009 might also have contributed to increased stability and confidence in the banking sector.

Fluctuations in the ratio from 2014-2021 reflect various economic and regulatory challenges, including the introduction of EU regulations aimed at increasing the stability of the banking system. The decrease in the ratio in 2021 results from the COVID-19 pandemic and its negative impact on the economy.

The debt ratio in 2000 was 95.18% and trended downward to 86.21% in 2013, then stabilized, ending at 91.77% in 2021. The gradual decrease in the debt ratio from 2000-2013 is the result of strengthening equity in the banking sector and reducing dependence on external financing, supported by macroeconomic stabilization and a growing economy.

The stability of the debt ratio from 2014-2021 suggests that banks were able to maintain a healthy balance between own and external financing, even despite potential challenges such as changes in banking regulations or economic uncertainty.

Similarly to other countries, the increase in debt from 2020-2021 is a response to the COVID-19 pandemic, which necessitated greater flexibility in financing to support the economy.

The Slovak banking sector demonstrated the ability to increase self-financing in the early years of the 21st century, likely due to optimistic economic prospects and systemic stabilization. The decrease in the debt ratio indicates an increase in capital strength and independence of banks. Recent years, especially the decrease in the self-financing ratio and the increase in debt, reflect the impact of the pandemic and associated economic uncertainty on the banking sector.

Analyzing the self-financing and debt ratios in the Czech banking system from 2000-2021 helps understand how the banking sector in this country coped with various economic challenges and how its capital structure changed. The self-financing ratio started at 5.71% in 2000 and rose to 7.96% in 2020, then slightly decreased to 7.41% in 2021.

The growth of this ratio from 2000-2003 resulted from stabilization processes after economic transformation and preparations for joining the European Union in 2004, which improved the investment climate and increased confidence in the banking system.

Fluctuations during 2004-2008 may be related to adapting to EU standards after accession and initial reactions to the upcoming global financial crisis in 2008. The increase in the ratio in the post-financial crisis period (2009-2013) reflects the improvement in bank profitability and the stable economic situation in the Czech Republic, which did not feel the effects of the crisis as severely as other countries.

The stability of the ratio from 2014-2021 indicates the good condition of banks and effective risk management, and the slight decrease in 2021 is most likely a result of uncertainty and challenges related to the COVID-19 pandemic. The debt ratio in 2000 was 94.29% and trended downward to 92.04% in 2020, then slightly increased to 92.59% in 2021.

The relatively stable ratio from 2000-2008 indicates moderate credit expansion and control over financial leverage by Czech banks. The decrease in the ratio after the financial crisis from 2009-2013 could result from a conservative lending policy and an increase in equity in response to global financial turbulence.

The stable level of debt from 2014-2021 suggests that banks maintained a cautious approach to risk management and financial leverage, while the slight increase in 2021 may result from actions to support the economy in the face of the pandemic.

The indicators for the Czech Republic suggest a relatively stable and conservative banking sector that managed to maintain a healthy capital structure even in the face of global challenges. The stability of the self-financing ratio may reflect an effective management strategy and the ability to generate profits, while controlled indebtedness indicates a conservative lending policy. Changes in 2021 are likely related to the pandemic and its impact on the Czech banking sector and economy. The self-financing and debt ratios in the banking sector indicate that banks in the analyzed Central European countries were able to increase their profits and financial stability up to a certain point. The COVID-19 pandemic had a significant impact on the banking sector, which can be observed from the changes in the indicators in 2020 and 2021. These indicators are important measures of the financial health of the banking system, directly affecting their ability to finance the economy. Changes in GDP dynamics largely colligate with changes in self-financing and debt ratios, showing how important a stable macroeconomic environment is for the banking sector.

The equity ratio in the total balance sheet, also known as the equity ratio, is one of the key metrics used to assess the financial stability of banks and the entire banking system. This ratio shows what percentage of a bank's assets is financed by equity, which includes funds from shareholders and

retained earnings. This ratio is important in the context of the stability of the banking system because equity acts as a buffer for losses that may occur. The higher the equity ratio, the greater the loss a bank can sustain before its ability to meet obligations is jeopardized, which is crucial for avoiding bankruptcy and ensuring financial stability. A higher equity share means that it should encourage shareholders to exercise greater oversight and control over the bank's operations, which can lead to more cautious and stable activities. Banks with a higher equity ratio are often seen as more creditworthy, which can facilitate their obtaining financing on favorable terms, and may also be positively assessed by rating agencies. International regulatory standards, such as Basel III, require banks to maintain a certain minimum level of equity relative to risky assets to prevent financial crises and increase the stability of the banking system. (Marcinkowska, 2010) A higher equity ratio can protect depositors and other stakeholders in the event of the bank's financial troubles, reducing the risk of losing their deposits or investments. However, high equity alone does not guarantee stability if the bank engages in risky lending or investment policies.

The liability ratio in the total balance sheet shows what percentage of a bank's assets is financed by liabilities, which may include customer deposits, long-term loans, bonds, and other forms of debt. This is an important indicator for assessing the stability of the banking system for several reasons. A high share of liabilities may indicate significant financial leverage, increasing the risk for the bank. In times of crisis or market instability, banks with high leverage may face difficulties in refinancing their debt and may be more susceptible to bankruptcy in the event of mass deposit withdrawals (known as a bank run). Banks with a lower liability ratio usually have larger capital reserves that they can use to cover losses and protect depositors. This allows for greater flexibility in risk management. Banks with a smaller share of liabilities typically have higher liquidity, which can be beneficial in managing short-term fluctuations in cash flows and in the event of a sudden increase in withdrawal demands by customers. In the event of losses, banks with a higher equity share and lower liability ratio have a greater capacity to absorb them. Higher indebtedness may limit this capacity, increasing the risk to the bank's stability. Nevertheless, a high share of liabilities does not always have to signify a risk to the banking system. For example, deposits are a form of liabilities but are also the main source of funding for banks and do not have to represent a direct risk, provided the bank effectively manages liquidity and credit risk. Hence, the liability ratio should be analyzed in the context of other financial indicators and the overall economic conditions.

The self-financing ratio, which determines a bank's ability to generate capital from its own operational activities and retained earnings, is an important indicator in the context of the bank's financial stability. This is because banks with a higher self-financing ratio are less dependent on external sources of capital, such as financial markets or interbank loans. In times of financial uncertainty, the ability to generate funds from internal operations can provide greater stability. Banks capable of self-financing are better prepared to cope with external shocks, such as changes

in interest rates or economic slowdowns, because they are not as exposed to fluctuations in financing costs or credit conditions. Banks with a strong self-financing position may be perceived as more stable and secure, attracting customers and investors, further strengthening the bank's stability. Although a high self-financing ratio is a positive signal, it does not eliminate all risks, especially if the bank is exposed to other threats, such as credit or market risks. Moreover, excessive retention of profits by the bank can also be a source of tension with shareholders expecting dividends.

The debt ratio, also known as the leverage ratio, refers to the ratio of a bank's liabilities to its equity or assets. It is a measure that determines the extent to which a bank's operations are financed through debt compared to capital provided by shareholders and retained earnings. This ratio is important for the stability of the banking system for several reasons. Banks with a high debt ratio may be more sensitive to financial shocks, as they have to service larger obligations, which can be challenging during times of financial stress. High indebtedness can increase liquidity risk, as the bank must ensure sufficient funds to cover its short-term liabilities. In a situation where a large amount of deposits are suddenly withdrawn (known as a bank run), a bank with high leverage may struggle to pay out these funds.

Banks with greater indebtedness incur higher financing costs. An increase in interest rates can significantly raise these costs, affecting the bank's profitability and its ability to generate capital. Rating agencies often assess banks considering their debt ratios. A high ratio can lead to a lower credit rating, which in turn affects the bank's capital acquisition costs. Banks with a lower debt ratio tend to have a larger capital buffer, which can be used to absorb losses, increasing their stability in uncertain times.

5.2. Indicators for assessing the financial efficiency of the banking sector during phases of the business cycle

The most important method of evaluating the financial efficiency achieved by banks is ratio analysis, based on the aggregated figures published in financial statements that characterize their activity. It is an analytical tool that allows for a synthetic evaluation of the results achieved, bypassing the need to analyze the impact of individual transactions on the financial outcome generated. (Bień & Sokół, 2000)

One of the most important indicators of financial efficiency for commercial banks is the return on equity (ROE) ratio. It allows for assessing a bank's ability to increase its own capital. The scope of inclusion within a bank's equity capital is usually a matter of agreement. It conventionally includes

basic capital and items reducing it, reserve capital, from revaluation updates, reserve as well as profit or loss from previous years. (Kochaniak, 2010)

Another important indicator of the financial efficiency of commercial banks is the return on assets (ROA) ratio. The result indicates the percentage relationship of the profit generated by the bank to the average level of assets held. It, therefore, determines the efficiency of using the resources owned by the bank during the process of generating a financial outcome. (Kochaniak, 2010)

Below is the formation of the ROE and ROA ratios in the banking sector of Central European countries.
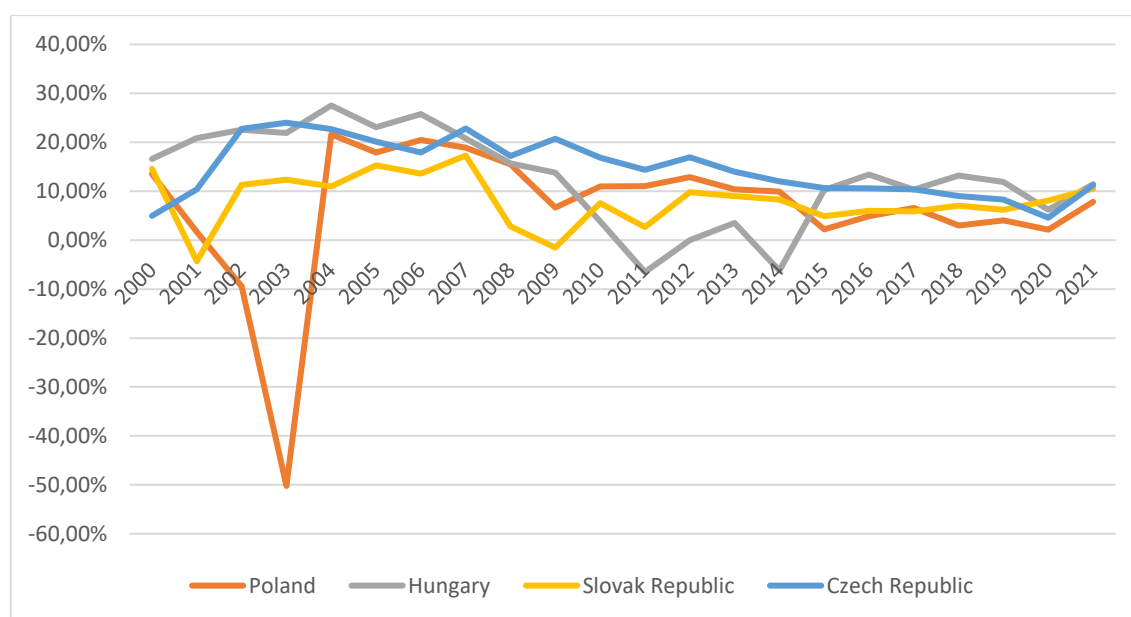
Chart 34 Formation of the Return on Equity (ROE) ratio in Central European countries in the years 2000 – 2021

Source: own elaboration based on FRED, 2023 and the Global Economy, 2023

The efficiency of the banking sector's operations in Central European countries during the analyzed years was significantly influenced by external factors, such as the economic situation, legislative changes, the impact of the central bank, and Poland's accession to the structures of the European Union. (Przybylska - Kapuścińska, 2009b) All these factors shaped the development possibilities of banks by affecting their size, structure of balance sheets, and achieved efficiency.

Equity in banking activities constitutes a relatively small part of the assets held because of the specificity of their operations. Therefore, the return on equity (ROE) is correspondingly higher compared to the return on assets (ROA). (Zawadzka, 2000) Analyzing the presented charts, it can be noticed that both the return on equity and assets during the analyzed period indicate positive trends in polish banking. Throughout the discussed period, the ROE indicator achieves higher values than the ROA indicator, meaning efficient use of equity.
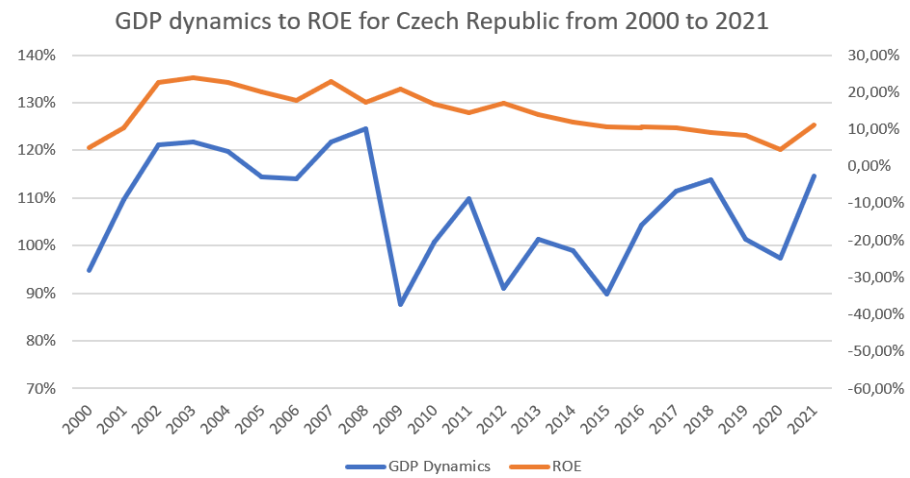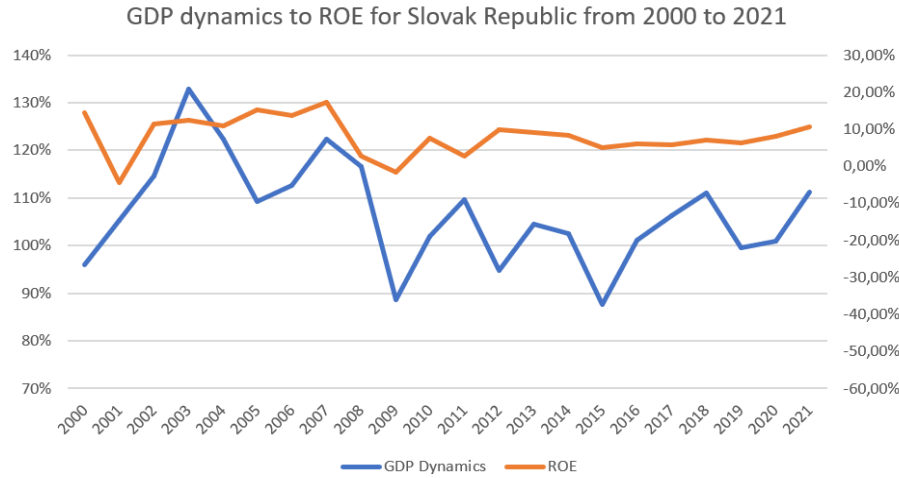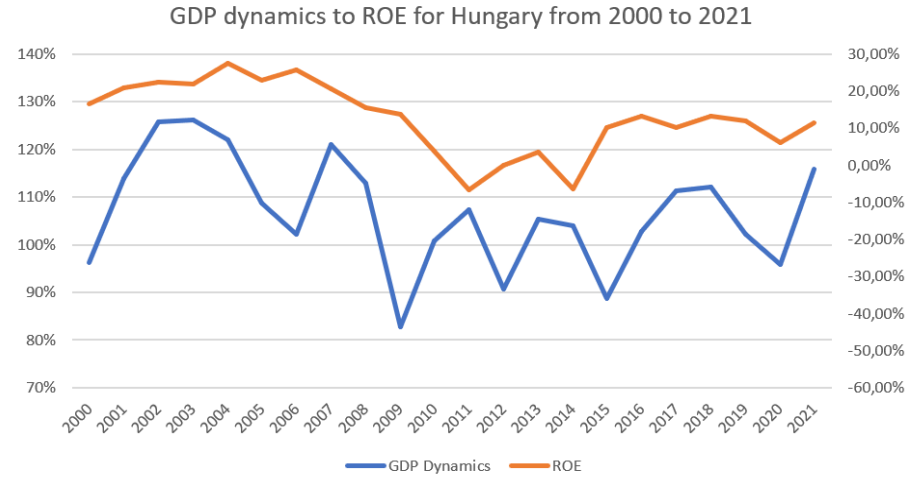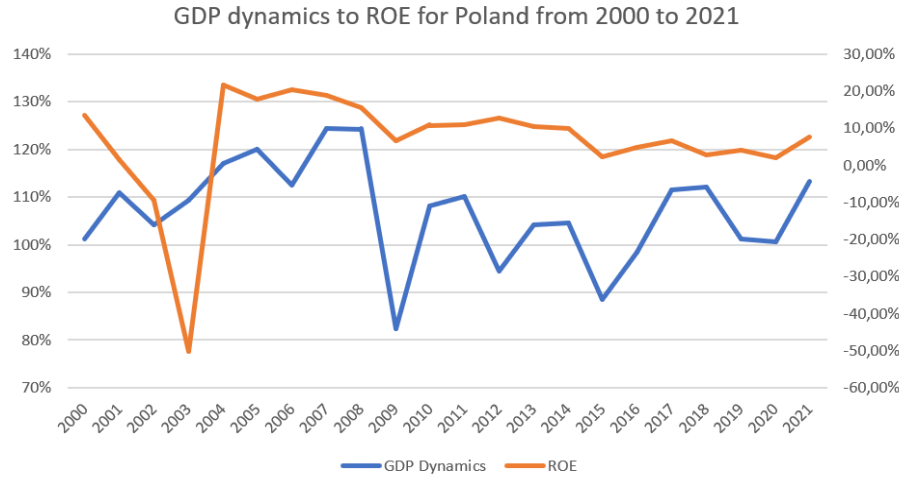
Chart 35 Formation of the Return on Equity (ROE) ratio in comparison to GDP dynamics in Central European countries in the years 2000 – 2021

Source: own elaboration based on table 17 and chart 34
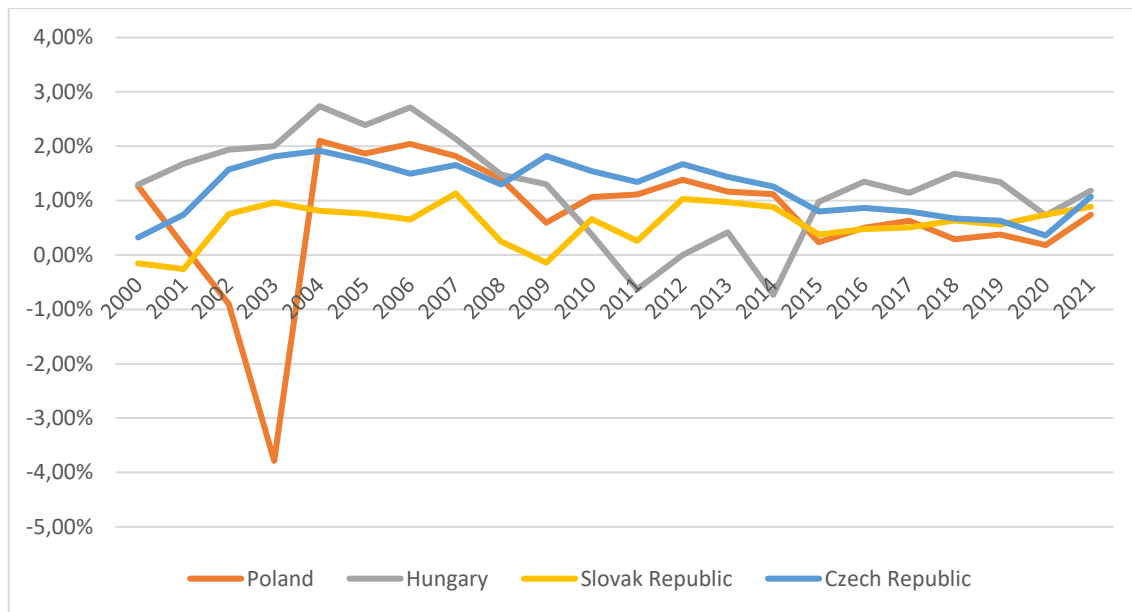
Chart 36 Formation of the return on assets (ROA) ratio in Central European countries in the years 2000 – 2021

Source: own elaboration based on FRED, 2023 and The Global Economy, 2023

It also indicates that the costs incurred by banks due to their liabilities are lower than those obtained from investing them in revenue-generating activities. Such a situation positively affects the increase in profitability of equity. (Kochaniak, 2010) As a result of systemic reforms carried out in Poland, restructuring of bank receivables, and positive changes in banks' loan portfolios since the mid-90s, there was a significant improvement in their financial results. By the end of the 20th century, the efficiency of the banking sector's operations had significantly decreased. This was reflected in a sharp decline in the discussed indicators, associated with an unexpected economic slowdown in 1998. The deterioration of the financial result achieved by the banking sector was caused by an increase in the growth rate of costs in relation to revenues. It is worth noting that the last years of the 90s and the beginning of the 21st century were characterized by strong competition in the banking sector, which contributed to lowering the costs of financial intermediation. Moreover, the fight against inflation and lower nominal interest rates were reflected in the banks' income statements as continuously narrowing interest margins. All these phenomena, combined with the necessity to make significant investments in the most modern banking technologies and observed economic slowdown, significantly affected the banks' problems with maintaining profitability at a higher level. Therefore, the profitability of own assets was low throughout this period, while the profitability of equity during the same period was characterized by high volatility. This situation was also not favourable for the banking sector, as it is postulated that the ROE indicator should be higher than 15%. (Marcinkowska, 2007)
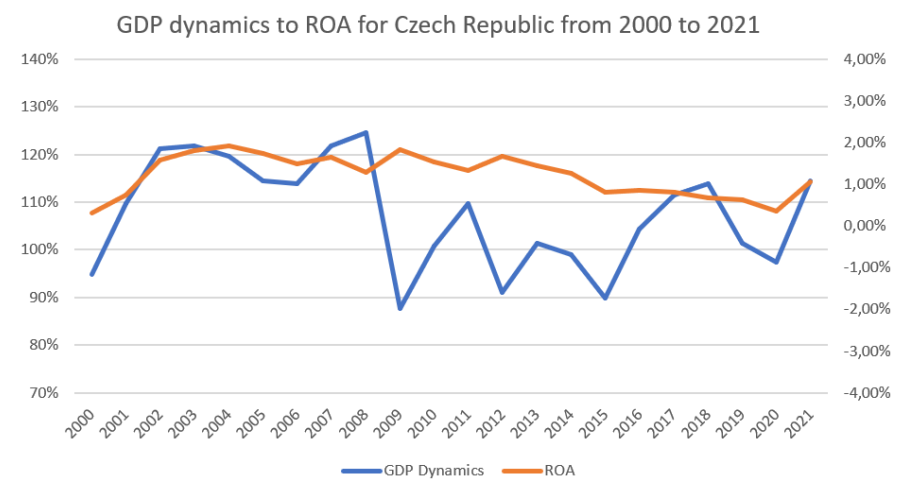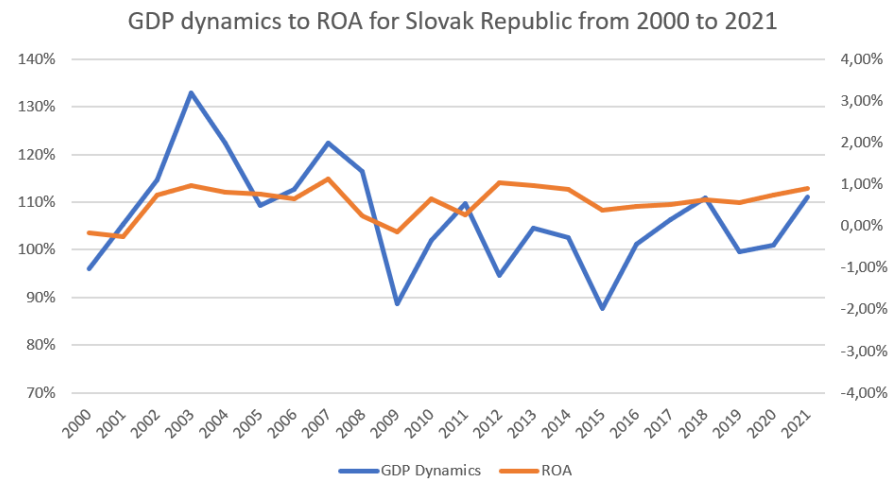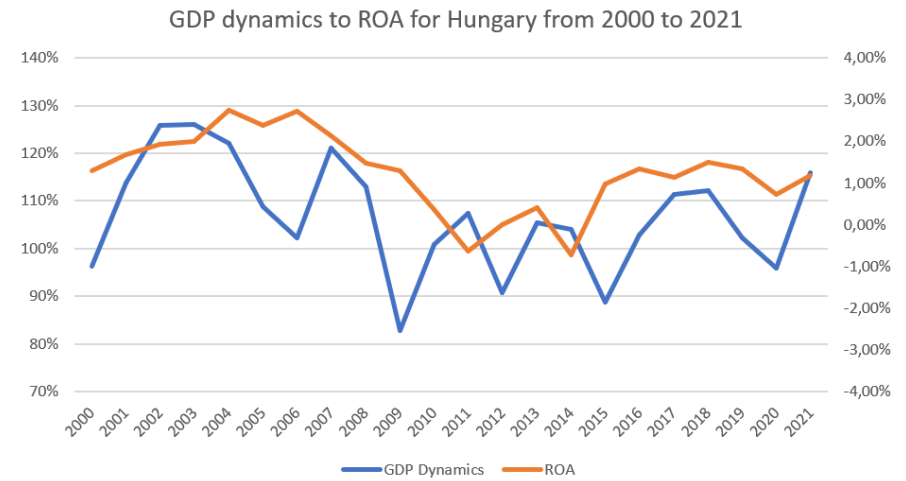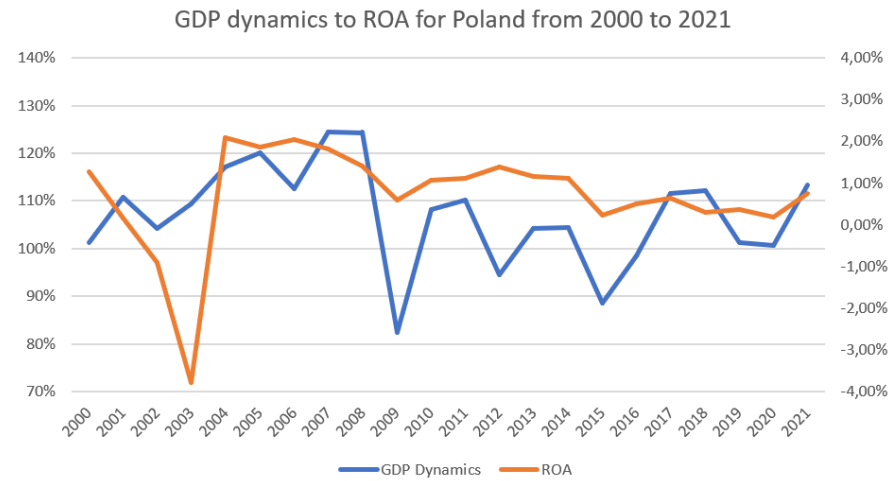
Chart 37 Formation of the return on assets (ROA) in comparison to GDP dynamics in Central European countries in the years 2000 – 2021

Source: own elaboration based on table 17 and chart 36

In 2002-2003, there was another serious decline in indicators of the financial efficiency of the banking sector. This situation originated from a significant decrease in net profits, mainly due to the observed economic slowdown, which led to a significant increase in the share of non-performing loans in banks' portfolios (and was associated with the necessity of making write-offs for non-performing loans) and decreasing interest income. As a result, the discussed indicators decreased. The year 2004 brought a halt to negative trends in terms of portfolio quality and results achieved. Largely due to the stabilization of the economic situation, there was a significant increase in the profitability indicators of the banking sector. Moreover, expanding the range of traditionally provided banking services and the development of modern distribution channels allowed reaching a larger number of customers while simultaneously reducing operating costs, which led to both an increase in banks' assets and their financial results.

The establishment of positive economic trends in subsequent years significantly improved the situation of both households and enterprises, which was reflected in the dynamic development of the banking sector in the following years, further stimulated by favorable prospects related to the free flow of capital due to Poland's presence in the common European market.

Due to worrying changes occurring in the global financial markets, the situation of the Polish banking sector deteriorated in 2009. Financial efficiency indicators decreased – ROE to the level of 6.66% and ROA to 0.59%.

Changes that took place in the global financial markets had an adverse effect on the economic climate in 2009, significantly determining a strong economic slowdown. The full emergence of the effects of observed problems in the financial markets negatively impacted the real sector's situation, significantly limiting the demand for banking services. Consequently, the financial result achieved by the banking sector also decreased. There was a significant decrease in asset dynamics, while equity dynamics increased due to an increased focus on the sector's safety. The profitability of equity then fell to 10.66%, and the profitability of assets decreased to 0.9%. From 2010, favorable changes in the discussed indicators were observed, despite still unfavorable economic development prospects, they began to show an upward trend.

The increase in ROE indicates the reconstruction of the banking sector after the crisis and the ability to generate profits under difficult conditions. The variable ROE values between 2011-2014 may reflect uneven economic development, changes in the regulatory environment, and various bank strategies. The low ROE in 2015 and fluctuations in subsequent years indicate diverse market challenges and the impact of new regulations on bank profitability. The decline in ROE in 2020 reflects the negative impact of the COVID-19 pandemic on banks' financial results. The improvement in the indicator in 2021 may indicate banks' adaptation to the new reality and the beginning of recovery after the pandemic.

The ROA indicator, which represents the profitability of a bank's total assets, shows how effectively assets are managed to generate profit. The stable ROA at the beginning of the period reflects the appropriate use of assets, while the decline in 2001-2003 indicates deteriorating economic conditions and an increase in higher-risk loan portfolios, generally indicating a difficult situation in the banking sector.

The improvement in ROA between 2004-2006 indicates greater efficiency in using assets due to the improved economic situation and optimization of portfolios. The relative stability of ROA before the financial crisis reflects a healthy asset structure of banks before the crisis hit.

The variability of the ROA between 2009-2019 may result from restructuring actions and different dynamics of credit markets, caused by continuous adaptations to changing market conditions, including variable interest rates and legal regulations.

The decline in ROA, similar to ROE, in 2020 reflects the impact of the pandemic on asset profitability. Meanwhile, a slight improvement in ROA may indicate a revival of lending activity and an improvement in the quality of the loan portfolio, allowing for better use of assets. The volatility of indicators, both ROE and ROA, shows significant variability during the analyzed period in each of the countries. The ROE indicator in Poland shows significant fluctuations, with a clear drop around 2003 and a rebound after 2004. Poland exhibited the greatest fluctuations in the ROE indicator, with a negative minimum, which may indicate periods of significant difficulties in the banking sector. Such fluctuations may indicate periods of instability but also the ability to recover quickly from crises.

High ROE ratios indicate the strong position of Hungarian banks at the beginning of the new century, thanks to post-communist economic transformation and integration with European financial structures. Stable ROA reflects the healthy operational efficiency of Hungarian banks in using their assets to generate profit.

The continuation of ROE growth from 2002 to 2004 reflects a growing economy and favorable market conditions, enabling banks to expand and increase profitability. Changes in ROA reflect changes in asset management strategies, as well as the impact of external economic conditions.

In the following years, ROE remains at a relatively high level, indicating the stability of the banking sector and a favorable business environment. Stable ROA from 2005 to 2007 also indicates the maintenance of effective asset management policies by banks.

The decline in ROE in 2008 aligns with global crisis trends and signifies greater caution in bank management, as well as the negative impact of the financial crisis. The rebound in the years following the crisis reflects successes in risk management and the restructuring of the banking sector. The decline in ROA during the financial crisis may reflect a general decline in profitability

in the banking sector. The ROA rebound from 2009 to 2011 indicates gradual improvements in the management of banking assets after the crisis.

Fluctuations from 2012 to 2014 result from market uncertainty and adaptation to new regulations and economic changes. Visible changes in ROA were the result of further adaptation to changing market and economic conditions. Gradual ROE growth from 2015 to 2019 indicates the banks' ability to adapt to new conditions and improve their operational efficiency. The improvement in ROA also indicates better efficiency in using assets and improved financial condition of banks.

The COVID-19 pandemic negatively impacted banks' financial results, as seen in the reduction of ROE. The negative impact of the pandemic on ROA in 2020 resulted from reduced economic activity and increased loan loss provisions.

The increase in ROE in 2021 indicates a rebound from the pandemic and improvement in the overall financial condition of banks. A slight improvement in the ROA ratio suggests a return to normal economic activity and potentially improved asset management efficiency in the Hungarian banking system.To sum up, in Hungary, the ROE indicator shows large volatility with several peaks, especially in 2004 and 2018, which may indicate particularly favorable periods for the Hungarian banking system. ROA shows a relatively stable growth during the analyzed period, except for a few declines, with the largest occurring in 2011. GDP dynamics in Hungary also show some declines, especially in 2009, but generally seem to follow the trends of ROE and ROA. Both ROE and ROA in the Hungarian banking system indicate the sector's ability to adapt to changing economic and regulatory conditions. The analysis of these indicators shows that banks in Hungary, like in other countries, were influenced by global economic events, such as the financial crisis and the COVID-19 pandemic, and their ability to quickly adjust to these changes had a significant impact on their profitability. The ROE indicator for Hungary seems to be more stable than in Poland, except for a few years. A high and stable ROE may indicate a healthy banking system but may also suggest insufficient competition or excessive risk. The ROA indicator for Hungary is relatively stable, like ROE, though some fluctuations are noticeable. The stability of the ROA indicator, like ROE, may suggest a stable banking system.

Analyzing the Return on Equity (ROE) and Return on Assets (ROA) ratios for the banking system in Slovakia from 2000-2021 identified how effectively banks utilized their equity and assets to generate profit.

The initially high ROE in 2000-2001 reflects the favorable market development following the privatization of banks and economic reforms. The sudden decline in 2001, also in ROA, resulted from one-off events such as crisis situations in some banks and changes in the macroeconomic environment.

The increase in ROE in 2002 and stabilization in 2003 indicate effective sector restructuring and increased operational efficiency of banks. The overall increase in ROA during this period suggests enhanced efficiency in using assets and increased revenues from lending activities. Variable ROE values between 2004-2006 reflect the process of adapting to the new regulatory environment associated with Slovakia's entry into the European Union.

Fluctuations in ROA reflect the diverse market dynamics and various investment strategies of banks. The maintenance of ROE at a stable level in 2007-2008 before the financial crisis indicates the health of the banking sector. The relative stability of ROA during this period suggests that banks effectively managed assets before the financial crisis. Negative ROE in 2009 (financial crisis) reflects the global financial crisis and its impact on banks, including potential loan losses. The decline in ROA indicates the crisis's impact on bank revenues and increased costs associated with credit risk. Gradual improvement in ROE after the crisis suggests a revival of the credit market and better risk management. Improvement in ROA between 2010-2013 may indicate improved quality of the loan portfolio and operational efficiency. Negative ROE in 2014 may reflect difficulties in the sector and the impact of adverse market conditions. Variable ROA values in these years may indicate ongoing adaptation to regulations and changes in the business environment.

Improvement in the ROE and ROA ratios from 2016-2021 reflects stable economic conditions, favorable changes in monetary policy, and implemented effective business strategies. It also indicates the banks' enduring ability to generate profit from the assets utilized. The ROE and ROA ratios for Slovakia reflect the banks' ability to adapt to changing economic, political, and market conditions. Especially, the COVID-19 pandemic had a significant impact on banking activities in recent years.

Generally, however, the banking system in Slovakia demonstrated the ability to manage capital and assets in a way that maintained profitability, even in challenging periods.The ROE and ROA indicators in the Slovak banking system indicate greater volatility, with a clear increase in the last years of the analyzed period. As with Poland and Hungary, the decline in GDP dynamics in 2009 is visible and has a decisive impact on profitability indicators. The trend for the Slovak Republic is relatively stable with a few fluctuations. Generally, the stability of the ROE indicator may indicate a balance between risk and profit in the banking sector. The trend of the ROA indicator for the Slovak Republic is quite stable with a few fluctuations, consistent with ROE trends.

Analyzing the Return on Equity (ROE) and Return on Assets (ROA) ratios for the banking system in the Czech Republic from 2000-2021 helps to understand how effectively banks used their equity and assets to generate profit. The initial high ROE in 2000-2001 reflects favorable conditions after the privatization of banks and preparations for the Czech Republic's entry into the European Union,

which positively influenced the investment climate. The low initial ROA may reflect cautious asset management, whereas its increase in the following year could indicate increased efficiency in their utilization.

The dynamic growth of ROE in 2002-2003 was due to favorable macroeconomic conditions, increased profitability of the banking sector, and effective capital utilization. The growth of ROA in these years suggests that banks improved asset management and increased profitability with a relatively stable level of assets.

Maintaining high ROE during 2004-2006 shows market stabilization at a high level and indicates the good condition of the banking sector and efficient capital management. The stabilization of ROA at a higher level indicates a balance between effective asset utilization and risk management.

The slight decline in ROE before the financial crisis in 2007-2008 was an anticipation of upcoming difficulties. Changes in ROA during this period resulted from banks' preparations for the impending crisis and their reactions to its first signs. The reduction in ROE in 2009 is typical for a crisis period, affecting the increase in financing costs and higher provisions for losses. Similar to ROE, the decline in ROA was a result of increased loan loss provisions and higher financing costs.

The improvement in ROE after the financial crisis (2010-2011) suggests an effective sector recovery and the ability to adapt to changing market conditions. The improvement in ROA post-crisis reflects the optimization of loan portfolios and better asset utilization. The stability of ROE and ROA in 2012-2013 may reflect market maturity and the banks' ability to maintain profitability.

Fluctuations in the ROE and ROA ratios during 2014-2015 resulted from local market conditions, investment strategies, changes in regulations, and global economic trends, and better operational efficiency.

The period 2016-2019 is characterized by stable growth in the ROE and ROA ratios, indicating good risk management. This suggests an improvement in the quality of bank assets and an increase in operational efficiency.

The COVID-19 pandemic caused a global economic slowdown, negatively affecting bank profitability, as seen in the decline of ROE and ROA ratios. The pandemic and associated economic turmoil contributed to a decrease in asset utilization efficiency by banks.

The improvement in the ratios in 2021 indicates recovery post-pandemic and potentially favorable changes in the banking sector. The rebound of ROE and ROA in this year signifies better asset utilization in a changing economic environment and potential improvement in banks' credit conditions.

The ROE and ROA ratios for banks in the Czech Republic demonstrate the financial institutions' ability to adapt to changes in the macroeconomic, regulatory, and market environment. Over the years, banks have faced various challenges, from the financial crisis to the COVID-19 pandemic, but generally showed the ability to rebuild and maintain stable profitability. In the Czech Republic, the ROE indicator generally shows a decreasing trend with a clear increase in the last year of analysis. The ROA indicator seems to have a downward tendency, though it is less volatile than ROE. GDP growth is more stable but shows declines in crisis years. The Czech Republic shows the most stable trend of the ROE indicator among the analyzed countries. This stability may indicate a well-managed banking system. The ROA indicator for the Czech Republic, like ROE, is the most stable among all the analyzed countries. High stability of both indicators may indicate efficient management in the banking sector.

The Czech Republic and Hungary generally have higher average ROE and ROA values compared to Poland and Slovakia. This may indicate the greater efficiency of their banking systems in generating profits from equity and assets.

The indicator values in individual years are related to the general economic conditions, regulatory changes, and specific events and crises affecting the banking sector in these countries.

As can be seen, all countries experienced the impact of the financial crisis in 2009, which is visible in both GDP and profitability indicators. ROE indicators show greater volatility than ROA indicators, suggesting that equity profitability indicators are more sensitive to market condition changes than the overall efficiency of asset use.

Economic crises and external shocks have a clear impact on the financial results of the banking systems of the countries studied, as evidenced by the declines in ROE/ROA in crisis years. Crises, such as the one in 2008, can severely affect the financial stability of banks, significantly reducing their profitability and ROE and ROA indicators. Crises can lead to an increase in borrower insolvency, which increases banks' credit losses. The introduction of more stringent regulations, such as increased capital requirements, can limit banks' ability to generate profit, reducing ROE and ROA.

Both positive and negative development trends in the national and global economy are transferred to the economic results achieved by the banking sector. Simplifying, it can be said that the condition of the banking sector is largely a reflection of the macroeconomic situation. (Ostrowska, 2005)

Large fluctuations in the ROE indicator may indicate instability in the Polish banking sector, possibly caused by political, economic, or regulatory changes. Low ROA values suggest that banks may have had problems with effective asset utilization.

High maximum values of ROE and ROA indicators may suggest periods of strong growth and profitability in the Hungarian banking sector, possibly thanks to favorable market conditions or effective management.

Average values of ROE and ROA indicators in the Slovak banking system indicate the moderate efficiency of this banking sector. It is worth paying attention to factors that could have influenced the stability of this sector, such as integration with the European Union or local economic conditions.

Stable and high ROE and ROA indicators in the Czech banking system may indicate a strong and well-managed banking sector.

Another important indicator used in assessing the efficiency of the banking system is the cost-to-income ratio, also known as the operational efficiency ratio. It is a key financial metric used in the banking industry to assess a bank's operational efficiency. It evaluates what percentage of a bank's revenues is consumed by operational costs. The lower the ratio, the better the bank's operational efficiency. A lower ratio indicates higher efficiency, meaning the bank manages its costs relative to generated revenues better. The ideal level of the cost-to-income ratio may vary depending on the country and market specifics, but banks usually aim to keep this ratio as low as possible. The cost-to-income ratio is therefore an essential tool in the financial analysis of banks, helping to assess how efficiently an institution manages its resources to generate profits.

The cost-to-income ratio in the banking system, as a measure of operational efficiency, is extremely important. It is a measure of efficiency, providing a clear picture of how efficiently a bank manages its resources and expenditures relative to generated revenues. Banks with a lower ratio are typically considered more operationally efficient. They may be seen as more attractive investment-wise because it suggests better management and greater ability to generate profits.

In a dynamically changing market environment, especially in the face of digitization and regulatory changes, the cost-to-income ratio can help banks assess the effectiveness of their adaptation to new conditions. Banks aiming for sustainable development must maintain a healthy cost-to-income ratio to ensure long-term financial stability. As seen, the cost-to-income ratio provides valuable information about operational efficiency and the ability to generate profit. In the banking sector, where profit margins can be tight and competition is intense, effective cost management is key to success.

Chart 38 presents the development of the cost-to-income ratio in Central European countries from 2000 to 2021.
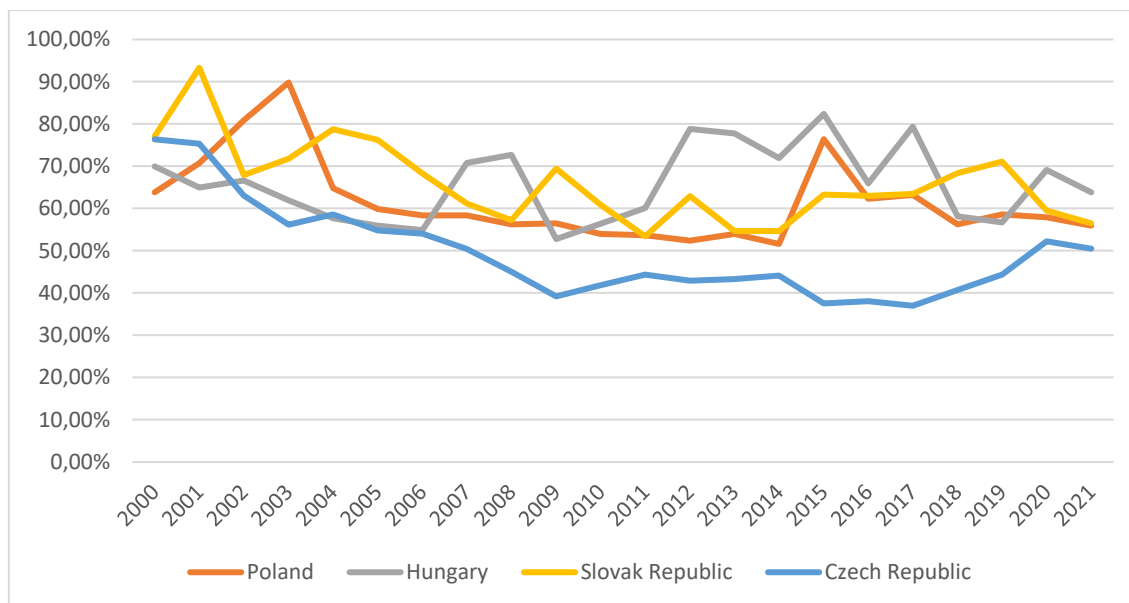
Chart 38 Cost-to-income ratio in Central European countries from 2000 to 2021.

Source: own elaboration based on FRED, 2023 and Global Economy, 2023

The cost-to-income ratio in the banking sector shows what portion of a bank's revenues is consumed by costs. This ratio illustrates the financial efficiency of a bank – a lower ratio means that the bank operates more efficiently, as a smaller portion of revenues is allocated to cover costs.

Based on the presented data, it is clear that there were significant fluctuations in the ratio in Poland, with the highest level in 2003 (89.81%) and a significant drop to 64.82% in 2004. During the same period, Poland's GDP showed growth, particularly strong in 2004, which may correlate with the decrease in the cost-to-income ratio, suggesting better bank efficiency during periods of economic growth.

Looking at the data for Poland from 2000-2021, it is evident that the cost-to-income ratio is variable, which may indicate a variety of factors influencing the banking sector, such as changes in regulations, competition, technological innovations, and changing economic conditions. Over the entire period, it can be noticed that the value of this ratio ended at a similar level to where it started, which may indicate a certain stability of the banking sector over the long term, despite short-term fluctuations. Changes in the ratio can also reflect broader economic trends, for example, the financial crisis in 2008 had a global impact on the financial sector, which could have affected the costs and revenues of banks in Poland as well. The cost-to-income ratio in Hungary also showed fluctuations, reaching its lowest level in 2003 (61.95%). The GDP growth in Hungary was particularly strong in 2002 and 2003, which could have contributed to the improvement in the operational efficiency of banks.
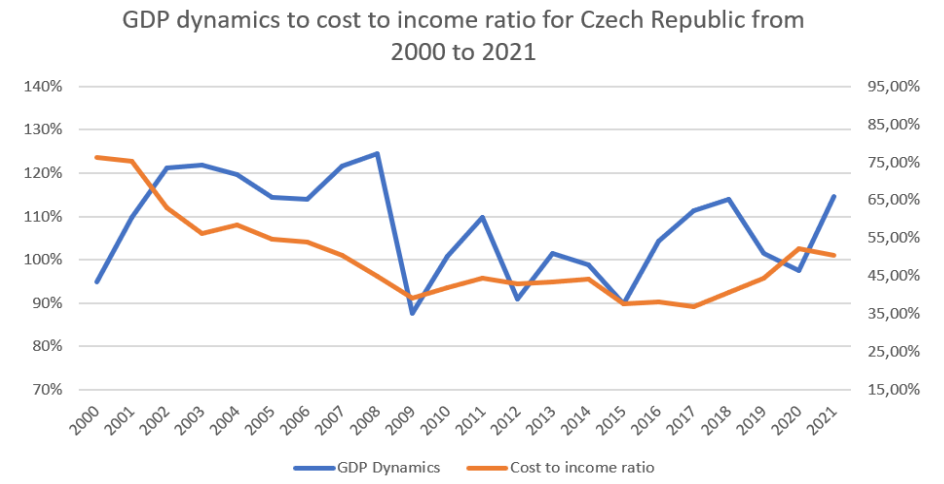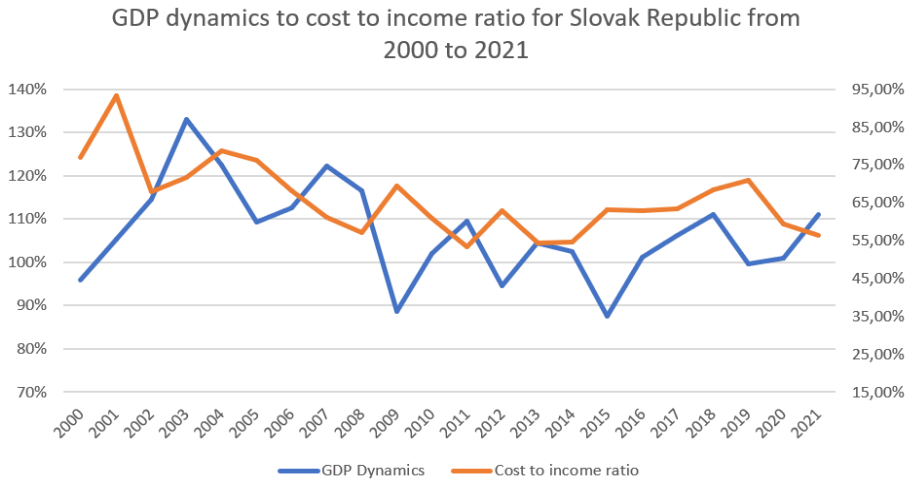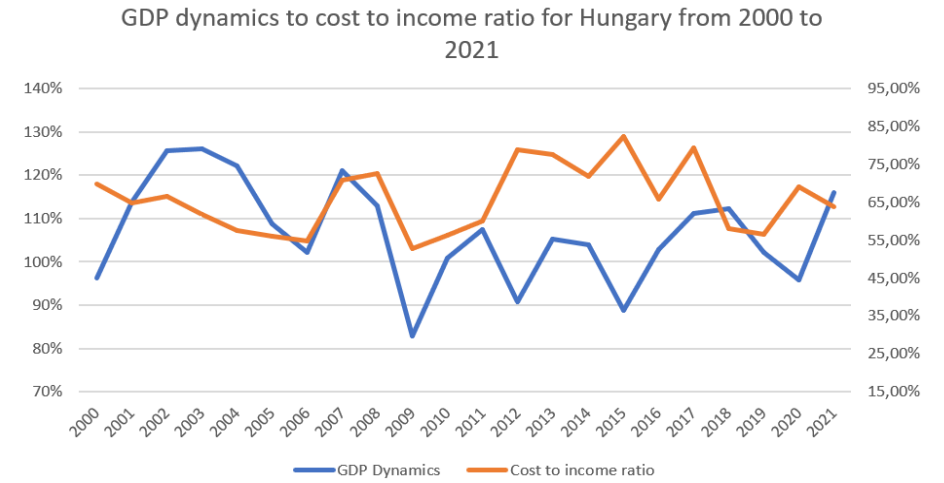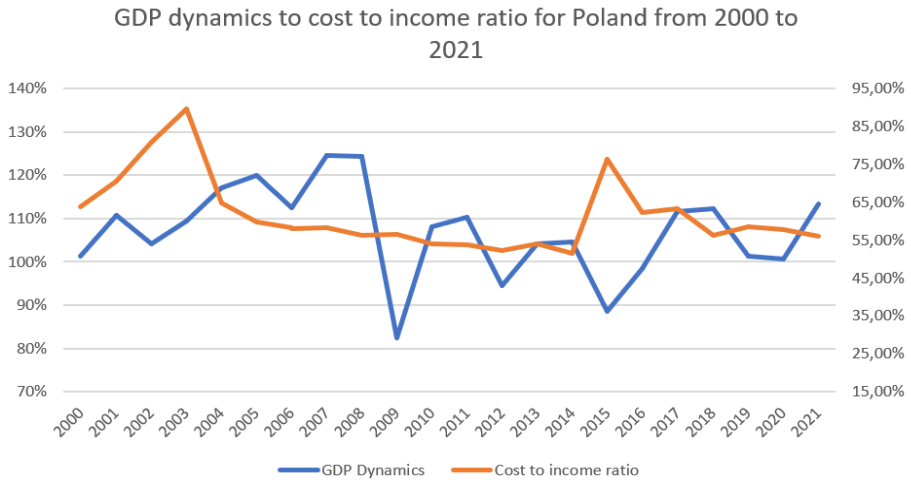
Chart 39 The cost-to-income ratio of the banking sector against economic fluctuations in the years 2000 – 2021

Source: own elaboration based on table 17 and chart 38

The analysis of the cost-to-income ratio for the banking system in Hungary from 2000-2021 allows us to observe the dynamics of financial management in the banking sector in this country. This ratio reflects what portion of bank revenues is absorbed by costs – lower values indicate greater efficiency.

The cost-to-income ratio in Hungary, like in other countries, was influenced by global financial crises, especially the crisis of 2008, which had broad consequences for the global economy. Changes in this ratio also reflect risk management strategies, cost management, and the approach of Hungarian banks to investments. The ratio also mirrors the dynamics of the banking sector, including competition, the introduction of new technologies, and changes in customer preferences. Hungary, like other economies, went through many political and economic changes, which could have had a direct impact on the banking sector. In Slovakia, the cost-to-income ratio reached a very high level in 2001 (93.30%), but then significantly decreased. GDP growth was particularly noticeable in 2003-2004, which may correlate with the decrease in the cost-to-income ratio. The analysis of the cost-to-income ratio for the banking system in Slovakia over the years 2000-2021 reveals the specifics of financial management in the banks of this country. This ratio in Slovakia reflects the degree of banks' adaptation to the changing regulatory, technological, and market environment.

Changes in the ratio indicate the impact of external factors, such as economic crises and financial regulations, which have influenced operational costs and revenue-generating capabilities. A visible downward trend in recent years suggests an increase in the operational efficiency of Slovak banks, possibly due to process automation, better risk management, and cost optimization. Low values of the ratio in later years may also reflect Slovakia's overall economic growth and the associated increase in bank revenues.

In the Czech Republic, this ratio had a downward trend, reaching the lowest level in 2003 (56.17%). Similar to other countries, the Czech Republic experienced GDP growth, especially in the years 2002-2004, which may be related to the decrease in the cost-to-income ratio.

The cost-to-income ratio for the banking system in the Czech Republic from 2000–2021 allows us to identify how effectively banks managed their costs relative to generated revenues.

As one of the new members of the European Union, the Czech Republic could benefit from access to new markets and capital, which impacted the improvement of bank efficiency at the beginning of the period. The stability of the ratio after the financial crisis of 2008 indicates the ability of Czech banks to manage effectively under challenging economic conditions. The increase in the ratio in 2020 may reflect challenges related to the COVID-19 pandemic, such as reduced demand for certain banking services or increased costs associated with adapting to remote work. The reduction

in the ratio in 2021 signifies a return to stability. It may indicate that banks quickly adjusted to the changed conditions and regained the ability to manage costs more effectively against revenues.

In each of the analyzed countries, there seems to be some relation between GDP growth and a decrease in the cost-to-income ratio in the banking sector. Periods of economic growth usually favor the improvement of banks' operational efficiency, which may be reflected by a lower cost-to-income ratio. Economic growth periods typically signify better economic conditions of a country, leading to increased credit and investment activity. Banks may experience revenue growth due to increased demand for loans, investments, and also higher fees and commissions. In times of economic growth, credit risk usually decreases, which can lead to reduced risk-related costs, e.g., less need for credit losses. Economic growth can enable banks to achieve economies of scale, lowering the average operational costs per unit of revenue. These factors can contribute to improving the operational efficiency of banks, manifested by a lower cost-to-income ratio. Banks generate more revenue with relatively constant or slower-growing costs. Improving operational efficiency can lead to increased profitability for banks, beneficial both for shareholders and the financial stability of institutions. Recession, on the other hand, can lead to a decrease in demand for loans and other banking services, reducing banks' revenues. In difficult economic conditions, the risk of borrower insolvency increases, forcing banks to increase provisions for credit losses, thereby increasing operational costs. In times of recession, this ratio may increase, as banks experience rising costs with a simultaneous decrease in revenues. When the cost-to-income ratio rises, a bank's profitability may decrease, which can negatively impact the financial stability and investment attractiveness of the bank.

Periods of economic growth usually favor the improvement of banks' operational efficiency (reduction of the ratio), while recession can have the opposite effect. However, it should be noted that the level of this indicator is also influenced by other factors, such as banking policy, regulatory changes, technological innovations, and global financial crises.

The Czech Republic consistently shows a lower cost-to-income ratio, suggesting a more efficient banking sector. Poland and Hungary exhibit relatively higher ratios, indicating lesser operational efficiency. Slovakia shows the greatest volatility, which may indicate less stability in the operational efficiency of its banking sector. Over two decades, the banking sectors of these countries have experienced various degrees of operational efficiency, as indicated by the cost-to-income ratio. The Czech Republic stands out with lower indicators, suggesting a potentially more stable and efficient banking sector.

A lower cost-to-income ratio typically indicates a more stable and efficient banking sector, suggesting that the Czech Republic may have had a relatively more stable banking sector during this period. Higher ratios, as seen in Hungary and Slovakia, may indicate potential challenges in

operational efficiency, which can affect the overall stability of the banking sector in these countries.

However, it's important to note that while the cost-to-income ratio is a significant indicator, the stability of the banking sector also depends on other factors such as the regulatory environment, economic conditions, and risk management practices.

5.3. Assessment of the stability level of the banking system

Financial system stability is perceived as a state in which the financial system fulfills all its functions uninterruptedly and efficiently, even in the face of unexpected and adverse disturbances of significant scale and scope. Disturbances related to the efficiency and safety of the financial system and disruptions in the effectiveness of financial intermediation services are very dangerous phenomena because they negatively affect the situation of all entities participating in economic life. However, speaking of a stable financial system does not exclude the possibility of certain difficulties in the activities of individual financial institutions or significant fluctuations in financial market activity. In a stable banking system, problems arising in individual institutions operating in the financial market do not negatively impact the tasks of the financial system as a whole and do not translate into its functioning. (Zawadzka, 2000)

Exceptionally important for maintaining the stability of the financial system is maintaining the stability of the banking sector. Nowadays, banks play a fundamental role both in financing the economy and in monetary settlements. An important role of banks is also to create products that enable other entities to manage their financial risk. Despite the continuous development of the insurance market, investment fund market, and pension funds, the scale of operation of the banking sector is still incomparably larger than other segments of the financial system.

Systemic risk is recognized as one of the main causes of instability in the contemporary banking system. In the banking sector of the modern economy, systemic risk was triggered by a series of bankruptcies of mutually interconnected banks in a relatively short time. The collapse of one bank can lead to a loss of trust in other banks, which in turn can result in deposit withdrawals, lack of liquidity, and ultimately the collapse of more banks, leading to a crisis in the entire financial system. The occurred mechanism of risk "contagion" caused the problem to spread to the entire global economy and the outbreak of a global financial crisis.

Systemic risk is defined as the possibility of disturbances in the functioning of the financial system and financial markets caused by the loss of asset value, leading to a sudden reduction or even suspension of delivering important financial products to market participants, such as loans,

insurance, or hedging instruments, which are necessary for the proper functioning of the real economy.

Therefore, assessing changes in the financial assets ratio of the banking sector in relation to GDP is crucial. This indicator is widely used in international statistics and by the central banks of the analyzed Central European countries. It allows for determining the measure of exposure to systemic risk of the entire banking sector. It illustrates the significance of the banking sector in the functioning of the economy. This indicator is related to the financial size of the assets of individual banks, as well as the total size of financial assets of the entire banking sector in relation to the GDP of the home country.
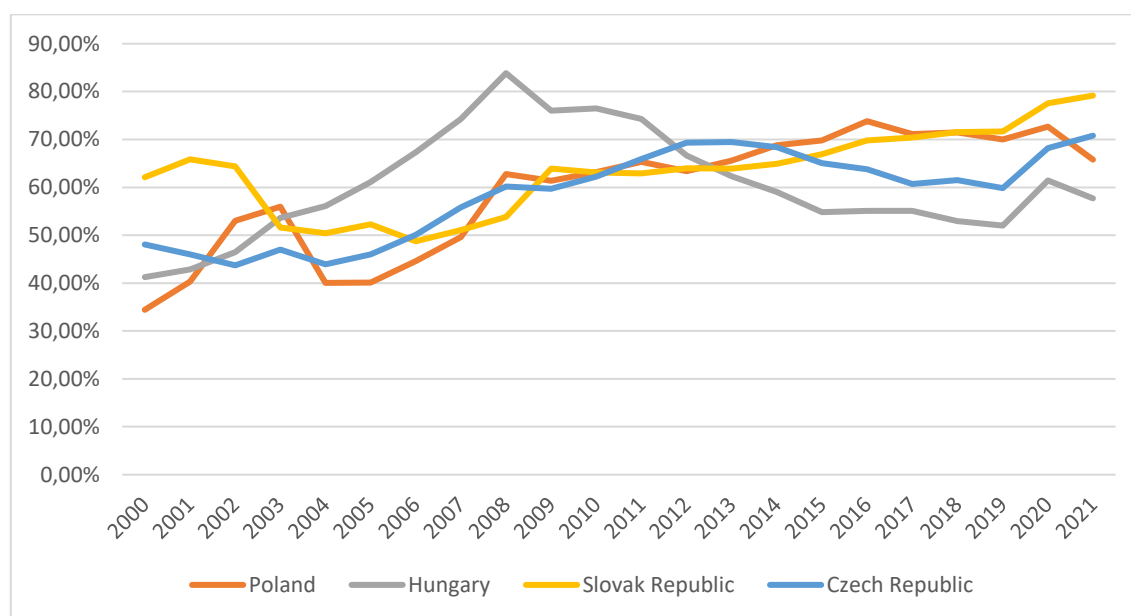
Chart 40 Banking Sector Assets to GDP ratio of Central European Countries in 2000 – 2021
Source: own elaboration based on The Global Economy, 2023

The overall condition of the economy and the stability of the banking system are significantly correlated. An efficient financial system contributes to more effective resource allocation in the economy and thus leads to the emergence of more favorable prospects for further economic development. It can therefore be observed that a smoothly functioning financial system has a beneficial impact on improving the conditions of the real economic sector. Conversely, an economic development slowdown is synonymous with a deterioration in the situation of this sector. Therefore, to fully illustrate issues related to the stability of the banking system, it is necessary to refer to the general conditions of the current macroeconomic situation, as they undoubtedly have a significant impact on the stability of the banking system, as they can easily disrupt or deregulate it. (Szewczyk, 2004b)
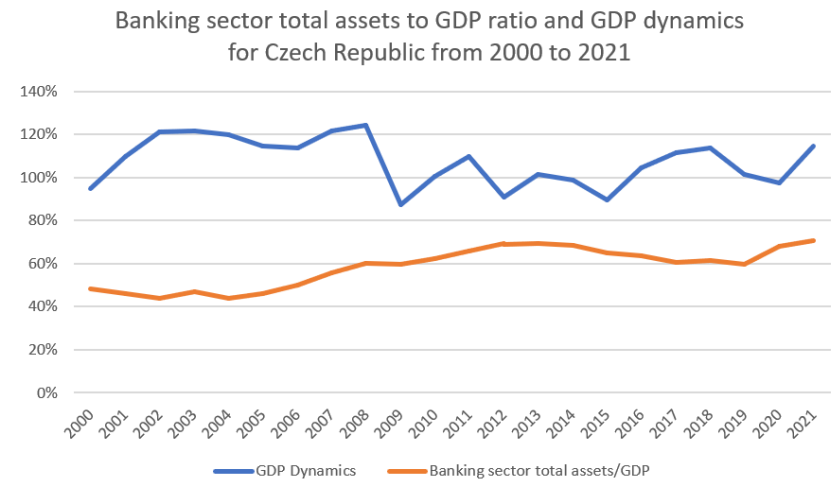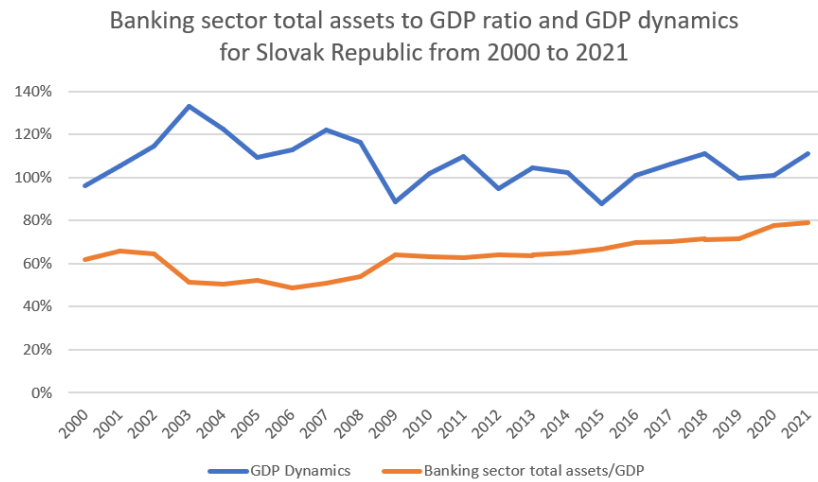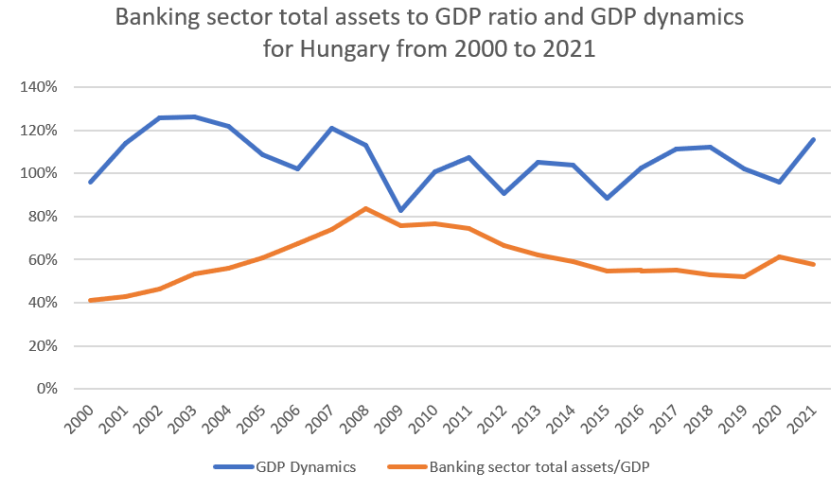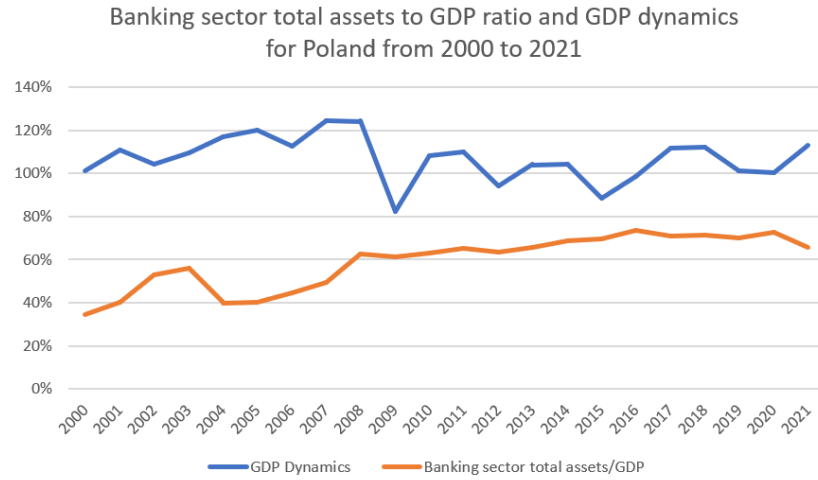
Chart 41 Banking sector total assets/GDP ratio against economic fluctuations of Central European Countries in 2000 – 2021

Source: own elaboration based on table 17 and chart 40

In the 1990s, Poland experienced a very high pace of development of the domestic banking system. During this decade, there was a significant increase in both its size and the quality of services provided. The early 1990s were a period of growing stability in the banking sector. It was a time when regulations governing the banking sector were amended, and a dynamic process of adjusting them to new environmental conditions took place. Financial institutions in the country could thus operate in conditions of reduced risk thanks to new frameworks and prudential practices, more effective supervision, as well as the refinement of development strategies and risk management by many banks. (NBP, 2013) Additionally, strong economic growth and the accompanying transfer of knowledge (e.g., related to risk management) and new technologies began to positively shape the situation in the domestic banking sector. Furthermore, important factors affecting changes related to the efficiency and safety of the sector were undoubtedly more favorable prospects for bank activities related to less uncertainty about the economic situation in the future and increased stability in the domestic and global financial market. The steadily improving economic situation stimulated development and positively affected the stability of the banking system. Its effect was an increasing ability to service debt, thereby increasing the demand for loans. The development and safety of the banking sector were also favoured by the inflow of external funds and the appearance of strategic investors interested in the development of individual banks. Moreover, due to favourable economic conditions, there was a rapid increase in population income and an improvement in the liquidity situation in enterprises, which positively affected the propensity to save, thereby increasing the deposits of the non-financial sector.

The pace of development of the national economy decreased in 2001 – 2002, and with it, its stability worsened. However, the deterioration of basic indicators characterizing bank activities, such as the quality of loan portfolios, did not pose a significant threat to the banking sector, as the emerging risk was adequately secured by legal regulations and provisions set aside by banks earlier.

In 2003, the banking sector was still under the influence of the economic slowdown of the previous years. However, processes affecting the stability of the banking system in a positive way were noticeable in the economy, indicating primarily the gradual transition of the economy into a phase of recovery. In 2004, an improvement in the economic climate was observed, which also positively affected the safety of the domestic banking system. A significant improvement in the situation of the real sector, mainly the corporate sector, contributed to the improvement of performance indicators reflecting the stability of the banking system. The banks' favorable financial results were undoubtedly facilitated by the rapid pace of economic growth, including a very high level of individual consumption and investment demand. Meanwhile, in 2005, despite a noticeable decrease in economic growth, the threat to the efficiency and safety of the domestic banking system significantly decreased. This situation was largely due to the good overall economic situation and a

high level of development of the banking sector in the country. In 2006 – 2007, another increase in the economy was observed, thanks to which the threat to the stability of the system remained at a fairly low level. The revival visible in the economy improved the situation of banking sector clients, which favorably affected the growth in demand for financial services and the financial results of these institutions.

The year 2008 brought further challenges for the stability of the banking system. The current situation in the domestic banking sector was still stable, however, the emerging crisis in global markets meant that the risk of the banking system's activity in Poland significantly increased. The most significant source of risk was the decrease in mutual trust among banks due to events in the global financial market, which led to a reduction in liquidity in the domestic interbank market. Another problem for stability was also the emergence of unfavorable prospects related to economic growth - a slowdown in the pace of growth in the economy, also among the country's most important trading partners. This situation was associated with the possibility of high credit risk due to the decreasing ability of bank clients to service their debts. In the following year, the banking sector also remained under the very strong influence of the global banking crisis. In 2009, the trend of low economic growth pace was again visible, along with significant disruptions in the smooth functioning of the domestic banking sector. Despite these difficulties, the banking system in Poland remained stable. The most important factors shaping the macroeconomic situation in the country and the conditions for the smooth operation of the banking system in 2010 was the significant revival in the global economy, following the deep economic and financial crisis of 2008 – 2009.

The differences in the growth rate of the banking sector's assets seem to be higher than the GDP growth rate, which may indicate the dynamic development of the banking sector relative to the overall economy. It is also observable that in some periods there are mutual dependencies. GDP growth goes hand in hand with the growth of banking sector assets, suggesting a co-dependence between the economy and the banking sector. After periods of decline, we observe rapid recovery periods, which may indicate the economy and the banking sector's ability to adapt and regenerate after crises. As seen, after 2010, the ratio of banking assets as a share of GDP seems to stabilize, suggesting the banking sector's maturation relative to the overall economy.

GDP growth often signals an overall improvement in a country's economic condition, which can lead to an increase in the banking sector's assets. Economic growth usually means higher business activity, resulting in greater demand for banking services, such as loans and other financial products. Banks play a key role in financing economic activities, both for businesses and households. Therefore, the growth of banking assets can be both a result and a factor stimulating further economic growth, through increased lending and investment capacity.

During the analyzed period, the share of bank assets in Poland's GDP generally increased from 34% in 2000 to 66% in 2021. The highest level was reached in 2020, where bank assets constituted 73% of GDP. Poland joined the European Union in 2004, which opened its economy to European markets, attracting investments and increasing economic activity. The growth in bank assets could have been partly the result of greater investor confidence and better access to financing. The growth of small and medium-sized enterprises, supported by access to bank loans, could have contributed to the increase in bank assets. The development of SMEs stimulated demand for banking products, which in turn increased the assets of the banking sector. Technological development and innovations in the banking sector, including the introduction of online and mobile banking, could have attracted more customers and increased the amount of deposits and loans. Economic stability and low inflation could favor the growth of bank assets by increasing consumer and business confidence in financial institutions.

Despite the general upward trend, there were years when the share of bank assets in GDP decreased. The global financial crisis in 2008 and other local and international turbulences could affect the declines or slower growth of bank assets due to increased risk aversion, a decrease in investments, and increased caution in granting loans. The decrease from 70% in 2019 to 66% in 2021 may indicate various factors, such as changes in banking policy, the impact of global and local economic crises, or changes in the size of the economy.

The introduction of new regulatory regulations regarding capital and liquidity, both at the national and EU level, could limit banks' expansion possibilities through increased capital requirements. The development of fintechs and alternative financing methods, such as crowdfunding or peer-to-peer lending, could partially contribute to the reduction of traditional banks' share in financing the economy, which could affect the dynamics of bank asset growth.

The analysis shows that the banking sector in Poland has continuously grown relative to GDP for most of the analyzed period, indicating an increasing role of banks in financing the economy and enhanced stability and trust in the banking sector. Despite local fluctuations and global challenges, the banking sector in Poland has demonstrated the ability to grow and adapt, which can be a positive signal for the future of the economy.

The growth in bank assets usually translates into better access to financing for households and businesses, which can stimulate investment and consumption. If this growth is supported by appropriate supervision mechanisms and risk management, it can contribute to increasing the country's financial stability.

The dynamics of bank asset growth can also reflect changes in the market structure, including the consolidation of the banking sector and increasing competition from new financial players. In summary, the bank sector assets as a share of Poland's GDP from 2000-2021 were shaped by a

range of factors, both internal and external. This growth reflects positive trends in the economy but also highlights the need for continuous monitoring and adjusting regulations and banking strategies to the changing environment. The above data indicate the strengthening of the banking sector in Poland in the context of the country's overall economic growth. The stabilization of the ratio of banking assets to GDP in recent years may suggest the stabilization of the banking sector's role in the economy.

In 2000, the bank sector assets in Hungary accounted for 41% of Hungary's GDP. This relatively low level began to increase in subsequent years. Like Poland, Hungary joined the EU in 2004, which opened the doors to larger foreign investments and better access to capital. This could have favored the development of the banking sector through increased demand for financial services. Direct foreign investments could have contributed to the growth of bank assets by increasing economic activity and demand for banking services. Political decisions and economic reforms, including those affecting the banking sector, could have favored the growth of bank assets by facilitating access to loans and other financial services.

The most dynamic growth of assets occurred in the years leading up to the global financial crisis in 2008 when the share of bank sector assets in GDP rose to 84%. This could indicate intense development of the banking sector, increased lending activity, and the impact of foreign direct investments and capital in the banking sector.

The financial crisis had a significant impact on the banking sector in Hungary, as in other countries. Decreased trust in financial institutions, economic difficulties, and declining lending capacity could limit the growth of bank assets. The introduction of additional banking taxes and other restrictions for financial sectors could affect the profitability of banks and their ability to accumulate assets. The introduction of new regulations on capital and liquidity, both at the national and European levels, could influence banks' strategies and their assets. A decrease in the share of bank assets in GDP in the years immediately following the crisis is visible, which may reflect tighter credit conditions, decreased demand for loans, and overall economic slowdown.

After the initial decline following the crisis, the share of bank assets in GDP began to gradually increase, reaching 58% in 2021. This increase could be the result of economic recovery, improved conditions in the credit market, and further investments in the banking sector. The growth in bank assets may indicate improved access to financial services for businesses and households, which fosters investment and economic development.

The financial crisis had a significant impact on the banking sector in Hungary, evident in the decrease in the share of bank assets in GDP. This shows the sector's sensitivity to global economic shocks. The gradual rebound after the crisis and the increase in the share of bank assets in GDP in subsequent years testify to the sector's ability to regenerate and adapt to changing economic

conditions. Greater bank assets can contribute to the country's financial stability, helping financial institutions better cope with economic shocks. The dynamics of bank assets can influence policy decisions regarding the regulation of the financial sector, economic stimulation, and public investments. Macroeconomic stability is crucial for the healthy development of the banking sector, as seen in the case of Hungary. Economic growth, stable inflation, and investor confidence contribute to the growth of bank assets. The banking sector in Hungary showed the ability for rapid growth in periods of economic prosperity but also vulnerability to global risk factors, as seen during the financial crisis. After the crisis, the sector showed gradual reconstruction and stabilization, which may indicate increased resilience and adaptation to changing economic conditions. The growth of banking assets before the crisis and their decline during the crisis show the important role this sector plays in the economy and how sensitive it is to global economic changes.

In summary, the banking sector's assets in Hungary from 2000-2021 were characterized by growth dynamics and declines. The changing ratio of banking assets to GDP in Hungary indicates dynamic interaction between the banking sector and the broader economy, reflecting the impact of both internal and global economic factors.

From 2000 to 2021, Slovakia experienced significant economic growth. It's important to note the GDP growth rates in different periods. Bank sector assets as a share of Slovakia's GDP increased from 62% in 2000 to 79% in 2021. This significant growth indicates the increasing role of the banking sector in the country's economy. Slovakia's accession to the European Union in 2004 and to the eurozone in 2009 had a significant positive impact on the development of the banking sector. These steps increased investor confidence, attracted investments, facilitated access to capital, and created more opportunities for cross-border banking activities, easing access to new markets and sources of financing. Investments in financial technologies, improvements in banking services, and the development of online and mobile banking contributed to the increase in efficiency and accessibility of services, boosting bank assets. Active lending policies of banks, supported by stable macroeconomic conditions and low-interest rates, favored asset growth. An expanded offering of deposit products attracted additional funds from savers. The GDP decline in 2009 was a direct consequence of the global financial crisis. At the same time, the growth of banking sector assets suggests that banks may have increased their activity in response to the crisis, perhaps as part of stimulus measures or greater demand for banking services in the face of economic uncertainty. During this period, the banking sector in Slovakia underwent a process of modernization and consolidation. Key was the entry of foreign banks into the Slovak market, which affected the increase in competitiveness and innovation in the industry, which in turn could lead to the growth of banking assets. This competition could also affect the availability and conditions of lending, impacting economic growth.

Like other countries, Slovakia also felt the impact of the global financial crisis, but the effects on the banking sector were less severe than in some other countries. The Slovak banking sector demonstrated resilience, which can be attributed to a conservative approach to risk management.

After a brief period of stabilization, the banking sector in Slovakia continued to grow, supported by economic recovery, a stable macroeconomic environment, and the healthy fundamentals of the economy. Slovakia's stable economic growth, especially in the second decade of the 21st century, contributed to increased demand for financial services, including loans for businesses and households. Banking assets also generally grew, except for a decline in 2012 and 2015. Significant increases were noted in 2007, 2008, and from 2018 to 2021. The growth of banking assets in 2020 and 2021, despite relatively small changes in GDP, may reflect the banking sector's response to the pandemic, including an increase in lending or other forms of financial support for the economy. The banking sector in Slovakia grew faster than the economy for most of the studied period, especially in recent years. Macroeconomic stability, investor confidence, and thoughtful regulations have contributed to the growth and stability of the banking sector in Slovakia.

An important indicator is the ratio of the total assets of the banking sector to the country's GDP. The percentage values of this ratio help understand the share that banks had in the country's economy over the years. Changes in this indicator can signal the greater significance of the financial sector and its consolidation. The growth of this indicator may indicate not only the growing role of banks in the economy but also potential risks associated with excessive financial leverage. The introduction of new banking regulations in the EU, including Basel III and MIFID II directives, had a significant impact on bank activities, which could affect the growth of banking assets, as banks adjusted to new capital and liquidity requirements and risk management.

A particularly noticeable increase in the percentage share of banking assets in GDP occurred in 2020 and 2021, which may indicate increased banking activity or slower economic growth. The growing share of banking assets in GDP may indicate a greater role of banking financing and investment in the economy. This could be the result of both the development of the financial market and changes in the economic structure of Slovakia, where the financial services sector has gained importance.

The Slovak banking sector has demonstrated the ability to cope with global financial shocks, which is an important indicator of financial health and risk management in banks.

In summary, the banking sector in Slovakia has shown dynamic growth and significant development from 2000 to 2021, playing an increasingly important role in the country's economy. A stable macroeconomic environment, integration with the European Union, and effective risk management have contributed to this success, strengthening the banking sector's position as a key component of Slovakia's financial and economic system. The modernization of the banking sector

and the introduction of new technologies have contributed to increasing the competitiveness of banks and promoted innovation in offering financial products and services. The result of these changes is a stronger and more stable financial system capable of supporting the country's economic development.

The introduction of new financial regulations aimed at increasing stability and security in the banking system could temporarily limit the dynamics of bank asset growth by introducing stricter capital and liquidity requirements. The Slovak banking sector has gained in stability and trust, which is crucial for long-term economic development.

The Czech Republic recorded a gradual but stable increase in GDP over two decades, except for declines in certain years, e.g., in 2020, likely reflecting the impact of global economic events. The analysis of banking sector assets as a share of GDP for the Czech Republic from 2000 to 2021 reveals interesting trends in the development of the country's banking sector. The share of banking sector assets in Czech GDP started at 48% in 2000 and increased to 71% in 2021. This significant increase indicates gradual and stable development of the banking sector. Czech Republic joined the EU in 2004, which had a significant impact on further development of the banking sector. Integration with the European market attracted foreign investments, increased competitiveness of the banking sector, and improved its stability through access to larger markets and capital. Integration with the European Union was an important growth factor for the banking sector, enhancing its investment potential and opening up new development opportunities.

Similar to other countries, the financial crisis in 2008 also affected the Czech Republic, introducing a period of increased uncertainty and caution among both consumers and financial institutions. The introduction of new regulations aimed at increasing stability and security in the banking system may have temporarily impacted the operating costs of banks and limited the expansion of their assets. However, the effects on the banking sector were relatively limited compared to other countries. Czech banking sectors demonstrated resilience, which may be attributed to a conservative approach to risk management and banking regulations.

After the financial crisis period, the Czech banking sector continued its stable growth, supported by the country's healthy economic fundamentals, low inflation, and fiscal and monetary policies supporting economic development. The macroeconomic stability of the Czech Republic was crucial for the development of the banking sector, enabling banks to expand and increase their share in financing the economy. The Czech banking system demonstrated resilience to global financial crises, which is an important indicator of financial health and effective risk management. The increase in the share of banking assets in GDP underscores the growing role of the banking sector in financing economic activities in the Czech Republic, both for businesses and households.

The Czech banking sector from 2000 to 2021 was characterized by stable growth, supported by stable macroeconomic conditions, EU accession, resilience to global crises, and effective banking regulations. This growth reflects the increasing importance of the banking sector in financing the economy and indicates its health and development potential. Stable macroeconomic conditions favored investments and business development, thereby increasing demand for financial services, including credit. Although the Czech Republic did not adopt the euro, its integration with the European Union since 2004 had a positive impact on the banking sector by increasing trade and investment flows with other EU countries. Many Czech banks were acquired by large international financial groups, introducing capital, modern technologies, and management practices. This, in turn, contributed to the growth of banking assets and the development of product offerings. Diversification and development of these offerings, including the introduction of innovative banking services and financial technologies, attracted new customers and increased banking assets. The growth of banking assets supported the development and increased availability of financial services, which supported investment and consumption in the economy.

The percentage share of banking sector assets in GDP significantly increased during the analyzed period, especially in 2020 and 2021, reaching levels of 0.6818 and 0.7079. This means that banking sector assets constituted about 68.18% and 70.79% of GDP in those years. These data indicate the growing role of the banking sector in the Czech economy, especially in the last years of the analyzed period. The banking sector not only grew faster than the overall economy, but its assets constituted an increasingly larger percentage of GDP, which may indicate increasing financialization of the economy. This signifies strong growth and the increasing importance of the banking sector in the Czech economy over the last two decades. An increase in stability and maturity of the sector is noticeable, which is key to the country's financial health.

The development of the banking sector in subsequent years and the increase in its assets contributed to greater financial stability in the Czech Republic, which is crucial in the face of external economic shocks. The presence of international financial groups and the development of technology have influenced market competitiveness, facilitating the introduction of further innovative products and services.

As seen, Poland began the period with one of the lower indicators compared to Hungary, Slovakia, and the Czech Republic, but over the years, it reduced this difference, especially concerning the Czech Republic and Slovakia. Slovakia and Hungary showed significant increases in the share of banking assets relative to GDP, reaching 79% and 58% respectively in 2021. The growth in Slovakia was particularly impressive, considering that it was 62% in 2000. Czechia started with a high share of banking assets in GDP (48% in 2000), but its growth was more stable and less dynamic than in the case of the other countries, reaching 71% in 2021. This is an interesting

observation, indicating the diversity of strategies and experiences in the development of banking sectors in Central and Eastern Europe.

Safety, which is a fundamental parameter for assessing the stability of the banking sector, can be measured using the solvency ratio of banking institutions. The solvency ratio is a basic measure of the capital adequacy of the banking sector as well as individual financial institutions. Solvency is a fundamental indicator of banking activity that also has a significant impact on stability in the entire system. Its protection is provided by banks' equity, which is also the subject of prudential regulation. The requirements set by banking law stipulate that banks should have funds adjusted to the scale of their activities to ensure economic safety. Therefore, solvency serves to determine the capital adequacy of banks and is simply defined as the ratio of a bank's own funds to the total capital requirement. In its assessment, primarily the fact of meeting the established prudential norms should be taken into account, hence there is a necessity to meet the minimum statutory requirement regarding the level of this ratio. A bank is thus required to maintain a solvency ratio of at least 8%. However, although solvency determines the degree of risk coverage by banks' own capital, its maximization is not beneficial for these institutions, as a significantly higher level of this ratio indicates inefficient use of own funds. Therefore, it is considered that its value should oscillate in the range of 10 – 15%. (Marcinkowska, 2007)

The primary goal of the amendments made to the credit institutions' own funds account under the CRR Regulation was to enhance the quality of own funds by reinforcing Tier 1 capital. It was emphasized that Tier 1 capital would be utilized to offset current losses, while Tier 2 capital would be used to meet creditor demands in the event of the institution's insolvency. Additionally, Tier III capital, which was previously used to cover trading book risks, has been eliminated. Consequently, the composition of a credit institution's own funds now solely includes Tier 1 capital (both core and supplementary) and Tier 2 capital.

Throughout the banking sector since the beginning of the 21st century, solvency has never fallen below the minimum threshold required by prevailing prudential standards. However, it should be noted that this situation does not entirely preclude instances where individual banks faced difficulties in maintaining this ratio at the required 8% level. We can also observe that during the discussed period, this indicator shows an increasing trend. The visible upward trend of this indicator results from improving economic conditions, safer banking operations, and the emergence of strategic investors interested in bank development.

Table 27 Capital requirements according to CRD IV / CRR

Capital buffer for systemically important banks	Buffer for systemic risk	Anti-cyclical buffer	Fixed security buffer
CRD IV art. 131	CRD IV art. 133, 124	CRD IV art. 130, 135-140, CRR 440	CRD IV art. 129
Mandatory buffer from 2016 for global entities indicated by EBA. At the level 1 – 3.5% of the bank's total exposure according to the EBA classification. Additional from 2016 for other systemically significant banks. The maximum value of 2% of the bank's total exposure.	Additional CET 1 capital buffer used by national authorities for all or part of banks to prevent and reduce long-term non-cyclical system or macro-prudential risks not covered by the Regulation: -from 2014, at the level of 0 - 3%, it requires notification to: European Commission EBA and ESRB; -from 2015, at the level of 3-5%, it requires the opinion of the Commission; -more than 5% requires the approval of the Commission and the issuing of the relevant implementing act, taking into account the opinions provided for by the ESRB and EBA.	Macro-prudential buffer estimated on the basis of loans to GDP. Up to 2.5% of risk-weighted assets. Under the poor economic conditions, the measures, by the competent authority are released, to liven up the lending. If the institution does not fully meet the buffer requirement, it is subject to restrictions on the payment of profits.	Mandatory capital buffer equal to 2.5% of the bank's total exposure, covered only in CET 1 (gradual coming to the level of 2.5%). Where the institution does not fully meet the buffer requirement, it is subject to restrictions on the payment of profits.

Source: own elaboration based on Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms, amending Regulation (EU) No. 648/2012 (Official Journal EU L 176/1) and Directive 2013/36 / EU of the European Parliament and of the Council of 26 June 2013 on the conditions for the admission of credit institutions to operate and prudential supervision of credit institutions and investment firms, amending Directive 2002 / 87 / EC and repealing Directives 2006/48 / EC and 2006/49 / EC (OJ EU L 176/338).

Table 28 Own funds' account of credit institutions

Tier I capital	Tier II capital
Tier I core capital: -positions and instruments -deductions	-positions and instruments -deductions
Tier I additional capital: -positions and instruments -deductions	

Source: own elaboration based on Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms, amending Regulation (EU) No. 648/2012 (Official Journal EU L 176/1) and Directive 2013/36 / EU of the European Parliament and of the Council of 26 June 2013 on the conditions for the admission of credit institutions to operate and prudential supervision of credit institutions and investment firms, amending Directive 2002 / 87 / EC and repealing Directives 2006/48 / EC and 2006/49 / EC (OJ EU L 176/338).

The chart below illustrates the solvency of the banking sector in Central European countries from 2000 to 2021.
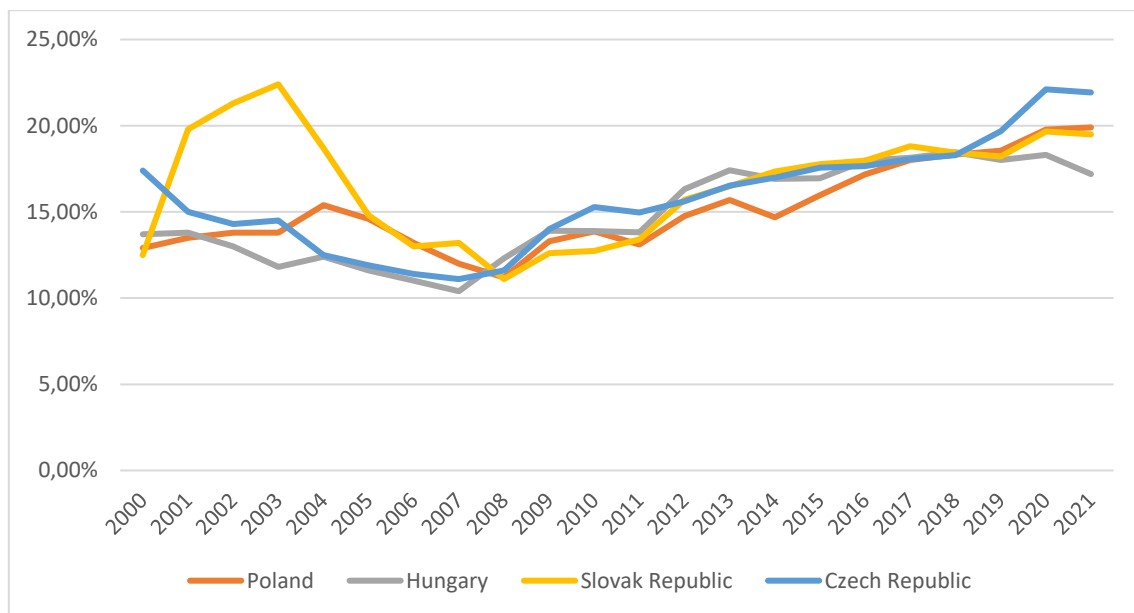
Chart 42 Solvency of the banking sector in Central European countries from 2000 to 2021

Source: own elaboration based on FRED, 2023, Our World Data, 2023 and The Global Economy, 2023
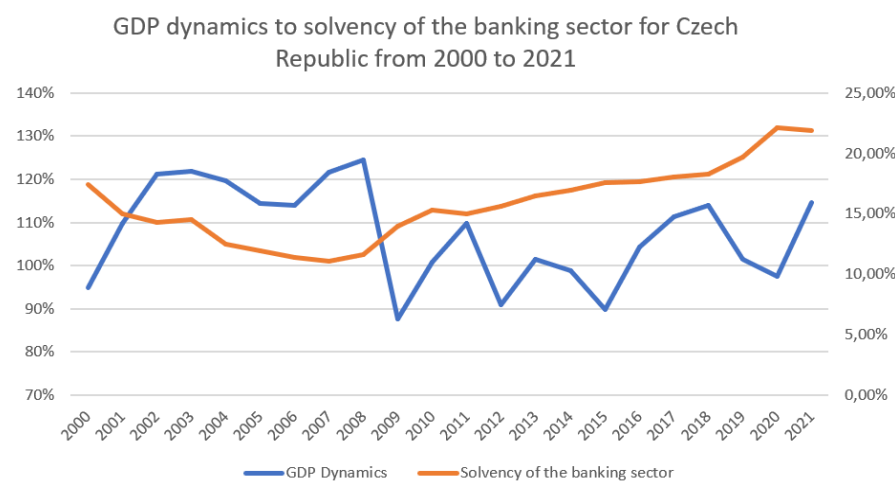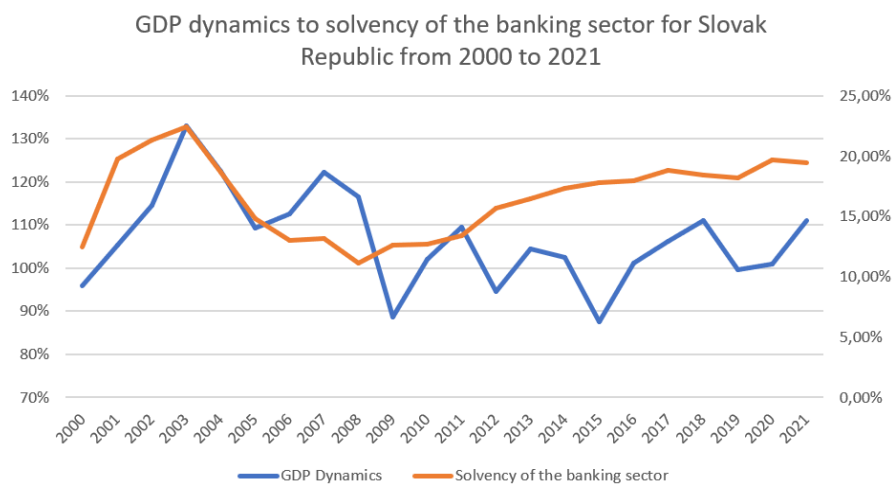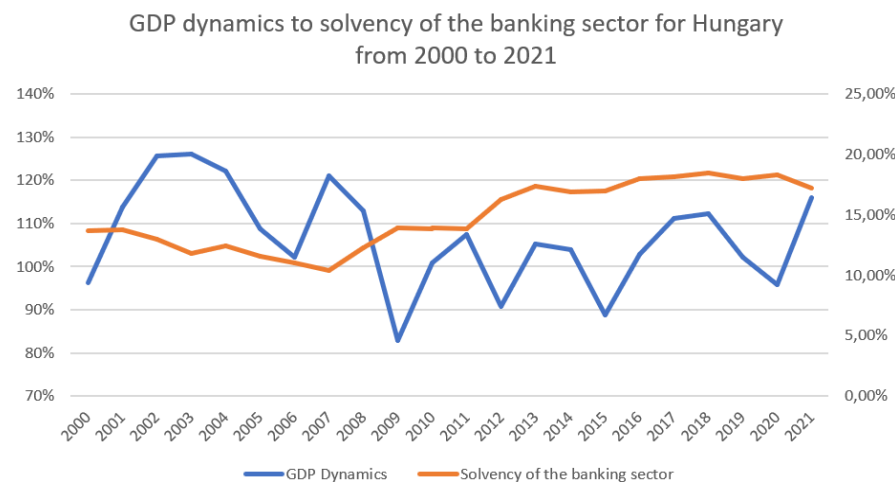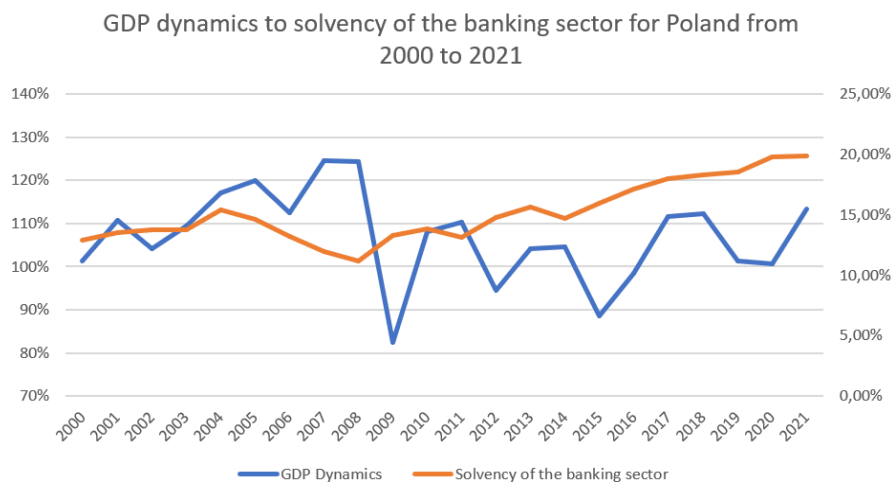
Chart 43 Solvency of the banking sector in Central European countries against economic fluctuations in the years 2000 – 2021

Source: own elaboration based on table 17 and chart 42

The analysis of the solvency ratio for Poland from 2000 to 2021 shows how the level of regulatory capital in the banking system relative to risk-weighted assets has changed over time. The solvency ratio is a significant indicator of financial safety, indicating a bank's ability to cover potential losses using its own capital. The value of this ratio indicates the percentage of a bank's capital relative to its assets, with higher values signifying better capital adequacy.

Over the years 2000-2021, this ratio generally exhibited an increasing trend. The lowest level was reached in 2007, with the ratio standing at 12%. The highest value was achieved in 2021, reaching almost 20%.

The strong economic slowdown in 2001 – 2002 also did not negatively affect the solvency ratio in the Polish banking sector. The level of the solvency ratio indicates that at that time, banks were capable of absorbing unexpected losses, so the worsening macroeconomic indicators did not negatively impact their further safe operation.

In the following years, with the improvement of the economy's condition, there was a significant increase in the solvency ratio. In 2004, it reached the highest level in the analyzed period at 15.4%, which was beyond the range considered optimal (8 – 15%). Due to the fact that such a high ratio indicates inefficient use of own funds during a favorable economic climate, it gradually decreased in the subsequent years. Moreover, in 2007, as a result of new regulations related to adapting national law to European Union standards, a package of adopted resolutions caused a change in the total capital requirement, which was not balanced by an adequate increase in own funds. Consequently, a significant decrease in the solvency ratio was noticeable. However, considering the favorable prospects for the development of the banking sector at that time, these changes should not be assessed negatively. (KNF, 2008)

In 2008, due to disturbances on the global financial market and weakening economic conditions, the solvency ratio was at 11.2%. While this ratio was still above the required prudential minimum, a significant reduction in banks' ability to absorb possible losses resulting from the deterioration of the quality of previously timely-regulated loans was observable. In the following years, the allocation of a large part of the profits earned in previous years by banks to increase their own funds, along with a significantly lower pace of lending activities, contributed to a higher level of the solvency ratio. However, with further unfavorable forecasts related to the economic situation and the deterioration of banks' loan portfolios' quality in 2009, the increase in the solvency ratio to 13.3% only slightly affected the ability to absorb potential losses. (KNF, 2009a) In response to the global financial crisis of 2007-2008 and the European debt crisis, Polish banks increased their capital reserves. Banks also made shifts in the structure of their assets, opting for investments with lower risk, thereby reducing the required level of regulatory capital while maintaining adequate solvency. Strengthening banking supervision in Poland may have contributed to greater discipline

in risk and capital management by banks, resulting in an improvement in the solvency ratio. Such an increase in the solvency ratio is a natural response to the growing perception of credit and investment risk.

From 2010 to 2021, the solvency ratio consistently increased, which may indicate strengthening financial stability in the Polish banking system and increasing resilience to potential crises. The years 2016-2021 are characterized by particularly high growth in the ratio, exceeding 17%, which may indicate good risk management and an appropriate level of capital. Indicating increasing financial stability of the banking sector in Poland.

Tu sum up the Polish economy showed stable growth during the analyzed period, which could contribute to the growth of banks' capital. Additionally, European Union regulations (e.g., Basel III) forced banks to increase regulatory capital. A higher capital adequacy ratio contributes to the banking sector's greater resilience to financial crises, which in turn favours economic stability.

Over the years, the Polish banking system has increased its solvency, which is a positive signal for the country's financial security. The increase in the solvency ratio may also indicate strengthened regulation and banking supervision, as well as a growing awareness of risk management in Polish banks. At the same time, banks' investment and lending strategies, which may have changed in response to economic conditions and shifting credit demand, also influenced the level of regulatory capital. All these aspects interact in a complex manner, creating a system that evolves towards greater stability and financial security.

Analyzing the solvency ratio for Hungary from 2000 to 2021, one can observe how the Hungarian banking system's ability to cover potential losses from its own capital evolved, which is crucial for assessing the financial stability of banks. At the beginning of the period under analysis, in 2000, the ratio stood at 13.7%, which is a moderate value suggesting relatively stable capital situations in banks. In the following years, some fluctuations can be noticed – a decline to 10.4% in 2007, which may be associated with the onset of the global financial crisis and indicate increased risk in the banking sector or greater involvement in higher-risk assets requiring more regulatory capital.

The global financial crisis had an impact on banking systems worldwide, including in Hungary. In response to the crisis, banks likely increased their equity capital to strengthen their position and build reserves for future economic turmoil. This could have led to an increase in the solvency ratio in the years following the crisis. After 2007, the solvency ratio began to steadily increase, suggesting that Hungarian banks gradually started to increase their regulatory capital, likely in response to lessons learned from the financial crisis and new regulations requiring a stronger capital base. Basel agreements, which impose international capital and liquidity standards on banks, may also have contributed to the ratio's growth. The implementation of Basel II and III in Europe, including in Hungary, required banks to maintain higher levels of capital.

In 2013, this indicator reached 17.42%, indicating a significant strengthening of the capital position of Hungarian banks, perhaps in preparation for stress tests or in response to new Basel requirements. Central bank decisions on interest rates and credit policy could affect banks' profitability and thus their ability to accumulate capital. During periods of lower interest rates, banks may increase profits from loans, resulting in capital growth.

The highest level of solvency ratio was achieved in 2016, when it reached 17.97%. Such a high value may indicate that Hungarian banks had significant capital surpluses, which is advantageous from a risk management and resilience perspective. During periods of economic growth, there is usually an increased demand for banking services, which can lead to higher profits and, consequently, to an increase in regulatory capital.

After 2016, a slight decrease in the ratio can be observed, which may indicate changes in risk-weighted assets or banking strategies. The decline to 17.2% in 2021 still maintains a relatively high level, suggesting a healthy capital position.

In summary, over the period 2000-2021, the banking system in Hungary showed a tendency to strengthen its capital base, which is a positive phenomenon in terms of the country's financial stability. The clear increase in the solvency ratio after the financial crisis indicates that Hungarian banks adopted a more cautious approach to risk management and capital enhancement, which may result from both internal management decisions and the introduction of stringent regulatory provisions. Several factors influenced the solvency ratio of Hungary during the study period, such as international financial crises, changes in banking regulations, credit policy, economic growth, macroeconomic conditions, political stability, and real estate market dynamics. All these elements combined contributed to the observed changes in the level of regulatory capital in the Hungarian banking system. Good management of macroeconomic risk contributed to the improvement of the solvency ratio.

The solvency ratio reflects banks' ability to absorb losses and is an important measure of their financial stability, also for the Slovak banking system.

In 2000, the solvency ratio was 12.5%, indicating moderate levels of capital relative to risk. The following year saw a significant jump to 19.8%, which may indicate consolidation of the banking sector, increase in equity capital, or changes in banking regulations increasing capital requirements. From 2001 to 2003, further growth in the ratio can be observed, reaching 22.4% in 2003. This is significantly above the levels recorded for other surveyed countries, which may suggest a very conservative risk management model and specific market conditions for Slovakia. In 2004, Slovakia joined the European Union, opening the way for deeper integration with the European banking system and increasing requirements for the solvency ratio. After joining the EU, the Slovak banking sector could benefit from increased investor and customer confidence, leading to

growth in deposits and financial stability. As a developing economy, Slovakia attracted foreign capital, including foreign direct investment, which could support the local banking system.

In the following years, the solvency ratio began to stabilize, oscillating around 17-19%. Similarly to other countries, the global financial crisis may have led to tightening regulations regarding capital, prompting Slovak banks to increase their capital reserves, as evidenced by the growth in the ratio after 2008.

In 2010, the solvency ratio again decreased to a level similar to the beginning of the decade, which may reflect the effects of the financial crisis of 2008-2009 and the need for bank recapitalization.

After adopting the euro in 2009, Slovakia became subject to the ECB's monetary policy, which could have influenced credit conditions and risk management in the banking sector. The implementation of new Basel regulations, which introduced higher capital requirements, likely contributed to the increase in the ratio in subsequent years. This is evident in the period from 2011 to 2021, where the ratio again increased, reaching levels above 17%, indicating a gradual strengthening of the capital stability of the Slovak banking system.

Overall, apart from the financial crisis period, the solvency ratio in Slovakia was relatively high, which may indicate strong capital positions of Slovak banks. A higher solvency ratio is a positive phenomenon because it means that banks have an adequate capital buffer for unexpected losses, contributing to the overall financial stability of the country.

Slovakia, as one of the faster-growing EU members, experienced significant economic growth, which could translate into better financial performance of banks and enable them to accumulate more capital. The increase in the solvency ratio in Slovakia during the analyzed period may be the result of a combination of factors, such as regulatory changes after joining the EU, the effects of the global financial crisis, stable economic development, and the impact of monetary policy after the introduction of the euro. All these elements contributed to increasing the resilience of the Slovak banking sector by building a stronger capital base.

Analyzing the period from 2000 to 2021 allows for an assessment of how the proportion of regulatory capital to risk-weighted assets of banks changed during this period. The solvency ratio is a key indicator of banks' ability to cover potential losses, and its high value indicates greater resilience of the banking system to financial crises.

Looking at the solvency ratio of the Czech banking system, we can see that at the beginning of the analyzed period, in 2000, it was 17.4%, which is a relatively high value compared to other countries in the region, indicating a solid capital position of Czech banks. In the early years of the decade, we observe slight fluctuations in the ratio, but it remains at a relatively stable level of around 15%.

In 2007, the solvency ratio slightly decreased to 11.1%, which may reflect the effects of the global financial crisis and the need for bank recapitalization to maintain liquidity and financial stability. The financial crisis of 2007-2008 had a global reach and prompted many countries to review their financial regulation systems. The increase in the solvency ratio after 2008 may reflect the implementation of remedial measures by Czech banks, such as increasing core capital.

Despite the global crisis in the years 2008-2009, the solvency ratio in the Czech Republic increased, which may indicate effective risk management and good regulatory practices. Basel II and III standards, adopted in response to the financial crisis, increased capital requirements for banks. The increase in the ratio in the Czech Republic may indicate adaptation to these new regulations, especially regarding the quality and quantity of regulatory capital.

Since 2010, there has been a visible increase in the ratio, reaching values exceeding 15%. This may be the result of the implementation of new regulations and greater emphasis on bank capital stability following crisis experiences. The Czech central bank and other supervisory authorities tightened national regulations concerning the banking sector, resulting in better risk management and increased bank capitalization.

In the last years of the analyzed period, especially after 2015, the ratio remained at a high level, often exceeding 18%, indicating a durable strengthening of the capital base of Czech banks. The Czech Republic is an example of a relatively stable economy in Central Europe. Stable economic growth, low unemployment, and moderate inflation may have contributed to improving the quality of banks' credit portfolios and enabling the increase in own capital. Risk management by Czech banks could have contributed to maintaining a high solvency ratio, as a cautious approach to lending reduces the risk of default. The development of the financial services market in the Czech Republic, including increased competitiveness of banks, may also have contributed to the increase in the ratio through more efficient capital management.

In summary, the Czech banking system demonstrates a strong capital position over the period 2000-2021, which may result from a conservative approach to risk management, effective regulatory supervision, and stable economic development in the country. The high solvency ratio in the Czech Republic suggests that banks were well prepared for potential financial disturbances, which is crucial for maintaining investor and customer confidence in the banking system. Overall, this indicates a healthy financial structure of Czech banks and their good resilience to potential economic disruptions. Analyzing the charts related to the capital adequacy ratio against GDP dynamics in Central European countries, it can be stated that all four countries recorded an increase in the capital adequacy ratio during the analyzed period. Slovakia and Poland show a greater increase in the ratio than Hungary and the Czech Republic. The average values of the ratio indicate a stable capital position of the banking sectors relative to each country's economy. The highest

average ratio and the largest increase were recorded in Slovakia, while Hungary had the lowest average value and the smallest increase in the ratio during the analyzed period. These increases testify to the enhancement of financial stability of banks in these countries through strengthening their capital base relative to risk.

Solvency in the banking sector increases during economic slowdowns and decreases as operating conditions improve. The increase in the solvency ratio achieved under deteriorating economic conditions through reduced use of own funds along with their augmentation by allocating previously earned profits, as well as tightening credit policy, aims to enhance operational security by accumulating own funds for the potential necessity to cover due liabilities in case of difficulties in settlement by bank customers. Conversely, increasing the use of own funds, reflected in a decrease in the solvency ratio noticeable during an improvement in overall macroeconomic indicators, affects a riskier and more efficient use of own funds to achieve greater profit from activities conducted in a stable environment.

The Z-score indicator is a measure of the insolvency risk of the banking system. Its application lies in assessing the financial stability of banks, more precisely, in estimating the probability of their insolvency. The Z-score is calculated as the sum of the return on equity (ROE) and the capital adequacy ratio (CAR) to the standard deviation of the return on equity. The formula for the Z-score looks as follows:

$$Z - score = \frac{ROE + CAR}{\sigma(ROE)}$$

Where:

- ROE (Return on Equity) is the return on equity.
- CAR (Capital Adequacy Ratio) is the capital adequacy ratio, which determines the bank's ability to cover its risks with its own capital.
- $\sigma(ROE)$ is the standard deviation of the return on equity, measuring the volatility of this return.

The higher the Z-score, the lower the risk of a bank's insolvency. A high Z-score indicates a large capital buffer of the bank and the stability of its profits, which reduces the probability of insolvency. Conversely, a low Z-score signifies greater risk, as it indicates a smaller capital buffer and greater volatility of profits. The Z-score indicator is particularly useful in the context of assessing systemic risk in the banking sector.
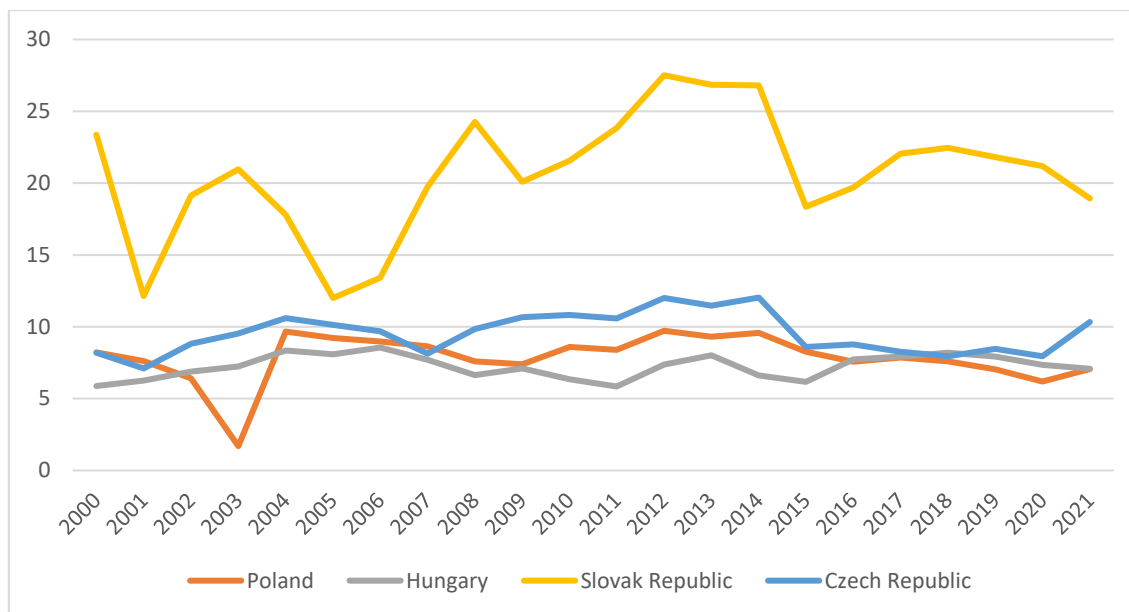
Chart 44 Z-score Indicator in Central European Countries in the years 2000 -2021

Source: own elaboration based on Fred, 2023 and The Global Economy, 2023

Its value helps understand how changes in market conditions can affect the financial stability of banks. This tool allows for a better assessment of banks' resilience to financial and economic crises. The Z-score indicator is widely used in analyses and studies concerning the stability of banking systems, both at the level of individual institutions and the entire banking sector. It is a helpful tool in assessing systemic risk and in the supervisory process. It is especially useful in the context of assessing systemic risk in the banking sector. Its value helps understand how changes in market conditions can affect the financial stability of banks. This tool allows for a better assessment of banks' resilience to financial and economic crises.

The applications of the Z-score indicator are very broad because:

- The Z-score enables the comparison of financial stability among different banks. Banks with a higher indicator are considered to be more stable and safe.
- Regulators use the Z-score to monitor the financial health of banks.

A high indicator may indicate a lesser need for regulatory intervention, while a low indicator may suggest the necessity for increased oversight and potential recapitalization:

- This indicator is used for assessing systemic risk in the banking sector, allowing for the identification of institutions that could pose a threat to financial stability.
- The Z-score is often utilized in academic research to analyze the impact of macroeconomic policy and regulations on the stability of banking sectors.
- Investors can use the Z-score to evaluate the risk associated with investments in specific banks or the banking sector as a whole.
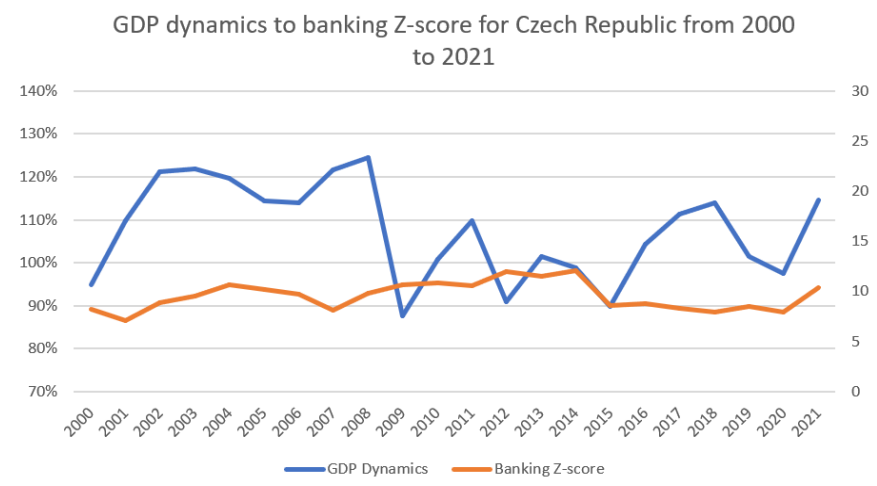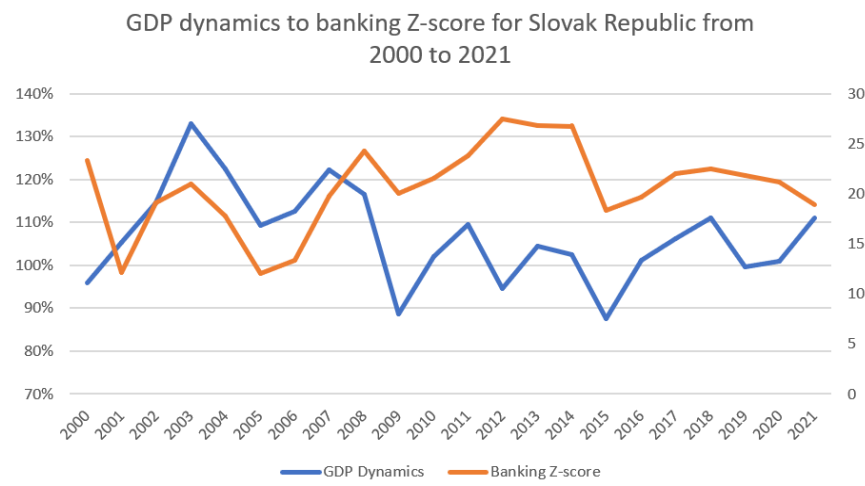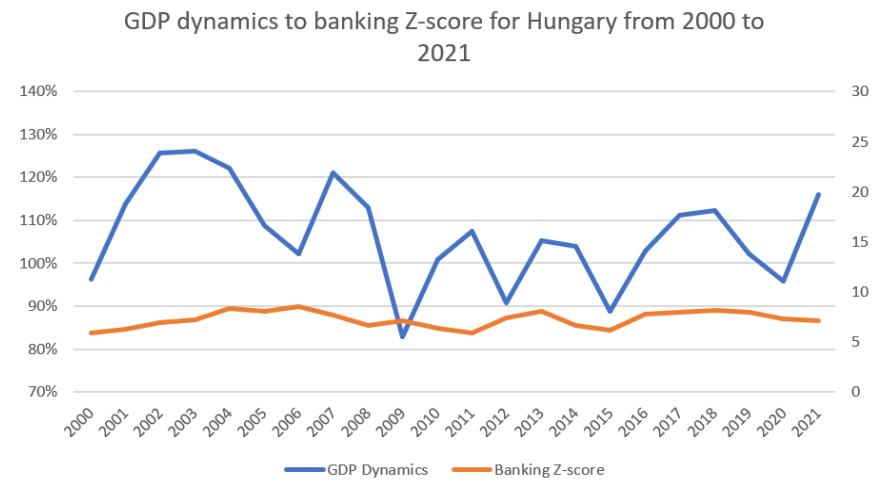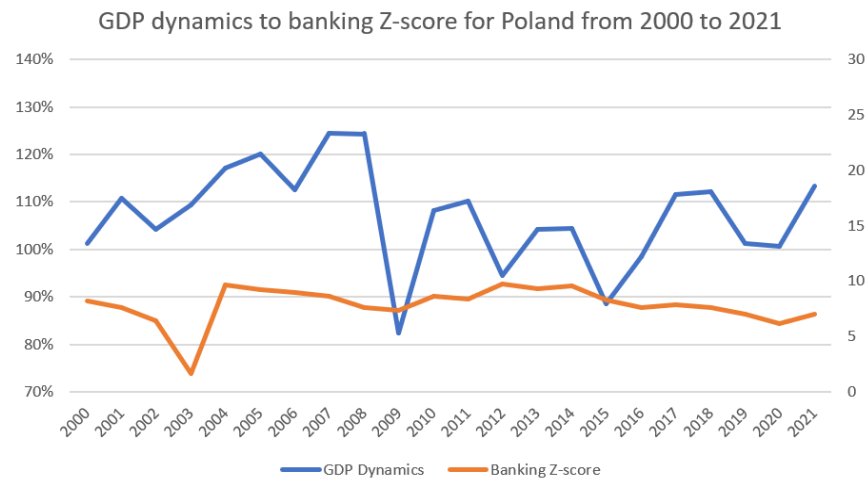
Chart 45 Z-score Indicator in Central European Countries countries against economic fluctuations in the years 2000 - 2021

Source: own elaboration based on table 17 and chart 44

Unfortunately, there are limitations to the use of the Z-score indicator. This indicator is based on historical data, which means it does not always accurately predict future risks. Different business models and strategies of banks can affect the interpretation of the Z-score, making comparisons between different institutions difficult. In periods of high market volatility, the standard deviation of ROE may be higher, affecting the Z-score result. Changes in capital regulations can affect the CAR, and thus the Z-score result. Despite these limitations, the Z-score remains an important tool for assessing the insolvency risk of banks and analyzing the stability of banking sectors worldwide.

The Z-score is often used in international comparisons, which allows for the assessment of the stability of banking systems in different countries. This enables the identification of global trends and potential cross-border threats. Banks can use the Z-score internally as part of their risk management procedures, assessing their sensitivity to various market scenarios. The Z-score and its implications can increase awareness about banking risk among investors and bank clients. This indicator is important for macroprudential policy aimed at preventing financial crises through the monitoring and regulation of systemic financial risks.

In summary, the significance of the Z-score indicator for the stability of the banking system is immense. It aids in assessing the insolvency risk of individual banks, influences regulatory decisions, limits systemic risk, and builds trust among market participants. However, its effectiveness depends on the accuracy of the input data and the context in which it is used, and it should be complemented by other risk assessment measures. This comprehensive approach allows for a more precise assessment of the stability of banks and the entire banking system.

Analyzing the Z-score indicator in the banking system of Central European countries reveals interesting relationships between this indicator and the GDP dynamics in individual countries from 2000-2021.

Economic growth and the expansion of the banking sector in Poland initially could have led to an increase in the Z-score. At the beginning of the period (2000-2002), the Z-score showed a downward trend, starting from 8.21 in 2000 to 6.41 in 2002. This decrease may be associated with a global economic slowdown following the bursting of the internet bubble, which could have affected the profitability of banks. It may indicate increased risk in the banking sector or changes in the profitability or capitalization of banks. The drastic drop in the Z-score in 2003 to a level of 1.69 may be a result of specific events in the Polish market or changes in monetary policy that could have affected the stability of the banking sector. This is the year when significant changes in financial supervision in Poland occurred, which could have influenced the banks' performance.

From 2004 to 2007, the Z-score for Poland quickly recovered, reaching stable levels within 8-9. This indicates an improvement in stability and the potential adaptation of banks to changing market conditions.

In 2008, at the beginning of the global financial crisis, the Z-score for Poland again decreased, but not as drastically as in 2003, which may indicate better resilience of the banking system to external shocks compared to the previous crisis. The slight decrease in the ratio during this period may reflect increased investments in risky assets in search of higher returns, which increases the volatility of bank profits. The smaller decline in the Z-score in Poland compared to some other countries may reflect better stability of the banking sector in Poland and effective actions taken in response to the crisis.

In the period 2009-2011, we again observe an increase in the Z-score, indicating that the banking sector is stabilizing after the financial crisis. This increase may result from both a better macroeconomic situation and more efficient risk management by banks. The increase in the Z-score during this period may be the result of regulatory reforms, better economic conditions in Poland, and increased caution in risk management by banks.

From 2012 to 2021, the Z-score for Poland fluctuates, which may reflect varied market conditions, banking regulations, changes in bank profitability, or capitalization. Fluctuations in the Z-score may result from a combination of factors such as changes in monetary policy, geopolitical instability, volatility in global markets, and the impact of the COVID-19 pandemic, especially in 2020. The recent increase in the ratio in 2021 may suggest that banks have strengthened their capital position in response to the challenges posed by the pandemic.

In summary, during the analyzed period, the Z-score for Poland showed some fluctuations, indicating changes in the level of risk, profitability, and capitalization of banks. Generally, after the exceptional decline in 2003, the ratio stabilized, suggesting further strengthening of bank stability in Poland. The Z-score is a measure of a bank's potential resilience to crises. A high Z-score indicates lower risk of insolvency, and changes in this ratio may result from many factors. Therefore, Polish banks seem to be able to maintain reasonable stability, even in the face of external economic shocks.

The Z-score for Hungary during the analyzed period shows some variability. We start with a Z-score of 5.88 in 2000, which may indicate higher risk in the banking sector and is a result of risky strategies adopted by Hungarian banks in previous years and the immaturity of the banking sector compared to economic transformations. The increase to 6.24 in 2001 may reflect initial actions aimed at strengthening financial stability.

The gradual increase in the Z-score until 2004 could result from adaptation to market requirements and improvement in risk management during this period. There is a visible increase in the Z-score to 8.36 in 2004. This may indicate an improvement in risk management and increased profitability of banks, perhaps also as a result of structural reforms and economic growth in Hungary. The

indicator stabilizes in the following three years, maintaining values around 8, suggesting a period of stability in the banking sector.

The decrease in the Z-score in 2008 is typical of the impact of the global financial crisis, which increased the level of risk in the banking system worldwide. Hungary, as a country with an open economy, was particularly exposed to external economic shocks.

The increase in the Z-score in the years following the financial crisis is the result of actions taken by the Hungarian authorities to stabilize the banking system through debt restructuring and increasing equity in banks. It may also reflect the country's improved economic condition. The Hungarian banking sector during this period was also subject to the introduction of new internal and EU regulations, which could have increased the capital requirements for banks and thus influenced the increase in the Z-score. The variability of the indicator may also reflect fluctuations in the economy, such as inflation, exchange rate volatility, and overall economic uncertainty, which affect bank stability. The resurgence of the indicator in 2011 reflects recovery from the crisis and strengthening of the foundations of the banking sector.

Since 2012, we have observed stabilization of the Z-score, which may result from further reforms in the banking sector and stable economic growth. The Z-score remains at a relatively stable level, with a slight increase in 2021 to 7.07. This may suggest that Hungarian banks continue to pursue a policy of strengthening their capital position and risk management, especially in the context of economic challenges posed by the COVID-19 pandemic.

In summary, the Z-score for Hungary shows that although the banking sector in this country faced challenges, especially during the global financial crisis, it managed to rebuild and maintain relative stability in subsequent years. The increase in the Z-score in the years following the financial crisis may be the result of actions taken by the Hungarian authorities to stabilize the banking system through debt restructuring and increasing equity in banks. This reflects the country's improved economic condition. The cyclical changes in the Z-score reflect the adaptation of the banking system to changing economic, regulatory, and market conditions.

The Z-score for Slovakia from 2000 to 2021 shows interesting changes that may indicate various phenomena in the banking sector and the country's economy. High values of the Z-score in 2000 and 2003 may indicate a cautious banking policy and a low level of indebtedness of banks in Slovakia. They suggest very low risk of insolvency of banks and a very conservative approach to risk during this period. This is also a period before Slovakia's accession to the European Union, where banks may have been less exposed to external risk and applied a more conservative approach to risk management.

From 2004, after Slovakia's accession to the EU, we observe moderate fluctuations, but the indicator remains at a high level (17-19), suggesting good risk management and stable financial situation of banks in Slovakia.

During the global financial crisis (2008-2009), the Z-score remains high, especially in 2008, when it reaches a value of 24.27, which may indicate less exposure of the Slovak banking sector to global financial turbulence due to solid regulatory policy. The following years continue the trend of high stability in the banking sector.

Since 2015, we have observed a gradual decrease in the value of the Z-score, which may reflect a gradual increase in risk in the banking sector and evolution in the activities of banks, which may have included greater acceptance of credit risk.

The decrease in the Z-score in 2020 and 2021 is most likely directly related to the COVID-19 pandemic and its impact on the economy. Banks may have increased reserves for borrower defaults and dealt with higher economic uncertainty.

In summary, high Z-score values for Slovakia throughout most of the analyzed period indicate good financial stability of banks and effective risk management. Decreases in the indicator in recent years may reflect the introduction of riskier business strategies in banks or responses to external economic shocks, such as the COVID-19 pandemic. The overall tendency toward high Z-score values indicates general financial stability in the Slovak banking sector during the analyzed period.

Analyzing the Z-score for the Czech Republic from 2000 to 2021 allows us to understand what factors may have influenced the financial stability of banks during this period.

The low Z-score in 2001 may have been due to global economic slowdown after the bursting of the dot-com bubble and regional tensions that could have affected the Czech economy. It may also reflect the aftermath of shocks related to transformations after the dissolution of the Eastern Bloc.

The improvement in the Z-score in the following years reflects economic growth, macroeconomic stability, and the maturation of the financial market in the Czech Republic. It is possible that banks were also able to increase their equity in response to previous difficulties. Stable Z-score values before the crisis may indicate prudent banking policy and adequate risk management, which prepared the sector for upcoming challenges. The increase in the indicator during the global financial crisis may have resulted from cautious credit decisions, allowing Czech banks to avoid the worst consequences of the crisis. Increase in equity and good regulatory supervision may also have played a significant role here. High Z-score values in the years 2011-2013 suggest that the Czech banking sector strengthened its capital position and improved profitability in the post-crisis period.

Fluctuations in the Z-score after 2014 may result from normal banking activities, evolution of credit markets, and changes in regulatory provisions that affected banks' risk profiles. The decrease in the Z-score in 2020 reflects uncertainty and potential risk introduced by the pandemic into the global economy. Banks increased provisions for credit losses and dealt with greater volatility in profitability. The increase in the Z-score may suggest that the Czech banking sector effectively adapted to the pandemic conditions and that measures taken by central banks and governments, including relief programs and quantitative easing, achieved the intended stabilizing effects.

In summary, the Z-score for the Czech Republic indicates a banking sector that generally managed risk well and maintained stability even in the face of global financial challenges. This speaks to effective regulations, sound credit policies, and banks' adaptive capacity to changing economic conditions.

Another important indicator characterizing stability in the banking sector, which is subject to special analysis, is the ratio of non-performing loans (NPL), which also reflects the quality of the bank's loan portfolio. This indicator is defined as the share of non-performing loans in the total receivables of the banking sector and indicates the probability of recovering the borrowed amount along with interest. For the safety of banking operations, it is important for this indicator to have the lowest possible value.

The share of non-performing loans (below standard, doubtful, lost) in total gross receivables from the non-financial sector in the banking system from 2000 to 2021 is illustrated in the chart below.
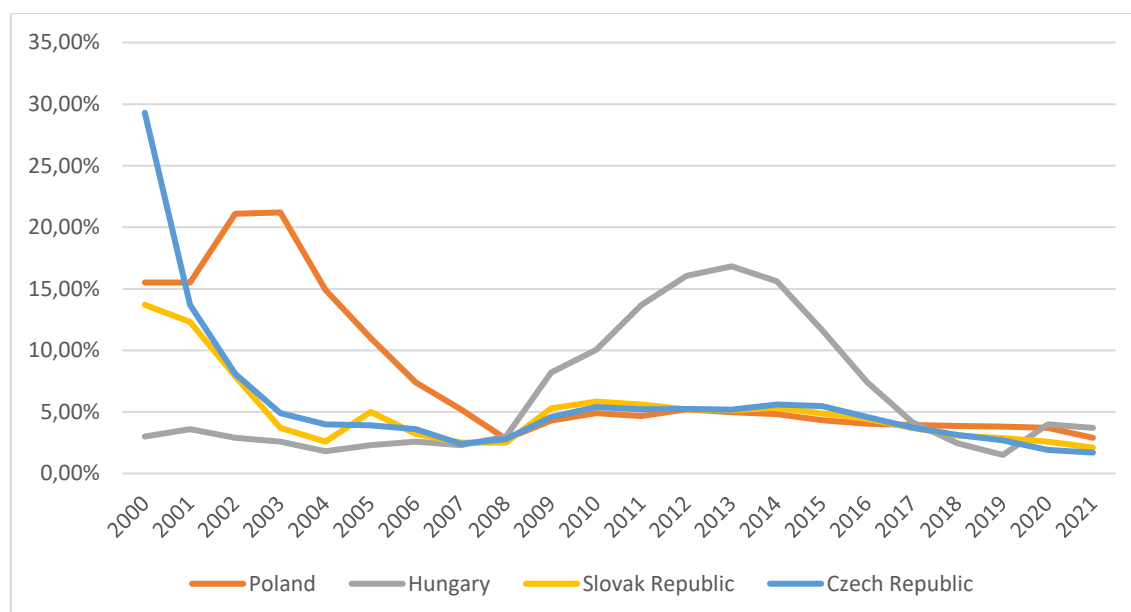
Chart 46 Share of non-performing loans in the credit portfolio of the banking sector in Central European countries from 2000 to 2021

Source: own elaboration based on FRED, 2023 and World Bank, 2023
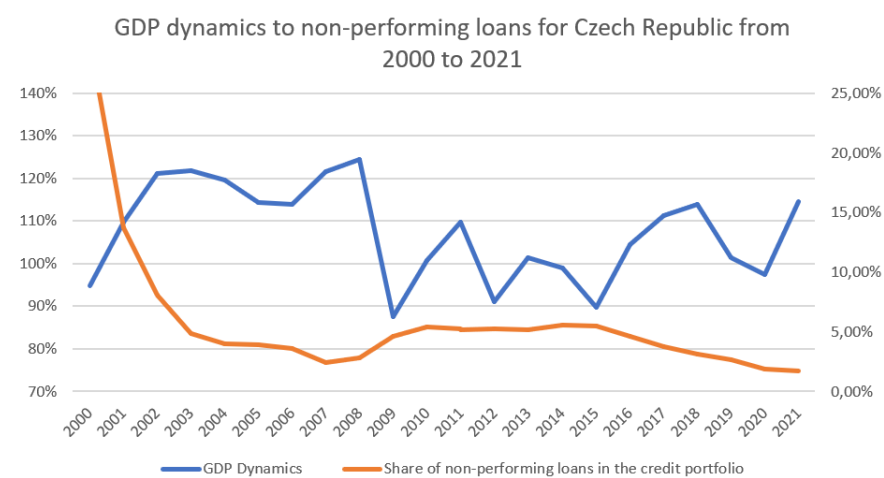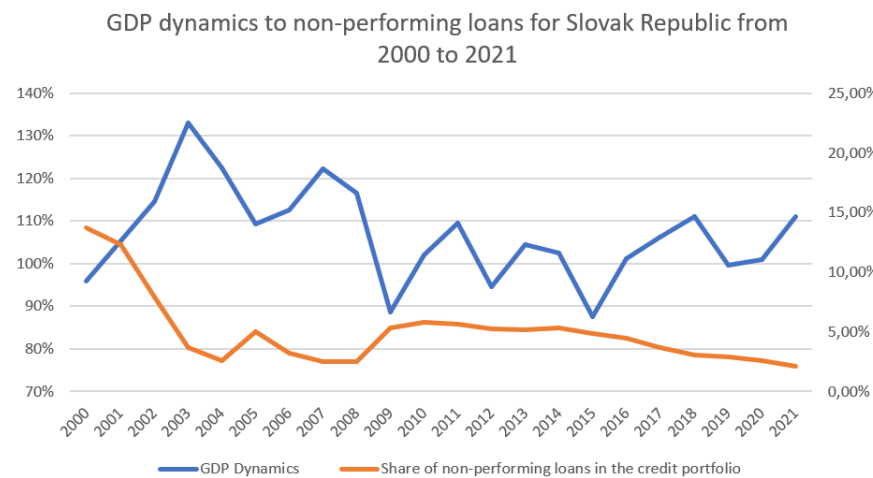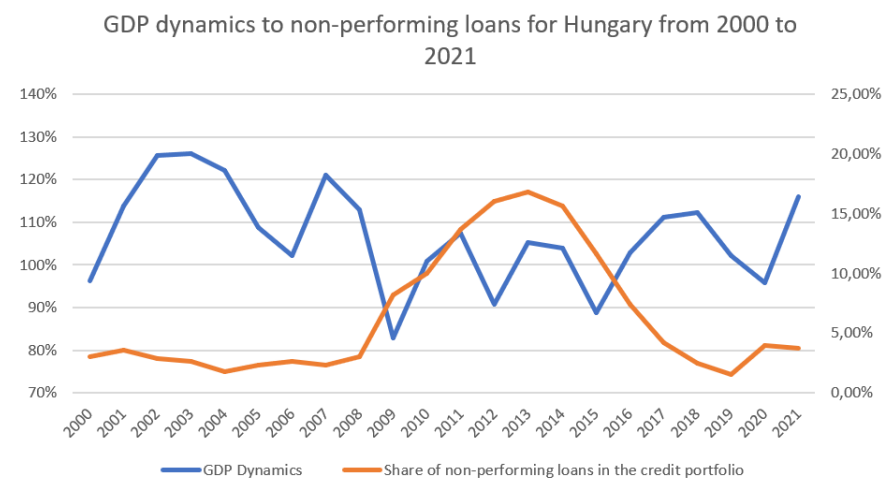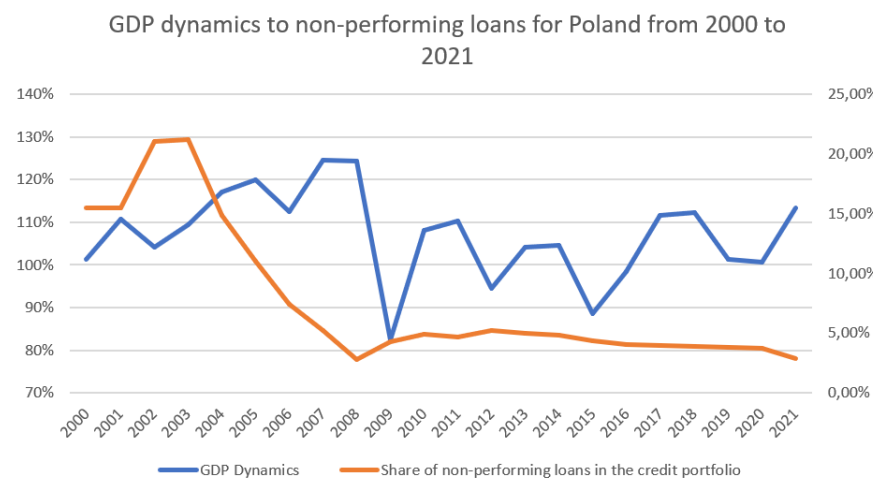
Chart 47 Share of non-performing loans in the credit portfolio of the banking sector in Central European countries against economic fluctuations in the years 2000 - 2021

Source: own elaboration based on table 17 and chart 46

At the beginning of the 1990s, the ratio of non-performing loans to total claims of Polish banking sector was at a very high level, and in the following years, a general trend of this indicator decreasing can be observed. This situation was related to the fact that initially, banks were very poor in economic and financial information about their clients and processed it poorly, using only the simplest, primitive risk measurement tools. Most often, this was associated with the possibility of observing risk only through the registration of delays or failures in debt settlement. With the economic development of the country, the improvement of the economic situation of the real sector undoubtedly related to the transfer of new technologies, knowledge in the mid-90s, a decisive improvement in the discussed indicator can be observed. However, as the economic situation worsened and the pace of economic development slowed down, the non-performing loan ratio began to rise, indicating a decline in borrowers' ability to service the debt. The banking sector was in the worst situation to date in 2002 – 2003. This fact was reflected in the increase in the non-performing loan ratio from 15.5% to 21.1% at that time, indicating a strong correlation between the economic situation and the discussed indicator. Such a significant increase was not influenced by increased lending action but by the burden of debt created in previous years and the decrease in borrowers' ability to service it due to unfavorable changes in the economy. In 2002, the economic situation slowly stabilized, so the discussed indicator slightly improved.

In 2003, the Polish banking sector was still under the influence of negative effects associated with the economic slowdown in previous years, which was manifested by a high share of the non-performing loan ratio, standing at 21.2%. However, the unfavorable trend of deteriorating the quality of banks' loan portfolios was halted, which can be seen based on the smaller increase in the discussed indicator. It was undoubtedly a lesser burden for banks thanks to a more cautious lending policy and the returning revival in the economy bringing improvement in the financial situation of economic life participants.

As a result of improving prospects for the banking sector and the improvement of enterprises and households in 2004, the quality of banks' loan portfolios significantly improved by reducing the average level of the non-performing loan ratio by 6.3 percentage points to 14.9%. This favourable trend related to improving claim quality lasted until 2008, in which the indicator reached its minimum and amounted to 2.8%. It should also be noted that such a significant improvement could result not only from the improvement of the most important macroeconomic indicators characterizing the economy. The improvement in quality could also be just a statistical effect associated with a very large increase in new loans granted by banks that softened their lending policy encouraged by a high rate of economic growth and favourable operating conditions. (KNF, 2009b) The rise in the quality indicator from 2009 to 2012 reflects the impact of the global financial crisis. Banks may have experienced an increase in non-performing loans due to the worsening financial situation of borrowers. In the subsequent years, the share of at-risk receivables

in the loan portfolio began to stabilize and then decline, which may indicate improved risk management and economic recovery after the crisis.

From 2016 to 2021, further strengthening of credit quality is observed, evidenced by a decrease in the indicator to 2.9% in 2021. This is likely the result of better creditworthiness assessment, as well as stable economic growth in Poland and potentially effective debt restructuring programs. The improvement in 2021, despite the ongoing pandemic, may reflect the economy's adaptation to new conditions, as well as the effectiveness of supportive measures and intervention policies implemented by the government and the central bank.

In summary, the share of at-risk receivables in the loan portfolio in Poland from 2000 to 2021 shows a general downward trend, with exceptions during crisis periods. This indicates an improvement in the financial condition of the banking sector and the effectiveness of credit risk management strategies. Changes in the share of at-risk receivables in Poland during the analyzed period were the result of several factors, such as the country's macroeconomic condition, bank credit policies, introduced regulations, and external economic shocks, including the global financial crisis and the COVID-19 pandemic.

Analyzing the share of at-risk receivables in the banking sector's loan portfolio in Hungary from 2000 to 2021, relatively low values of the indicator can be observed at the beginning of the period, from 2000 to 2006, which reflect a cautious credit policy after the transition to a market economy and the effects of Hungary's integration with the European Union, introducing additional regulatory requirements. The share of at-risk receivables in the loan portfolio was relatively low, suggesting that the Hungarian banking sector maintained good practices in credit risk management. Low indicators of at-risk receivables may indicate a favorable economic situation, which contributed to borrowers' ability to repay obligations. Fluctuations during these years were minor, indicating stability in this sector during the pre-crisis period.

An increase in the share of at-risk receivables is evident in 2009, reflecting the impact of the global financial crisis, which increased the risk of default both in the private and business sectors by affecting borrowers' ability to repay debts. After the financial crisis, the indicator increased dramatically, reaching a level of 16.04% in 2012. This increase may be the result of post-crisis economic difficulties that increased the risk of default among borrowers and may reflect the delayed effects of the crisis on the Hungarian banking sector. Despite some decline in 2013, the share of at-risk receivables remained at a high level. This may indicate the long-term consequences of the crisis, including problems with mortgage and consumer loan repayments.

Substantial improvement in the years 2015-2016, with a decrease to 7.42% in 2016, may reflect economic revival, effective credit portfolio management by banks, and potential remedial actions such as debt restructuring or debt sales. Maintaining a low level of at-risk receivables until 2019

may indicate economic stability, as well as the continuation of effective credit risk management strategies.

The increase in the indicator in 2020 and its stabilization in 2021 may be a consequence of the pandemic's impact on borrowers' ability to repay loans, as well as the result of government and central bank interventions to support the financial sector and the economy. Measures taken by central banks and governments to support borrowers are beginning to yield results, and the economy is starting to recover.

In summary, changes in the share of at-risk receivables in the loan portfolio in Hungary indicate that the country's banking sector has faced significant challenges, especially in the period following the global financial crisis. However, the downward trend after 2012 and stabilization before the pandemic indicate an improvement in risk management and the financial health of banks. Actions taken by banks and regulators, including reforms and support programs, have had a significant impact on reducing the level of at-risk receivables in the longer term.

The high level of at-risk receivables in the Slovak banking system at the beginning of the period may have resulted from the legacy of the banking system during the transition period, when banks struggled with many unpaid loans from the pre-privatization period. It was also essential for the banking sector to adjust to new international standards and requirements, especially in preparation for joining the European Union.

Significant decreases in the share of at-risk receivables in subsequent years may reflect the process of cleaning banks' loan portfolios of bad debts and improving borrower creditworthiness assessment procedures. It indicates an improvement in credit risk management by banks and the quality of the loan portfolio. Slovakia's economic growth and macroeconomic stabilization also contributed to the improvement in credit quality. Maintaining a low level of the indicator indicates the stability of the banking sector and Slovakia's good economic condition before joining the European Union in 2004.

Further decline in the indicator to 2.5% in 2007 indicates the continuation of positive trends, but at the same time, it may suggest banks' growing tendency to take on greater risk in the face of dynamic economic development. Despite the global financial crisis, the indicator of at-risk receivables remains at a stable level. Slovakia, although affected by the financial crisis, did not experience a sharp increase in at-risk receivables, which may indicate a cautious credit policy and an appropriate level of risk diversification in bank portfolios. This may mean that Slovak banks were not as heavily exposed to the crisis as other banking systems, perhaps due to more cautious credit strategies.

Minor fluctuations in the indicator in the years 2010-2013 are likely the result of post-crisis recovery and stabilization of borrowers' situations, as well as the continuation of a rigorous credit policy. The low and stable level of at-risk receivables in subsequent years indicates a healthy economy and the effectiveness of bank policies in risk management. The stabilization of the indicator at a low level, even despite the COVID-19 pandemic, may indicate effective actions taken by banks to minimize the pandemic's impact on borrowers' ability to repay obligations.

In summary, the banking sector of Slovakia throughout the years 2000-2021 has demonstrated resilience to various economic challenges. From the economic transformation through the global financial crisis to the COVID-19 pandemic, Slovak banks appear to manage credit risk in a way that maintains a low level of at-risk receivables. This indicator reflects financial stability and maturity of the banking sector in the country.

Analyzing the share of at-risk receivables in the loan portfolio of the Czech banking sector from 2000 to 2021 requires considering several key aspects.

The years 2000-2021 encompass a period of diverse economic events that impacted the Czech banking sector, including the global financial crisis in 2008. The financial crisis had a profound impact on the global economy, including the Czech Republic. It led to increased unemployment, a decline in property prices, and worsened financial conditions for many businesses and households, thereby contributing to the rise in at-risk receivables. The COVID-19 pandemic (since 2020) and associated restrictions adversely affected many sectors of the economy, increasing the credit risk for banks. Businesses, especially those in the sectors most affected by restrictions (e.g., tourism, hospitality), faced difficulties in servicing their obligations. This increased credit risk could have influenced the rise in the level of at-risk receivables.

During the analyzed period, the Czech banking sector underwent significant regulatory changes aimed at strengthening supervision and financial stability. The implementation of international Basel standards, including Basel II and Basel III, aimed at enhancing the financial stability of banks through capital and liquidity requirements, influenced banks' credit risk management practices, which indirectly affected the level of at-risk receivables.

Fluctuations in the labor market, changes in fiscal and monetary policy, as well as the overall economic conditions, affected borrowers' ability to repay their obligations.

An increase in the level of at-risk receivables weakens the financial stability of banks, increasing the risk of bankruptcies and financial crises. In response to the increased credit risk, banks may restrict credit availability, thereby hindering investment and economic growth.

The level of at-risk receivables can impact the perception of financial stability of banks by consumers and investors, which is crucial for trust in the banking system. This analysis underscores

the importance of credit risk management for the banking sector to minimize the negative effects of increasing at-risk receivables. The banking sector in the Czech Republic must continually adapt to the changing economic, regulatory, and market environment to ensure the stability of the financial system. The average NPL values in the analyzed period are respectively: 7.73% for Poland, 6.34% for Hungary, 4.98% for Slovakia, and 5.78% for the Czech Republic.

The non-performing loan ratio, an indicator of debt repayment ability, shows significant differences between Central European countries, as well as significant fluctuations during the analyzed period. The largest fluctuations of this indicator in the Czech Republic may indicate greater instability of the banking sector or changes in the country's economy. More stable and lower values in Slovakia may indicate a more stable credit situation in this country.

Based on the analysis of the development of the non-performing loan ratio, its connection with the state of the economic situation is clearly visible. It can certainly be stated that in years when GDP growth slowed down, there was an increase in this ratio. This dependency undoubtedly results from the deterioration of the economic and financial situation of entities that had previously taken out loans but are unable to repay them on time due to worsening operating conditions.

The non-performing loans ratio directly affects the stability of the banking sector in every country. It is a key risk indicator that banks must monitor, as a high NPL level can indicate problems in the bank's loan portfolio quality and potential risk to its financial stability.

In Poland, the observed increase in NPL at the beginning of the 21st century could have increased credit risk in banks, requiring higher reserves to cover potential losses. However, the subsequent decrease in this ratio indicates an improvement in the quality of the loan portfolio and an increase in the stability of the banking sector.

Fluctuations in NPL in Hungary, especially after the financial crisis of 2008, could introduce uncertainty in the banking sector. A high level of this indicator means that banks need to increase reserves for loan losses, which can limit their ability to issue new loans and generate profits.

A low and stable level of the NPL ratio in Slovakia indicates good credit risk management by banks and an overall healthy economic situation. Such a condition favors the financial stability of the banking sector and may encourage further lending.

The very high NPL ratio at the beginning of the analyzed period in the Czech Republic could indicate serious challenges in the banking sector. However, subsequent stabilization and reduction of the NPL level testify to effective corrective actions and increased stability of the banking sector.

In summary, a high level of the non-performing loans ratio may indicate financial health problems of banks, as it means a higher risk of loan defaults. Banks must maintain adequate reserves for loan

losses, which is particularly important in the case of high NPL levels. High reserves affect the profitability of banks. A high NPL level can limit banks' ability to issue new loans, directly affecting economic growth. Conversely, a stable and low NPL level fosters trust in the banking sector, which is crucial for the overall financial stability of the country.

Another important indicator affecting the stability of the banking system is the loans-to-deposits ratio. It indicates what portion of accumulated deposits is allocated by the bank for loans. This is the simplest indicator determining the liquidity of a bank, and partly the type of credit policy conducted. It shows the demand for financial market funds. In this way, it can illustrate the bank's ability to increase lending activity. It is difficult to talk about safe or unsafe values for the loans-to-deposits ratio. The level of this indicator is influenced by the level of mandatory reserves and the related necessity to keep part of the obtained deposits in the account at the central bank, the availability of funds on the market and their diversity, the cost of obtaining them and the risk associated with their early withdrawal, the profitability of the credit activity along with the credit risk, and the bank's policy related to its overall strategy, product policy, and risk management (especially liquidity risk). This indicator should take the highest possible values, indicating that the bank fulfills the primary business objective of its activity, i.e., accepting deposits to grant loans. A situation when this ratio is too low indicates that the bank may invest the obtained deposits in other financial market instruments, such as securities offering a higher return rate than loans with not higher risk. However, prudential considerations, mainly related to managing the bank's liquidity, should influence limiting the excessive height of this indicator. In situations where the loans-to-deposits ratio exceeds 100%, it can be observed that the bank finances its lending activity from sources other than deposits (e.g., through the issuance of securities).

Analyzing the chart presented below, we can notice a significant increase in the discussed indicator, which indicates a growing difference between the obtained deposits and the granted loans. The Loan-to-Deposit Ratio (LDR), often referred to as the loans-to-deposits ratio, is a metric used to assess a bank's liquidity, indicating what portion of its deposits the bank utilizes for loans. A value above 100% signifies that the bank lends out more than it has in deposits, indicating an aggressive lending stance and potential liquidity risk. A value below 100% indicates that the bank has more deposits than loans extended, suggesting a more conservative stance.

A high LDR may signal potential liquidity risk, where banks may have limited capacity to meet sudden deposit withdrawals. An increase in LDR may indicate higher credit risk, as banks have more assets in the form of loans, which could turn non-performing. If banks borrow more than they have in deposits, they may incur higher financing costs for additional loans in the interbank market.

An LDR value close to or exceeding 100% may signal a problem with excessive credit expansion, which in turn can affect the stability of the banking sector. Regulators, observing high LDR values,

may introduce additional capital requirements for banks to safeguard them against liquidity risk. Banks may offer higher interest rates for deposits to increase their deposit base, thereby lowering their LDR.
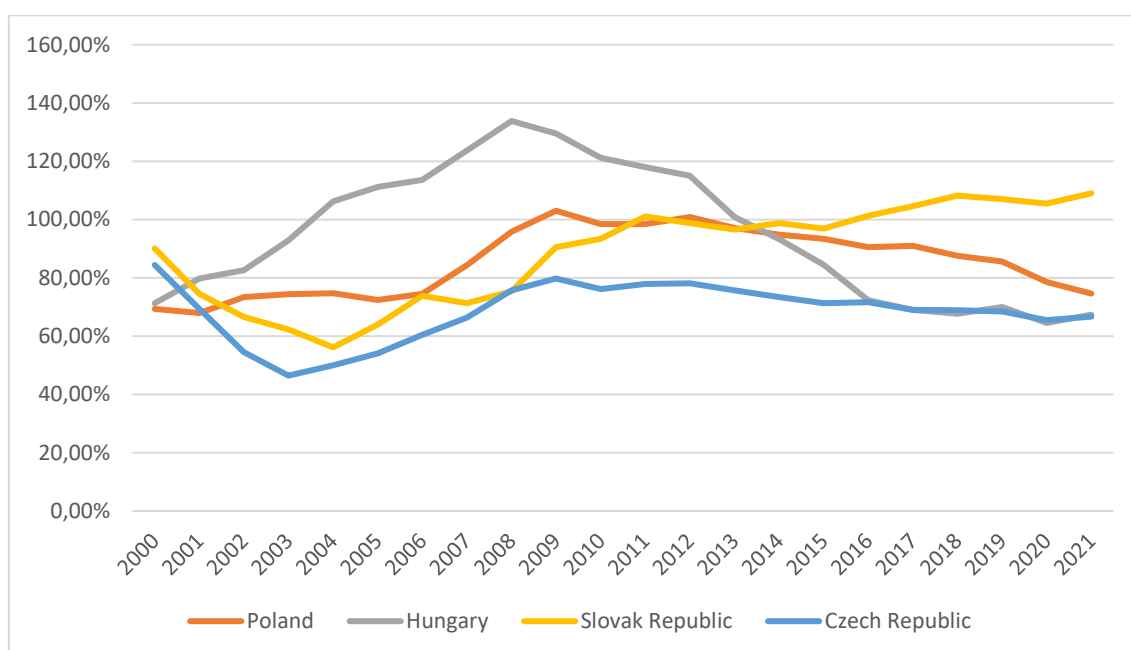
Chart 48 Credits-to-deposits ratio in Central European countries from 1993 – 2021

Source: own elaboration based on FRED, 2023 and Trading Economics, 2023

From 2000 to 2008, Poland experienced strong economic growth, stimulating demand for both consumer and mortgage loans. This contributed to the increase in the LDR. Easier access to credit and liberalization of banking regulations may have led to the rise in LDR, as banks were more willing to lend. A steady increase in the LDR is observed in Poland, from 69.29% in 2000 to 95.83% in 2008. This indicates a period of increased financing demand from households and businesses, part of a broader credit boom in Europe. Growing economy and credit availability favored increasing indebtedness.

The financial crisis in 2008 and subsequent crises affected the rise in the LDR in Poland, especially in 2009 when the value exceeded 100% (103.02%), a result of the global financial crisis and limitations on banks' financing capabilities. Despite tougher financial conditions, banks continued to lend, partly in response to the stimulative policy pursued by the government. The increase in the ratio could indicate that banks had difficulty in attracting new deposits amid global financial strain.

Changes in the reference interest rates by the National Bank of Poland (NBP), aimed at stimulating or cooling down the economy, also affected the LDR. Lower rates could incentivize borrowing, thus raising the ratio. Fluctuations in society's propensity to save also directly impacted bank deposits and thus the LDR.
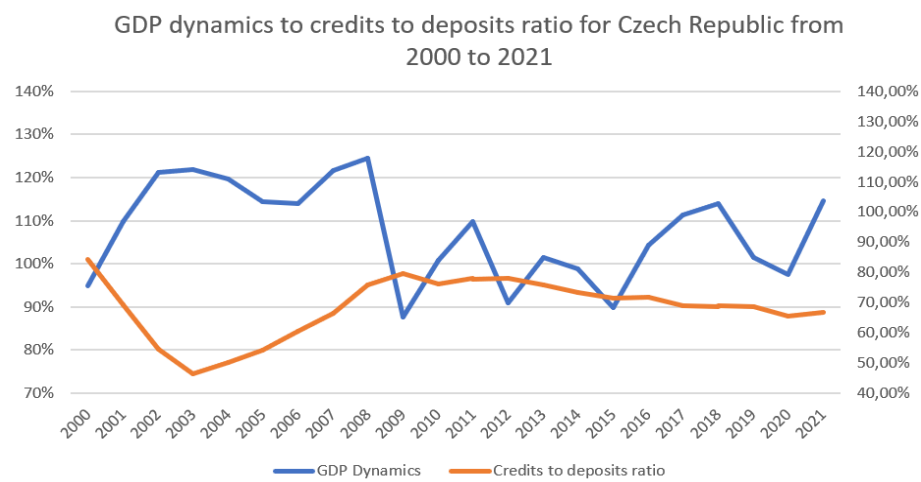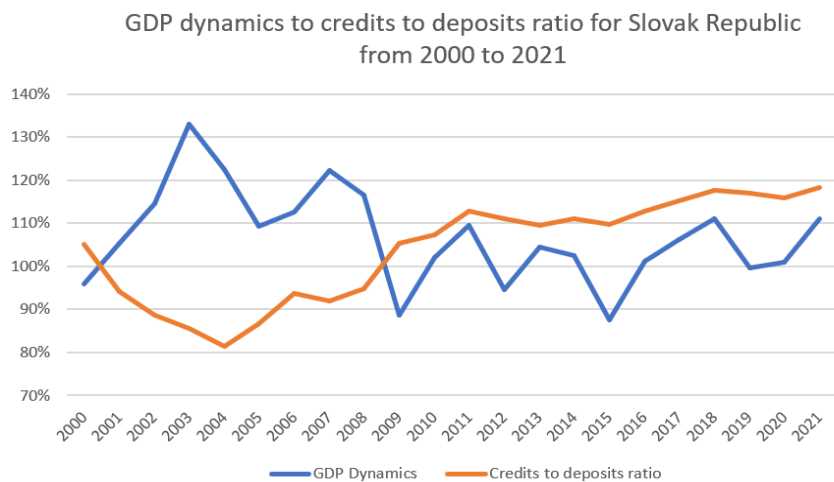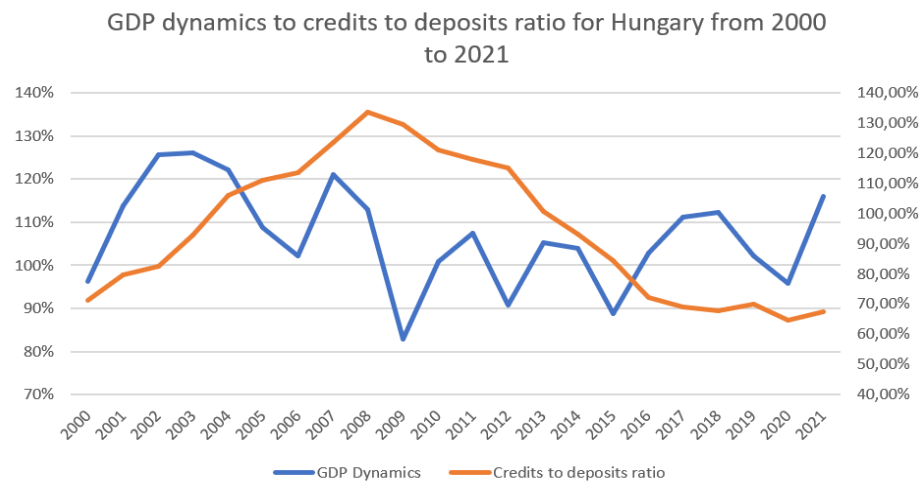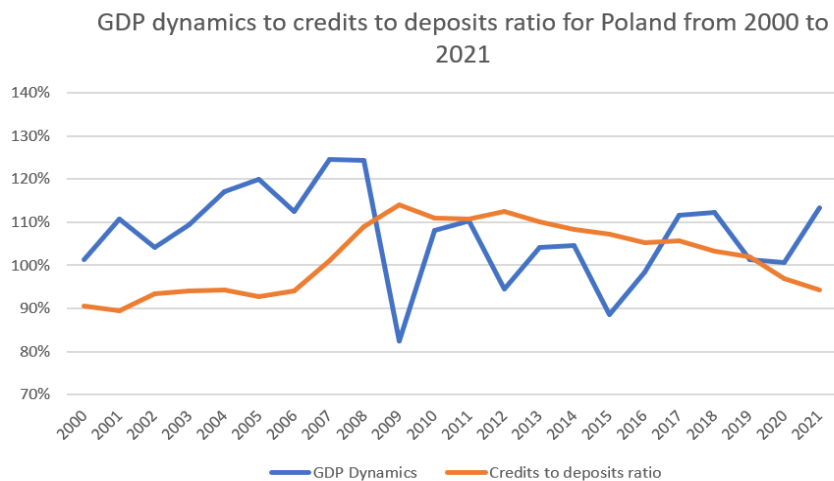
Chart 49 Credits-to-deposits ratio in Central European countries against economic fluctuations in the years 2000 – 2021

Source: own elaboration based on table 17 and chart 48

After a surge in 2009, the ratio began to decline and stabilize in subsequent years. In 2021, it stood at 74.62%, significantly below the 2009 level, indicating an improvement in liquidity management and possibly a more cautious approach by banks to lending, as well as an increase in deposits. The noticeable decrease in the ratio in 2020-2021 may also be related to the COVID-19 pandemic, which could have led to increased risk aversion and a preference for saving among the populace, explaining the decline in the LDR in 2020 and 2021. This may indicate an increased propensity for people to save in times of economic uncertainty and greater caution by banks in lending due to uncertainty about borrowers' ability to repay obligations.

The loan-to-deposit ratio in Poland from 2000 to 2021 reflects changes in the economic cycle and behaviors of both consumers and banks. The increase in the ratio before the financial crisis reflected a period of dynamic credit growth, while the subsequent decline indicates increased caution and potentially better liquidity position of the banking sector in Poland. The period of the pandemic further strengthened this trend, with the population inclined to increase deposits and banks, perhaps adopting a more conservative approach to credit risk.

In summary, the LDR in Poland from 2000 to 2021 underwent changes under the influence of many internal and external factors. The country's economic policy, global financial crises, regulatory changes, and societal behaviors influenced the dynamics of this ratio, which in turn affected decisions and stability in the banking sector.

Analyzing data on the loan-to-deposit ratio (LDR) for Hungary from 2000 to 2021, several significant trends and turning points can be observed, which may indicate the state of the economy and the banking sector of this country.

In the early 2000s, Hungary was preparing to join the EU, which was associated with economic optimism and increased investment. This increased demand for loans, and banks, responding to this demand, increased their lending activity. From 2000 to 2007, we observe an increase in the LDR from 71.27% to 123.75%. Hungary's economic development during this period, accession to the European Union in 2004, and openness to foreign markets favored the growing demand for loans. It can be assumed that banks sought to exploit new opportunities and increased lending activity.

The financial crisis of 2008 significantly affected the global economy, including Hungary. The high LDR in 2008, amounting to 133.80%, may reflect banks' difficulties in attracting new deposits and increased lending activity, which was not balanced by an adequate amount of deposits, and the crisis could have further exacerbated liquidity risk for banks. The financial crisis affected the Hungarian banking sector, increasing the level of credit-related risk. The Hungarian central bank and other regulatory authorities responded to the crisis by introducing precautionary measures, which could have increased the cost of borrowing and thus slowed down the growth of banks' loan portfolios.

After the financial crisis, the LDR gradually began to decline, reaching a level of 69.93% in 2019. This may indicate that banks in Hungary started to adopt a more conservative credit policy and better risk management in banks. Faced with economic uncertainty in subsequent years, Hungarian households may have increased their propensity to save, which affected the growth of deposits and the lowering of the LDR.

During the COVID-19 pandemic, the LDR further declined to 64.51% in 2020, and then slightly increased to 67.38% in 2021. This decrease may reflect increased economic uncertainty and a preference for savings during the crisis. The increase in 2021 may suggest a gradual normalization of the economic situation and a greater willingness to take out loans after the most difficult period of the pandemic.

The LDR in Hungary during the analyzed period reflects a series of economic and political events that influenced the banking sector. The initial increase in the ratio may indicate aggressive credit expansion and optimistic attitudes toward economic growth, while declines after 2008 may reflect responses to the financial crisis and changes in banking regulations aimed at strengthening financial stability. The COVID-19 pandemic has caused further turbulence, forcing both consumers and banks to rethink risk and approaches to savings and lending.

After the financial crisis and in the face of economic uncertainty in subsequent years, Hungarian households may have increased their propensity to save, leading to an increase in deposits and a decrease in the LDR.

In summary, from 2000 to 2021, clear trends in changes in the LDR can be observed in Hungary, which were the result of both internal economic and political factors and global events affecting the world economy. These changes had a significant impact on the functioning of the Hungarian banking sector and its ability to respond to the country's economic needs.

The loan-to-deposit ratio (LDR) in Slovakia from 2000 to 2021 presents diverse trends that reflect changes in the country's economy and political decisions. At the beginning of the economic transformation period and preparations for joining the European Union, Slovakia experienced changes that may have encouraged banks to increase lending activity. The LDR from 2000 to 2003 remained relatively stable, fluctuating from 90.08% to 62.31%. This period was characterized by preparations for EU accession, which may have influenced moderate lending activity.

From 2004, when Slovakia joined the EU, to 2008, the LDR increased from 56.16% to 75.33%. Accession to the single European market contributed to inflows of foreign investment and increased economic confidence, leading to an increase in the LDR.

The global financial crisis in 2008 also affected Slovakia, but the LDR did not exceed 100%, suggesting that the Slovak banking system maintained a degree of caution in lending. Responses to

the crisis, including regulatory reforms and credit policies introduced by the Slovak central bank, may have contributed to moderate growth in the LDR. In subsequent years, this ratio remained below 100%, reflecting both an increase in savings and a more conservative approach by banks to credit risk.

The adoption of the euro as the currency in 2009 may have contributed to increased stability and trust in the Slovak banking system. Reducing currency risk may have favored lending, although this did not translate into a significant increase in the LDR.

The LDR indicator in Slovakia from 2015 to 2019 stabilized at around 100%, which may indicate a balanced relationship between loans granted and deposits. This is a desirable state for the banking system, which can indicate a healthy financial structure for both households and banks.

The increase in the LDR during the COVID-19 pandemic may reflect a natural response to increased economic uncertainty and the need for emergency financing. The Slovak banking sector exhibits characteristics of stability, with moderate growth in the LDR, which remains around or slightly above 100%, considered a safe level in terms of liquidity risk. This increase was not as sharp as in other countries, suggesting that the Slovak banking sector was relatively well-prepared for such events.

In summary, in Slovakia, the LDR from 2000 to 2021 remained relatively stable, with a tendency to increase during periods of economic expansion and moderate decline during times of uncertainty. This indicates the banking system's ability to adapt to changing economic conditions and maintain financial stability.

The analysis of the loan-to-deposit ratio (LDR) for the Czech Republic from 2000 to 2021 shows how this relationship changed over time. This indicator is crucial for assessing banks' liquidity and their credit strategy. At the beginning of the analyzed period, the LDR in the Czech Republic decreased from 84.40% in 2000 to 46.44% in 2003. Such a decline may indicate an increase in deposit levels or a more cautious approach by banks in lending. This period followed the global economic improvement after 1999, which may have contributed to increased confidence in the banking system and deposit growth.

From 2004 to 2008, the ratio remained stable, fluctuating between 49.99% and 75.68%, which may suggest balanced development of loans and deposits. Economic growth and a stable macroeconomic situation favored this balance.

In the financial crisis year of 2009, the ratio increased to 79.71%, indicating increased demand for loans in more difficult economic conditions and banks' difficulties in attracting new deposits.

From 2010 to 2019, the ratio fluctuated, but generally, we observed a downward trend. This decline may indicate increasing deposits and less demand for loans, possibly as a result of regulatory changes and greater caution in banks' credit policies.

During the pandemic, the ratio decreased to 65.45% in 2020 and slightly increased to 66.71% in 2021. This may indicate the strong position of banks and their ability to accumulate deposits, even in challenging pandemic conditions, as well as increased support from the government and the central bank in the form of credit guarantees or assistance programs.

In conclusion, the LDR for the Czech Republic indicates a relatively stable and conservative banking system, especially compared to some neighboring countries. The low and stable LDR, especially after the Czech Republic's accession to the European Union in 2004, indicates a good condition of the banking sector, allowing for moderate credit growth while deposits increase simultaneously. The decrease in the ratio during the pandemic may suggest that banks coped well enough with the challenges that they did not need to excessively increase lending levels in response to the economic crisis caused by the pandemic. Government and banking interventions during crises may have contributed to maintaining a low LDR, supporting the economy through credit programs and deposit guarantees. Overall, the trend in the Czech Republic may indicate a cautious approach to risk and good capital management even in difficult economic conditions. A low and stable LDR may indicate the stability of the banking system, which is less vulnerable to liquidity risk.

The increase in the ratio after 2000 may indicate the development of the banking sector, greater availability of loans for households and businesses, which is often associated with overall economic development. All countries except Slovakia experienced declines in the ratio in 2010, suggesting a delayed reaction to the financial crisis. Slovakia experienced the most dramatic increase in the ratio in 2009, which may indicate specific economic or banking policy responses of this country to the crisis. Poland and the Czech Republic showed an increase in the ratio in the years 2007-2009, indicating stronger stability of the banking sector. The global financial crisis, which began in 2008, caused, as seen, a global recession. The loans-to-deposits ratio increased in most countries in 2008-2009, which may be a result of decreased confidence in financial markets and increased preference for accumulating deposits and caution in granting loans. In 2010, there was a decrease in the ratio, which may reflect the rebuilding of confidence in the banking system and an increase in lending activity.

In a country with a stable banking system, changes in GDP may have a smaller impact on the loan-to-deposit ratio, as seen in the example of Hungary.

The loan-to-deposit ratio is often used as one of the indicators to assess the stability of the banking sector in a country. It allows for assessing the extent to which deposits accumulated in banks are

used for granting loans. A high loan-to-deposit ratio may indicate that banks are actively lending, which can increase their exposure to credit risk. In a situation where borrowers are unable to repay loans, banks may encounter financial difficulties. A low ratio may suggest that banks are more conservative in lending, which can reduce credit risk but may also limit potential interest income. Banks must maintain an adequate level of liquidity to be able to pay out deposits on demand. If the loan-to-deposit ratio is very high, it may indicate potential liquidity risk, as a significant portion of the bank's resources is locked in loans. Banking systems with a high loan-to-deposit ratio may be more vulnerable to negative economic shocks. During economic crises, when the risk of debtor insolvency increases, banks may experience greater losses.

The loan-to-deposit ratio is an important tool in assessing the stability of the banking sector. A high ratio may indicate greater risk but also greater lending activity, which can be beneficial for the economy. A low ratio may indicate a conservative stance by banks and lower risk but also less lending dynamics. It is important to analyze this ratio in the context of other financial and economic indicators.

At this juncture, it is necessary to discuss the shaping of selected elements of banking systems operating in the four countries covered by the study. From the many concurrently used indicators in the literature for evaluating banking systems, the author selected a group of seventeen that allow for a possibly complete and multidimensional characterization, analysis, and evaluation of these systems. Their compilation is presented in the tables below:

Table 29 Shaping the Banking Systems of the Studied Countries Based on Selected Dimensions

Poland

No.	Item	Mean	Standard Deviation	Median	Skewness	Kurtosis	Range	Minimum	Maximum
1	Total bank loans	153,67	110,08	147,36	0,06	-1,83	299,43	15,98	315,40
2	Total bank deposits	176,56	121,87	174,71	0,33	-1,21	396,74	25,94	422,68
3	Corporate loans	109,95%	10,01%	107,40%	0,55	-0,76	33,60%	96,00%	129,60%
4	Household loans	117,33%	15,69%	111,40%	0,84	-0,55	51,90%	98,00%	149,90%
5	Household deposits	112,34%	11,45%	109,90%	0,92	-0,04	38,90%	98,40%	137,30%
6	Equity to total balance sheet ratio	8,55%	0,89%	8,25%	-0,02	-0,74	3,32%	6,70%	10,02%
7	Debt to total balance sheet ratio	89,23%	0,89%	91,75%	0,02	-0,74	3,32%	89,98%	93,30%
8	Self-financing ratio	9,36%	1,07%	8,99%	0,02	-0,77	3,95%	7,18%	11,13%
9	Debt ratio	61,71%	9,79%	58,39%	1,65	2,42	38,21%	51,60%	89,81%
10	ROA	0,68%	1,24%	0,90%	-2,36	7,95	5,89%	-3,79%	2,10%
11	ROE	6,28%	14,64%	8,88%	-2,93	11,08	71,86%	-50,23%	21,63%
12	Total assets of the banking sector	273,74	125,81	323,57	-0,40	-1,35	387,85	59,30	447,14
13	Banking Z-score	7,85	1,71	0,08	-2,25	7,55	8,03	1,69	9,72
14	Loans to deposits ratio	86,11%	11,44%	86,56%	-0,05	-1,54	35,11%	67,91%	103,02%
15	Share of non-performing loans in the loan portfolio	8,98%	5,92%	4,87%	1,38	0,55	18,40%	2,80%	21,20%
16	Solvency of the banking sector	15,10%	2,49%	14,65%	0,57	-0,64	8,70%	11,20%	19,90%
17	Interest rates	9,04%	10,25%	4,50%	1,37	0,56	34,90%	0,10%	35,00%

Hungary

No.	Item	Mean	Standard Deviation	Median	Skewness	Kurtosis	Range	Minimum	Maximum
1	Total bank loans	44,90	27,47	47,32	0,14	-1,13	91,39	9,39	100,78
2	Total bank deposits	48,43	24,95	56,02	0,09	-1,07	86,49	17,12	103,61
3	Corporate loans	107,26%	9,16%	105,00%	0,94	1,15	42,30%	91,00%	133,30%
4	Household loans	111,55%	17,08%	109,00%	0,62	-0,42	64,20%	87,00%	151,20%
5	Household deposits	110,16%	10,53%	109,00%	0,61	0,09	41,00%	94,00%	135,00%
6	Equity to total balance sheet ratio	8,95%	1,13%	8,45%	0,93	0,52	4,60%	7,10%	11,70%
7	Debt to total balance sheet ratio	91,05%	1,13%	91,55%	-0,93	0,52	4,60%	88,30%	92,90%
8	Self-financing ratio	9,84%	1,37%	9,23%	1,00	0,64	5,61%	7,64%	13,25%
9	Debt ratio	65,81%	8,85%	65,43%	0,32	-1,01	29,61%	52,78%	82,38%
10	ROA	1,24%	0,94%	1,32%	-0,49	0,03	3,47%	-0,73%	2,74%
11	ROE	12,66%	9,63%	13,30%	-0,49	-0,37	34,05%	-6,52%	27,53%
12	Total assets of the banking sector	78,55	27,81	83,89	-0,58	0,17	113,28	19,48	132,76
13	Banking Z-score	7,27	0,82	7,29	-3,16	-1,13	2,71	5,84	8,55
14	Loans to deposits ratio	96,13%	23,12%	93,05%	0,17	-1,48	69,29%	64,51%	133,80%
15	Share of non-performing loans in the loan portfolio	6,48%	5,21%	3,65%	1,05	-0,46	15,32%	1,51%	16,83%
16	Solvency of the banking sector	14,85%	2,71%	13,90%	-0,07	-1,54	8,06%	10,40%	18,46%
17	Interest rates	8,99%	7,94%	7,00%	1,01	0,15	28,00%	0,50%	28,50%

Slovak Republic

No.	Item	Mean	Standard Deviation	Median	Skewness	Kurtosis	Range	Minimum	Maximum
1	Total bank loans	32,57	20,89	29,20	0,58	-0,73	72,61	8,50	81,11
2	Total bank deposits	35,61	18,25	40,97	0,21	-1,02	65,54	8,87	74,41
3	Corporate loans	107,34%	9,01%	108,00%	0,44	0,74	41,00%	88,00%	129,00%
4	Household loans	112,16%	12,98%	112,00%	0,40	-0,78	45,50%	91,50%	137,00%
5	Household deposits	110,08%	8,89%	108,00%	0,33	-0,59	35,00%	94,00%	129,00%
6	Equity to total balance sheet ratio	9,62%	1,94%	9,98%	-0,69	0,00	7,52%	4,60%	12,12%
7	Debt to total balance sheet ratio	90,38%	1,94%	90,02%	0,69	0,00	7,52%	87,88%	95,40%
8	Self-financing ratio	10,68%	2,34%	11,09%	-0,60	-0,22	8,97%	4,82%	13,79%
9	Debt ratio	66,00%	9,58%	63,38%	1,07	1,65	39,87%	53,42%	93,30%
10	ROA	0,59%	0,39%	0,66%	-0,87	0,05	1,39%	-0,26%	1,13%
11	ROE	7,90%	5,27%	8,20%	-0,52	0,39	21,59%	-4,30%	17,29%
12	Total assets of the banking sector	52,83	21,16	58,54	-0,15	-0,88	75,77	18,17	93,94
13	Banking Z-score	20,61	4,27	21,08	-0,52	0,18	15,51	12,00	27,51
14	Loans to deposits ratio	87,90%	17,04%	94,98%	-0,53	-1,20	52,84%	56,16%	109,00%
15	Share of non-performing loans in the loan portfolio	4,84%	2,98%	4,66%	1,93	3,76	11,60%	2,10%	13,70%
16	Solvency of the banking sector	16,64%	3,23%	17,56%	-0,11	-1,13	11,30%	11,10%	22,40%
17	Interest rates	2,68%	3,37%	2,00%	1,72	2,62	12,00%	0,00%	12,00%

Czech Republic

No.	Item	Mean	Standard Deviation	Median	Skewness	Kurtosis	Range	Minimum	Maximum
1	Total bank loans	71,19	38,18	63,66	0,15	-1,74	106,44	24,11	130,55
2	Total bank deposits	98,53	56,20	99,92	0,18	-1,37	177,85	21,62	199,47
3	Corporate loans	108,63%	8,19%	107,50%	-0,02	-1,03	29,00%	95,00%	124,00%
4	Household loans	110,55%	13,75%	107,00%	0,58	-0,79	46,00%	92,00%	138,00%
5	Household deposits	110,26%	9,93%	107,85%	0,37	-0,75	36,00%	94,00%	130,00%
6	Equity to total balance sheet ratio	6,31%	0,80%	6,48%	-0,03	-1,45	2,32%	5,20%	7,52%
7	Debt to total balance sheet ratio	93,69%	0,80%	93,52%	0,03	-1,45	2,32%	92,48%	94,80%
8	Self-financing ratio	6,74%	0,91%	6,93%	-0,01	-1,44	2,65%	5,49%	8,14%
9	Debt ratio	48,88%	11,16%	44,69%	1,20	1,00	39,39%	36,98%	76,37%
10	ROA	1,24%	0,50%	1,32%	-0,36	-1,15	1,60%	0,32%	1,92%
11	ROE	14,97%	5,91%	14,20%	0,04	-1,09	19,42%	4,59%	24,00%
12	Total assets of the banking sector	112,57	49,42	127,62	-0,47	-0,90	169,74	29,74	199,48
13	Banking Z-score	0,0010	1,41	0,10	0,21	-0,97	4,93	7,10	12,03
14	Loans to deposits ratio	68,00%	9,95%	69,14%	-0,74	-0,01	37,96%	46,44%	84,40%
15	Share of non-performing loans in the loan portfolio	5,32%	5,82%	4,60%	3,53	13,75	27,60%	1,70%	29,30%
16	Solvency of the banking sector	15,65%	3,15%	15,45%	0,32	-0,39	11,01%	11,10%	22,11%
17	Interest rates	3,83%	4,59%	2,13%	1,23	0,16	14,70%	0,05%	14,75%

Total bank credits, total bank deposits, banking sector total assets expressed in USD billion.

Source: Own elaboration based on conducted research

Regarding total bank credits, Poland had the highest average value ($153.67 billion), which was twice as high as in the Czech Republic and more than three times higher than in the other countries. This difference naturally stems from the size of the economies and banking sectors of the discussed countries. The distributions of this characteristic in all countries exhibit very weak positive skewness and moderate platykurtosis, meaning the intensity of extreme values is lower than in a normal distribution, or in other words, the "tails" of this distribution are narrower.

The distributions of total bank deposits in the studied countries were similar to those of bank credits discussed above, also exhibiting positive skewness and slight flattening. In all the countries, the value of deposits was slightly higher than the total credit value, with the largest difference occurring in the Czech Republic, reaching close to 40%.

The average value of corporate credits in all countries was at a similar average level of 107-109% with about a 10% standard deviation. All distributions showed very weak asymmetry, but they were slightly platykurtic in Poland and the Czech Republic, while in Hungary and Slovakia, they were weakly leptokurtic.

As for household credits, their average value in the studied countries ranged between 117% (Poland) and 110% (Czech Republic). The distributions are characterized by weak right-side asymmetry, indicating that the studied characteristic has a weak tendency to cluster towards values lower than the average, while a kurtosis value below zero in all countries indicates that the distributions of this characteristic are more flattened than the normal distribution.

The average value of household deposits in the studied countries oscillates around 111% with about a 10% deviation. The distribution of this characteristic shows a slight positive skewness, and in the case of the Czech Republic and Slovakia, also a slight flattening.

In the studied countries, the average value of the equity to total balance sheet ratio hovers around 9%, with only the Czech Republic having a slightly lower level, not exceeding 7%. Except for Hungary, where the distribution of this characteristic shows positive skewness, in the other countries, we encounter left-side skewness, indicating that the studied characteristic has a weak tendency to cluster towards values higher than the average. Additionally, in Poland and the Czech Republic, we deal with the flattening of the distribution, meaning the "tails" are lighter.

The average value of debt to total balance sheet in the studied countries oscillated around 90%, with a very small standard deviation not exceeding 2%, only in the Czech Republic did this value reach close to 94%. In Poland and the Czech Republic, we dealt with symmetric distributions of this characteristic, while in Hungary, there was a weak negative skewness, and in Slovakia, a weak positive symmetry, indicating that the studied characteristic has a weak tendency to cluster accordingly: towards values higher and lower than the average.

The average value of the self-financing ratio in most of the studied countries was around 9% with a slight, just over one percent standard deviation, only in the Czech Republic did it not exceed 7%. Regarding the distribution of this characteristic, in Poland and Slovakia, it was symmetric, while in Hungary, there was a slight positive skewness, and in the Czech Republic, a slight negative skewness. In Poland, Slovakia, and most notably in the Czech Republic, there is a flattening of the distribution, while in Hungary, it is somewhat more peaked than the normal distribution.

Similar to the self-financing ratio, the average value of the debt ratio in all countries except the Czech Republic is set at a similar level of about 64%, while in the Czech Republic, it does not exceed 49%. In all countries, most notably in Poland, the Czech Republic, and Slovakia, there is moderate or strong positive skewness, indicating that the studied characteristic has a weak tendency to cluster towards values lower than the average. An interesting situation arises in relation to kurtosis, as the distribution of this characteristic in Poland is strongly leptokurtic, while in the Czech Republic and Slovakia, it is leptokurtic, indicating a concentration of this characteristic around the mean, whereas in Hungary, it turned out to be platykurtic.

The average value of the ROA index in the studied countries did not exceed 2% and oscillated around 1% with a similar standard deviation in each country. The distribution of this characteristic in each country was marked by negative skewness, with very strong negative skewness of the distribution in Poland, indicating a strong concentration of this characteristic's values in the area higher than the average. The analysis of the aforementioned distribution indicates that in the case of Poland, there is also an extremely high positive value of kurtosis, thus speaking of an extremely leptokurtic distribution, where the "tails" are "heavy".

The average value of the ROE index in the studied countries varied, with Poland and Slovakia having around 7%, while the other countries had several percent more. The distribution of this characteristic in Poland was marked by very strong negative skewness, while in Hungary and Slovakia by weak negative skewness, whereas the ROE distribution for the Czech Republic was symmetrical. The distribution of this index for Poland turned out to be extremely platykurtic, with values very concentrated around the mean.

As for the average value of the banking sector assets, among the studied countries, it was highest in Poland and several times exceeded the average value of banking assets in the other countries under study. The distribution of this parameter in all studied countries was characterized by weak negative skewness and, except for Hungary, weak platykurtosis.

Another analyzed indicator was the Z-score index, which is used to measure the safety of the banking system, helping to determine the risk of a bank's bankruptcy. The Z-score index shows the number of standard deviations below the mean, which indicates the minimum drop in profits that could initiate bankruptcy. This relationship between the Z-score index, its value, and safety is

directly proportional, and a decrease in the index directly translates into a decrease in safety. The highest average value of this index occurred in Hungary (over 20), while the lowest was in the Czech Republic (0.001), which should be considered a very puzzling result. The distribution of this index was marked by very large negative skewness in Poland and Hungary, while in other countries, it was close to a normal distribution in this regard. The distribution of Z-score values in the studied years was slightly flattened in the Czech Republic and Hungary, while in Poland, it was extremely leptokurtic, significantly more peaked than the normal distribution.

The next indicator examined was the loans to deposits ratio, whose average size was the lowest in the Czech Republic, where it did not even reach 70%, and the highest in Hungary (96.13%). The distributions were characterized by a lack of asymmetry and moderate flattening in all countries except the Czech Republic.

Regarding the share of non-performing loans in the loan portfolio, their average value oscillated around 5% in most of the studied countries except for Poland, where this indicator was somewhat worse, reaching the 9% level. The distribution of this parameter was marked by high positive skewness, indicating that the studied characteristic has a very strong tendency to cluster towards values lower than the average. It is also worth mentioning that the distribution of this characteristic is very strongly leptokurtic in Slovakia and even extremely leptokurtic in the Czech Republic, meaning the intensity of extreme values is lower than in a normal distribution, or in other words, the "tails" of these distributions are narrower.

The penultimate dimension analyzed was the solvency of the banking sector, which in all analyzed countries was about 16% with a deviation of about 3%. The distributions of this characteristic in most cases were also similar, with only their slight flattening in Hungary and Slovakia worthy of note.

The last of the indicators studied were interest rates, whose average value during the studied period in Poland and Hungary was about 9%, while in the Czech Republic and Slovakia, it was only about 3%. The distributions of this characteristic in all the studied countries were marked by strong positive skewness, and additionally, the distribution of interest rates in Slovakia was characterized by leptokurticity.

The above analysis should be enriched by examining the interdependencies that occur between the individual dimensions of banking systems in the countries studied.

A moderate positive correlation was observed between the level of inflation in Poland and the Czech Republic as well as Poland and Slovakia. It was also found that there is a positive moderate correlation between the level of interest rates during the studied period in Poland and Hungary, and a strong correlation between the interest rates in Poland and Slovakia (0,73). A positive moderate

correlation was identified between the average level of banking sector assets and the average GDP ratio in Poland and Hungary.

A moderate positive correlation of credit to deposit ratio was observed between Poland and Hungary, and a strong correlation (0,68) in this area between Slovakia and the Czech Republic.

In the area of nonperforming loans, a positive correlation exists between Slovakia and the Czech Republic, with a similar strength and direction of correlation also present in relation to the solvency of the banking sector in Poland and Hungary. A moderate positive correlation is also encountered in relation to the ROA level in Slovakia and the Czech Republic, and the ratio of liabilities in Poland and Hungary as well as in Poland and Slovakia.

A moderate positive correlation was also identified in the area of self-financing ratio in Poland and Hungary, and in relation to corporate credits in Poland and the Czech Republic, whereas a strong positive correlation was observed between the average level of corporate credits in Hungary and the Czech Republic.

In the area of corporate deposits, strong positive correlations were identified between the average level of deposits in Hungary and Slovakia, and Hungary and the Czech Republic. Notably, a very strong positive correlation was found between corporate credits and corporate deposits in the Czech Republic. Regarding the relation of households credits to corporate deposits, a very strong positive correlation was observed in the Czech Republic (0,92), while a strong positive correlation was identified in the area of household credits (0,66) between Slovakia and the Czech Republic, with moderate strength correlations between Poland and Hungary as well as Hungary and the Czech Republic.

Regarding the average level of household deposits, a moderate positive correlation was identified between Hungary and the Czech Republic, and Hungary and Slovakia, while very strong correlations were identified between Poland and Slovakia (0,96) and the Czech Republic and Slovakia (0,84). A strong positive correlation (0,61) was also encountered between household credits and household deposits in Slovakia.

Within the economic landscape of these countries, the correlations that emerged as strong or very strong deserve particular attention. These correlations, notably in financial metrics like credit-to-deposit ratios and corporate as well as household credits and deposits, may be indicative of intertwined economic activities and shared financial practices across borders. For example, the close economic ties between Slovakia and the Czech Republic, reflected in their credit to deposit ratio (0,68) and household credits (0,66), could be a legacy of their historical connection and current trade relationships, which align their financial markets and consumer behavior.

The corporate credits and deposits correlations between Hungary and the Czech Republic (0,69) and Hungary and Slovakia (0,74 for deposits) suggest significant cross-border business activities. These could stem from investments, shared industries, or banking practices that cater to corporate entities across these nations, underlining the interconnectedness of their economies.

Moreover, the exceptionally high correlation in corporate credits to corporate deposits ratio in the Czech Republic (0,92) indicates a mature and stable corporate banking sector, likely influenced by robust economic policies and a conducive business environment. This is significant for understanding regional economic stability and the flow of capital within corporate sectors.

The household deposit correlations between Poland and Slovakia (0,96) and the Czech Republic and Slovakia (0,84) highlight similar savings behavior among households, possibly due to comparable economic conditions, consumer confidence, and banking products offered across these countries. Such parallels in household financial behavior underscore the shared socio-economic factors influencing these populations.

Lastly, the household deposit to credits ratio in Slovakia (0,61) sheds light on the financial health and lending practices within the country, possibly reflecting broader regional trends in consumer finance and banking stability.

Unfortunately, the correlation analysis between the three main factors of the economic environment and the examined dimensions of banking systems in the studied countries did not reveal the co-occurrence of the mentioned characteristics. It could be expected that undoubtedly, an increase in GDP, a decrease in inflation levels, and unemployment could indicate the improvement of the economic environment's stability and stable conditions for conducting business. This is another issue that research should continue to address.

Understanding these correlations is crucial for grasping the economic intricacies of the region, providing insights into how economic policies, market dynamics, and financial practices shape the interconnected fabric of these nations' economies.

Conclusions

Changes are an inherent part of the modern economy. They can be predictable, systematic, staged, or unpredictable, chaotic, turbulent, and anticipating and managing these changes is becoming increasingly important, becoming a process of crucial importance for any economy. Changes can be observed throughout the economy, as well as in its individual sectors, including the banking system. Business theorists and practitioners strive to better understand their nature, systematize them, and identify and analyze the rules and mechanisms governing them, making some of them cyclical. Of course, this is an extremely difficult task, as the degree of complexity of the modern economy is increasing, the pace of change is accelerating, and often their course deviates from theoretical models. Economic cycles are considered one of the most interesting types of changes we deal with in modern economics. Continuous monitoring of their course is particularly important in conditions of progressive liberalization and deregulation of processes that remove restrictions on the functioning of financial markets and globalization, which cause the integration of national financial markets into one global market. Changes occurring in one of them can, based on the domino effect, pass from one economy to another, such as in the subprime crisis, and we may also deal with the interference of economic cycles occurring in different areas, and the ultimate effects of these events are very difficult to predict. There is a need and necessity to deepen knowledge about the course of business cycles and identify factors that influence their course, as well as analysis and evaluation of their impact on the most important sectors of the economy, including in particular the banking system.

The transformation of the economies of Central European countries, both systemic and economic, has laid the foundation for the restructuring and transition of the economy from centrally controlled to one based on market mechanisms. Marketization resulted in the emergence of free-market attributes, such as private ownership, competitiveness, and cyclical changes induced by market mechanisms, which completely changed the essence and character of the mentioned economies. For this reason, this region of Europe constitutes an extremely interesting and important area of research.

Business cycles, being the essence of economic functioning, have long been of interest to economists. They are often the subject of analysis and debates, most often concerning the impact of business cycle fluctuations on various sectors of the economy. This becomes particularly important in the context of the impact of the aforementioned cycles on the financial system, especially the banking system, which plays a key role in the functioning of every modern economy.

The research conducted served to achieve the objectives of this dissertation and to verify the research hypotheses set out in it. The conclusions from the conducted study allow us to state that

there are links between the way the economic environment is shaped in the studied countries, its variability caused by the occurrence of business cycles, and the stability of banking systems.

In the dissertation, a multidimensional analysis of the theoretical aspects of business cycles was carried out, perceiving them both through the prism of mature market economies and centrally managed ones, as well as in terms of an economy undergoing systemic and economic transformation. The dissertation did not limit itself to characterizing the dominant concepts of business cycle progression in the literature on the subject, but also conducted their critical analysis. Definitions and theories of the business cycle proposed by various economists were discussed, pointing out the diversity of possible approaches, often dependent on theoretical perspective and historical context. In conclusion, it was shown that understanding the causes and course of business cycles is crucial for formulating effective economic policy aimed at stabilizing economic growth and mitigating the effects of adverse fluctuations. Knowledge of business cycles is essential for effective economic management, which in turn allows for better preparation for future fluctuations and minimizing the negative consequences of recessions and exploiting the potential of economic recoveries.

It should be noted that the liberalization and globalization of financial markets and the development of new financial instruments not only increase the degree of complexity of a country's financial system but often also modify its structure. Business cycles overlap with the above-mentioned processes, which further complicates the anticipation of their course and the analysis of the effects they may cause. The aforementioned factors and the increasing pace of economic processes and the increasing degree of variability of the economic environment make it increasingly dynamic, unpredictable, and negatively impact the country's financial system. Its impact on the banking system, which is one of the most important components of the financial system, can be particularly dangerous, as the stabilization of the banking system is of capital importance not only for businesses but also for households.

The essence of banking system stability lies in its ability to counteract crises and maintain financial liquidity and solvency. This depends on many factors, both macroeconomic and microeconomic, including regulations and supervision, market and behavioral practices, and global financial connections. Financial stability is a *sine qua non* condition for healthy economic development, and its absence can lead to deep economic crises affecting all aspects.

Based on the conducted research, the following conclusions can be drawn from the analysis of economic fluctuations in the economies of Central European countries, namely Poland, Czech Republic, Slovakia, and Hungary. These countries underwent significant economic and political transformation after the fall of communist regimes, leading to the stabilization of democracy and the market economy. Despite challenges associated with the transition from centrally planned to

market economies, they recorded significant economic growth, especially after joining the European Union in 2004.

All the countries studied felt the effects of global crises, such as the 2008 financial crisis, which manifested as a slowdown in GDP growth and increases in unemployment and inflation. On the other hand, it should be emphasized that these countries demonstrated the ability to adapt and return to the path of economic growth.

Despite historical and cultural similarities, the studied Central European states exhibit a diversity of economic experiences, which is evident in differences in GDP growth rates, unemployment rates, and inflation. For example, they consistently showed a low unemployment rate and stable inflation, which testifies to their ability to maintain a stable economic climate.

Joining the European Union and NATO had a positive impact on the economies of the Visegrad Group countries, opening up new trade, financial, and political opportunities. At the same time, European integration poses political and legal challenges in terms of adapting to common standards and policies, which sometimes leads to tensions between national interests and EU requirements. In the studied countries, GDP level variability was most notable, mainly resulting from their transition to a market model and general increase in its value. Regarding the correlation of economic indicators studied, in the vast majority of the countries studied, a whole group of moderate and strong negative correlations (GDP/inflation and inflation/unemployment) was identified between various dimensions of the economic environment of the studied countries. During the studied period, no significant correlation was found between the level of inflation and unemployment. The analysis of GDP, unemployment, and inflation indicates a close dependency between economic policy and the condition of the economies of Central European countries. The traditional Phillips curve is confirmed in practice, showing a negative relationship between unemployment and inflation, highlighting the role of monetary policy in stabilizing the economy.

Central European countries show adaptability and resilience in the face of global economic challenges. Despite temporary GDP declines or increases in unemployment and inflation, these countries have managed to maintain stable economic growth and gradually improve economic indicators, demonstrating their ability to survive difficult periods. The Visegrad Group countries have recorded significant successes in economic development, despite challenges related to systemic transformation and the impact of global crises. Their experience shows how important adaptability, stable economic policy, and the ability to utilize new opportunities arising from European integration are.

At this point, it is necessary to discuss the degree of achievement of the dissertation's objectives and the method of verifying the research hypotheses set out in its introduction.

The main goal of the dissertation was to assess the stability of the banking systems of Central European countries during business cycles. It was achieved by accomplishing several subsidiary objectives.

The first of these was to define the essence of the business cycle as a key element of economic functioning. This goal was achieved at the beginning of the work, where the first chapter thoroughly characterized the sources, mechanisms of formation, the course, and possible consequences of the occurrence of the business cycle. It also presented the history of research on business cycles and the change in the approach to them, starting from the concepts of de Sismondi and Mill, to contemporary econometric models.

The next subsidiary goal was to present possible approaches to the business cycle in terms of the stability of the banking system and social welfare. This was also achieved in the first chapter of the work by explaining the nature and dominant factors of economic stability and the theoretical assumptions of social welfare extensively described in the literature on the subject.

The third subsidiary goal was the identification and selection of methods for measuring business cycle fluctuations, which was accomplished in the first chapter of the dissertation through a critical analysis of methods existing in the literature and an original adaptation of those that proved most useful for the needs of the dissertation. These included time series analysis methods based on the chronological average, as well as statistical dependency methods (correlations) used to identify relationships between the configuration and course of business cycles and the stability of banking systems in the studied countries. These issues were discussed in the methodological subsection and in chapters three, four, and five of this dissertation.

The fourth subsidiary goal was achieved in the second chapter, where, based on the analysis of the literature, the concept of the banking system's stability as a public good and the determinants and measures shaping it were introduced, focusing on those among them that were used in the third, fourth, and fifth parts of the dissertation.

The fifth subsidiary goal, namely determining the phases of the business cycle in the studied period, was achieved in the second point of the third chapter of the dissertation, where, based on data on GDP levels, inflation, and unemployment, attempts were made to identify individual phases of the business cycle in each of the studied countries during the analyzed period. All countries in the region experienced the impact of business cycles. Poland, starting from systemic transformation, recorded economic growth, albeit with some fluctuations, which may indicate the ability of its banking system to cope with external and internal economic shocks.

All countries experienced periods of high inflation, especially in the initial years of economic transformation. Stabilization of inflation later, while maintaining it at a relatively low level, is a

positive signal for the stability of prices and the value of money, which has a direct impact on the stability of banking systems. Conversely, the decreasing unemployment rate in the studied period in the Visegrad Group countries indicates an improvement in the labor market condition. This, in turn, favors the stability of incomes and the creditworthiness of citizens, which is beneficial for the stability of the banking sector. The Czech Republic seems to be the country with the greatest economic stability in the region, considering the low variability of GDP, inflation, and unemployment rates. This suggests that the Czech banking system may be considered the most resistant to external and internal shocks among the analyzed countries.

The sixth subsidiary goal was achieved in the third point of the third chapter by identifying and analyzing the activity in the banking systems of the studied countries, focusing here on selected dimensions and areas of mentioned activity, most important from the point of view of the work, such as the analysis of deposits, loans, or interest rates. The Pengab index was used here, a ratio calculated as the sum of differences in responses to individual research questions related to the deposit and loan activities of banks and their overall economic situation, which helps predict activities in the banking sector. The level of banking sector deposits in the studied countries was also compared against the GDP level, as well as the level of banking sector loans and GDP in the studied Central European countries.

The next seventh subsidiary goal, namely the attempt to assess the reactions of the external environment of the banking sector to business cycle changes in Central European countries, was realized at the beginning of the fourth chapter. This involved a comparative analysis of the financial behavior of households and enterprises, which was conditioned by changes in the economic cycle, and then their impact on the banking sectors of the studied countries was evaluated. This included changes in the socio-economic conditions of the studied countries and discussed the dynamics of the formation of bank deposits and loans in relation to households and enterprises. The data analysis shows that periods of economic prosperity favor increased credit activity. However, during periods of economic slowdown, a decrease in credit dynamics is observed along with an increased interest in safe forms of saving. Global financial crises, such as the 2008 crisis, have a significant impact on the banking system, changing the behaviors of households and enterprises. A decrease in the propensity to take out loans and an increase in interest in savings are observed, which is a reaction to economic uncertainty. The corporate sector shows greater sensitivity to changes in the business cycle than households, due to the direct link of business activities to the current economic situation. Companies react more quickly to changes in the economic environment, which translates into their behavior in the financial market. With the development of the financial market and the emergence of new financial instruments, companies change their preferences regarding sources of financing and the placement of financial surpluses. A further decline in interest in traditional banking products can be expected in favor of alternative,

innovative solutions available on the capital market. The financial behaviors of households and enterprises are directly related to the current economic situation and expectations for the future. An improvement in the economic climate increases the propensity to save and invest, which directly translates into increased activity in the banking sector. The availability of a wide range of financial services allows for better management of current consumption and savings, supporting households in realizing short- and long-term financial plans. Changes in the business cycle can affect behaviors related to saving and borrowing.

The next, eighth subsidiary goal was the core of the fifth chapter and, due to its high level of complexity, was carried out both in the first and second subsections of the said chapter. The impact of business cycles on the financing structure of the banking sector and its efficiency level was assessed based on the identified correlations between the studied variables. Both equity and debt financing were analyzed. From the analysis, it is evident that the economic situation in Central European countries has a significant impact on the financing structure of banks and their stability. During periods of economic growth, there is a tendency to increase financial leverage, which in times of crisis may translate into an increased level of risk. This goal was achieved by conducting a comparative analysis of the values of the equity share indicators and liabilities in the total balance, as well as debt and self-financing, and looking at them through the lens of business cycle fluctuations in the studied period. The liability share indicator in the total balance, reflecting the degree of financial leverage used by banks, is an important factor used to assess their stability level. Banks that finance a larger part of their activity with liabilities may be more exposed to liquidity risk and interest rate risk. The stability of this indicator in the banking systems of Central European countries during the analyzed period suggests that banks maintained a cautious policy regarding the use of financial leverage, which was beneficial for their stability.

The last of the subsidiary goals, namely assessing the level of stability of the banking systems in the studied countries, was achieved in the last subsection of the fifth chapter. From the conducted indicator analysis, it can be concluded that the banking systems of Central European countries, despite differences for individual countries, generally demonstrated the ability to maintain financial stability. These systems are generally characterized by increasing safety and financial stability. The growing role of banking systems in financing economies is emphasized by the increasing values of banking system assets in all Central European countries relative to GDP. Banks in these countries had to find a balance between promoting economic growth through loans and maintaining financial stability and avoiding the risk of insufficient liquidity. Important indicators used to assess the stability of banks in the studied countries are self-financing and debt ratios. A high level of the self-financing ratio indicates a bank's ability to generate profits and finance operations from its own funds, which is desirable from the perspective of its stability. Changes in the values of this indicator can signal changing financial conditions of banks and their ability to survive in difficult

market conditions. The debt ratio of banks, i.e., the ratio of external capital to own capital, is significant for assessing financial risk. High indebtedness can increase the risk of insolvency, especially in periods of economic instability. Therefore, an optimal level of this indicator is very important for maintaining the stability of banks. Central European countries, despite certain challenges and periods of greater economic volatility, have generally made significant progress in stabilizing their economies. This indicates a positive signal for the stability of their banking systems, especially in the context of the ability to survive global financial crises and manage business cycles. Despite many similarities in the way banking systems are shaped in the studied countries, some differences in their level of stability were noted, with the Czech banking system proving to be the most stable. The Czech Republic, due to the lowest volatility of major economic indicators, can be seen as the country with the most stable banking system in the region.

In summary, the banking systems of Central European countries have generally shown resilience to various economic challenges. The stability of financial indicators such as the share of equity, liabilities, self-financing, and indebtedness indicates the good condition of the banking sector. However, observed changes in these indicators, especially in the context of recent economic events such as the COVID-19 pandemic, underscore the need for continuous monitoring and adjusting of risk management strategies in banking systems to ensure long-term financial stability. The banking systems in Central European countries generally show an increase in financial stability, evident through the increase in the solvency ratio, improvement in the quality of the loan portfolio, and increased resilience to potential crises, as suggested by the rise in the Z-score value. However, differences between individual countries show that each has its specific conditions and challenges that influence the formation of these indicators. Despite differences in levels of economic development, Central European countries have experienced significant growth since joining the European Union. Poland and the Czech Republic stand out as leaders of growth in the region, which may indicate stronger economic foundations and potentially greater stability of their banking systems.

The main goal of the dissertation became the basis for formulating the main research hypothesis: **The stability of the banking systems of Central European countries is linked to the business cycles in the economy.**

The verification of this hypothesis occurred gradually through the verification of five auxiliary hypotheses.

The first of these assumed that the banking sectors of Central European countries play a crucial role in financing the economy and can provide support during periods of business cycle fluctuations. This hypothesis was positively verified in the third section of the third chapter, where the main ways banks in the studied countries react during different phases of the business cycle were

discussed in detail, especially in the deposit and lending area. There is a strong correlation between activity in the banking sector and economic dynamics. Economic growth often coincides with an increase in banking activity, as evidenced by increased levels of deposits and loans. This means that the stability of the banking system is closely linked to the general condition of the entire economy.

The second auxiliary hypothesis assumed that banks strive to reduce costs and increase efficiency in order to maintain their competitive position, which also affects the stability of the banking systems in the studied Central European countries. This was also positively verified and described in the last point of the fourth chapter and the second point of the fifth chapter. Competition in the banking systems of Central European countries has intensified over recent years, mainly due to globalization, liberalization, deregulation, and securitization. The emergence of new entities in the banking services market increases competitive pressure, forcing banks to seek innovative solutions and operational efficiency. Increased competition leads banks to continuously reduce their own operating costs, leading to narrower interest margins. As a result, banks must adjust to the imposed price levels, trying at the same time to maintain profitability. The interest margin, the difference between the interest rates on loans and deposits, is an important indicator of a bank's efficiency. Continuous narrowing of the margin in the sector can indicate increasing competitive pressure but also stabilization and maturation of the market. The level of interest margins varied among the studied countries, with some, like Poland and the Czech Republic, showing high volatility, while in others, like Slovakia, it was stable. Stable and high interest margins help banks maintain stability. The increase in the number of banking outlets and the development of online and mobile banking in the market are associated with increased competitiveness, and thus with improved quality and innovation of services, but also with the necessity to reduce the level of the mentioned margin, which can lead to an increase in credit risk. Operational efficiency is key to stability. The cost-to-income ratio, showing the operational efficiency of the banking system, highlights the importance of cost management in maintaining financial stability. Banks with low values of this ratio may be better prepared to cope with downturns, contributing to the stability of the banking system.

Analysis of the cost-to-income ratio in the banking sector of Central European countries from 2000 to 2021 confirms the usefulness of this indicator in assessing the operational efficiency of banks. The level of this ratio means that a part of the revenue is allocated to cover costs. Banks with a lower ratio are seen as more efficient and potentially more attractive to investors. Maintaining a stable level of this indicator is crucial for ensuring the long-term financial stability of banks, which is key to striving for sustainable development. Analysis of data from individual countries indicates a correlation between the cost-to-income ratio and GDP growth. Periods of economic growth often favor the improvement of banks' operational efficiency, impacting a lower cost-to-income ratio. This ratio shows significant fluctuations over time and differences between individual countries,

indicating that it is a key tool for assessing operational efficiency in the banking sector, reflecting how banks manage their costs relative to generated revenues. Analysis of financial efficiency indicators of the banking sector in Central European countries reflects their ability to adapt to changing economic conditions and rebuild after crises. Differences between countries, however, emphasize that the stability of the banking system depends on many diverse factors. Effective risk management, operational efficiency, and the ability to adapt to changing conditions are key to maintaining the stability of the banking system. Based on the research findings, it was found that the dynamics of the economic cycle affect competition in the banking systems of the Visegrad Group countries and that during periods of economic slowdown, an increase in credit risk and a decrease in demand for banking services can lead to a lowering of interest margins and intensification of competitive struggle. Faced with increased competition and rapid changes in the financial market, banks must be able to adapt quickly. This includes not only introducing innovations but also effectively managing risk and costs. Banks strive to reduce costs and increase operational efficiency to maintain competitiveness, which can impact the stability of the banking system. The global financial crisis of 2008 had an impact on the economies of Central European countries, as evidenced by GDP declines. However, the ability of these countries to quickly rebound after the crisis speaks to the relative resilience of their banking systems to global disturbances.

Another auxiliary hypothesis assumed that the economic cycle influences the financing structure and stability of banks in the studied countries was also positively verified at the beginning of the fifth chapter. Based on an analysis of indicators such as equity share, external capital, liabilities in the total balance sheet, self-financing, and indebtedness against the backdrop of business cycle fluctuations, differences in this scope were shown between the studied countries. Both the global financial crisis of 2008 and the COVID-19 pandemic had a significant impact on the banking systems of the studied countries, which manifested in declines in the Pengab index and a slowdown in the dynamics of deposits and loans. The rapid response of the banking system to these challenges, such as through the adaptation of credit policies, proved crucial for maintaining their financial stability. Particularly important was the self-financing ratio, which can be used to assess banks' policies regarding strengthening capital bases. In most of the studied countries, the level of the self-financing ratio increased until 2013, after which it stabilized until the end of 2020. This ratio defines a bank's ability to generate capital from its own operational activity and retained earnings, and thus is a significant indicator of the banking system's stability and lesser dependency on external capital sources, which is particularly important in uncertain and turbulent times.

The fourth auxiliary hypothesis, which assumed that the ability of banks to maintain profitability, liquidity, and capital resilience under diverse market conditions is crucial for the functioning of the economies of Central European countries, was positively verified in the second and third points of

the last chapter of this dissertation. A range of banking system stability indicators was identified and analyzed through the lens of their positive, stabilizing impact on the economy, especially in the current turbulent times. Experiences from crises highlight the importance of effective regulation and supervision over the banking sector to prevent excessive risk and maintain financial stability. A balanced credit policy, adequate capital reserves, and monitoring of asset quality are crucial for limiting the impact of business cycle fluctuations on the banking system. The dissertation confirmed the usefulness of indicator analysis for assessing the financial efficiency of banking systems in Central European countries in different phases of the business cycle, with the return on equity (ROE) and return on assets (ROA) indicators particularly standing out in this area. Variability in the level of these indicators in the studied countries indicates the sensitivity of their banking systems to the business cycle. Significant fluctuations in ROE and ROA indicators observed during the analyzed period underscore how significant changes in the macroeconomic environment, including business cycle fluctuations, impact the banking systems of Central European countries. The stability of these indicators in some periods suggests the ability of banking systems to adapt to changing conditions. Data analysis results show that banking systems in the studied countries have the ability to rebuild after crises, as evidenced by improvements in profitability indicators after periods of decline. Another important indicator used in the verification of this auxiliary hypothesis was the debt ratio, which shows how large a portion of debt is in financing a bank's assets. During the studied period, a significant decline in the level of this indicator was noted several times, such as in 2009 and during the COVID-19 pandemic, but for most of the studied period, its value indicated that banks in Central European countries were able to increase their profits and financial stability.

The last of the auxiliary hypotheses assumed that banks in Central Europe have varied abilities to absorb losses and thus different resilience to potential crises. This was positively verified in the third subsection of the fifth chapter. In the studies, the equity share in the total balance sheet was used, which serves as a bank's protection against insolvency and is intended to protect depositors from losing their funds and to cover any losses incurred by the bank. It was maintained at a stable level in the studied countries. Changes in its value were partly conditioned by the economic cycle and the introduction of regulations aimed at increasing the resilience of banking systems to shocks. A high share of own funds in financing bank assets was a positive phenomenon, strengthening the stability of the studied banking systems and limiting their sensitivity to external economic shocks. Nevertheless, declines in the value of this indicator, as observed in some countries in recent years of the analyzed period, may indicate the need to monitor and possibly adjust financial strategies by banks to ensure their continued stability. Research results confirmed that a stable, secure level of banks' own capital strengthens the stability of the banking system. The solvency ratio, Z-score, and loan-to-deposit ratio were also used to verify this auxiliary hypothesis. The safety level of the

banking system can also be expressed using the solvency ratio of banking institutions, which should be maintained at a level higher than 8%, and in the case of Central European countries, it showed an increasing trend, indicating improvements in the economic climate and the presence of strategic investors interested in further development of banking systems. The analysis shows that solvency in the banking sector increases during economic downturns and decreases during periods of economic growth. The studied banking systems, despite various challenges and crises, demonstrated the ability to maintain stability, especially in Poland, where the solvency ratio of the banking sector systematically increased. Economic development and stable macroeconomic operating conditions contributed to increasing the banks' ability to cover potential losses, as evidenced by the increase in the solvency ratio. In Hungary, after the financial crisis and regulatory changes, there was an increase in the level of the solvency ratio, which may indicate an effort to increase the safety level of the banking sector. In Slovakia, a high level of the solvency ratio indicates a conservative approach to risk management and a solid capital position of banks.

The Z-score, an indicator of the risk of bank insolvency, also indicates the strengthening of the stability of the banking sector, particularly in Slovakia and the Czech Republic, where its high values are recorded. In Poland, after a decline in 2003, the Z-score stabilized, suggesting an increase in the banking system's resilience to external shocks.

The loan-to-deposit ratio in the banking system plays a key role in assessing financial liquidity and the stability of banking systems, as well as in analyzing their credit policy. It is the simplest indicator of a bank's liquidity. The analysis of the banking systems of Central European countries shows that higher values of this indicator usually were associated with greater liquidity risk, especially during periods of external financial shocks, such as the global financial crisis of 2008. Conversely, lower values of this indicator indicate greater caution in lending and better liquidity risk management, which positively impacts the level of financial stability. Banks in these countries had to find a balance between supporting economic growth through lending and maintaining financial stability and avoiding the risk of insufficient liquidity.

The conducted research and its results in the area of business cycles in Central European countries during the period of economic transformation and their impact on the stability of the banking systems of Poland, Hungary, the Czech Republic, and Slovakia complement the gap in the literature and add another voice to the discussion about the changes shaping the modern economy. The author hopes that they will contribute to a better understanding of the nature of business cycles, the specifics of the economic conditions of Central European countries, and the mechanisms governing them. Generally, the banking systems of the studied countries proved resilient to the negative impact of business cycles and managed well during downturns in the studied period, although there were of course some differences among them in this area. The

research was conducted during the systemic transformation of the studied countries, and the results and conclusions based on them can be extrapolated to the economies of other countries that intend to undergo a similar path.

Among the studied countries, the banking system of the Czech Republic can be considered the most resistant to external and internal shocks among the analyzed countries. It should be noted that the Central European countries differed in terms of the speed of recovery after global crises, which affected the stability of their banking systems. Poland and the Czech Republic showed greater stability, which results, among other things, from a more conservative approach to credit risk and generally better economic condition.

In summary, it should be emphasized that the conclusions contained in the work do not predestine them to be final; they only represent another contribution to the discussion on this interesting and economically significant research problem. Research in this area should be continued in the future to check whether the banking systems in Central European countries will maintain their stability in the coming years.

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List of tables

List of charts

List of figures