ABSTRACT

ON A COMPARATIVE ANALYSIS OF INDUSTRIAL CREDIT PORTFOLIO RISK MODELS VERSUS A NEW SUPPORT VECTOR MACHINE - BASED APPROACH.

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The aim of the thesis is to compare credit portfolio models and to show that a novel approach based on support vector regression is suitable to measure credit portfolio risks and is even of superior performance compared to current industrial models for certain portfolios. Therefore, asset classes, further collections of assets in portfolios and funds as well as their underlying risk and return characteristics are defined and described. The various kinds of risks appearing in banking are presented, modern (credit) risk management requirements are discussed, and concrete risk measures and their mathematical foundations are explained. Afterward, as application and overarching context, current asset pricing and portfolio (risk) optimization models are considered. Thereby, the focus lies on debt or bond portfolios and the metrics utilized for credit risk. As the first component, the credit risk of single obligors has to be judged in a structured, quantifiable way, which is commonly achieved via rating or scoring functions, transformed into an individual probability of default. That rating process is thoroughly examined, and requirements for bank internal as well as external ratings are illustrated to build solid rating models. To put these in the context of a bank's model inventory, risk models for various other banking risks are briefly touched on. In order to come from a single obligor point of view to a (whole) portfolio level with correlated bonds in the next step, credit portfolio risk models are introduced and treated in-depth. Hazard rate and structural models (and further econometric ones) are compared by means of a comprehensive literature review. Modern artificial intelligence techniques are presented as additional possible model candidates, especially ANNs and SVMs (SVRs). The null hypothesis that SVR performs not better than a linear model is clearly denied for all four test portfolios, employing a Kruskal-

Wallis test and RMSE measure for comparison. Moreover, the null hypothesis that CreditMetrics® as a leading model performs better than SVR in most cases is also denied in terms of comparing the distance of the predicted VaRs to the real VaR. Support vector regression shows superior performance and can be a valuable tool for banks to quantify credit portfolio risk.