
The structure of credit risk: spread volatility and ratings transitions

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Rudiger Kiesel, William Perraudin and Alex Taylor

Regulators designing capital requirements for loan portfolios or senior bankers deciding levels of economic capital for their institutions need to know the magnitudes of the risks involved in holding portfolios of credit exposure of different types. This paper quantifies the risks involved in holding large portfolios of different credit qualities and times to maturity. To accomplish this, we formulate a ratings-based credit risk model and simulate it for large portfolios of credit exposures.

The model we develop generalises a widely employed model, namely the Creditmetrics approach popularised by JP Morgan, to include risks not just of rating transition and random recoveries but also random shocks to spreads in non-default states. Spread risk is important since it is highly correlated across different exposures and hence does not diversify away in large portfolios.

Incorporating spread risk is a difficult task not because of the added complexity of the credit risk model which is relatively slight, but more because of the difficulty of estimating a joint distribution of spread changes over the long horizons typically employed in credit risk modelling. We propose a non-parametric approach to

estimating moments of spread changes over one year or more and argue that over such long periods, spread changes appear approximately Gaussian.

Our non-parametric approach may be thought of as filtering out high frequency components of spread volatility, leaving volatility associated with permanent shocks to spreads. Since a relatively large proportion of the volatility of high credit quality spreads is made up of short term shocks that are reversed by subsequent, off-setting spread changes, filtering in this way increases the gap between the volatility of changes in high and low credit quality spreads.

Basing our discussion on Value at Risk (VaR) measures of risk, we show that spread volatility contributes much the largest fraction of total risk for investment quality portfolios. For reasonable confidence levels, portfolios of credit exposures that possess the same rating profile as that of an average large US bank turn out to have VaRs similar in magnitude to the capital charges required by the 1988 Basel Accord. Lastly, we document the fact that credit risk has an important maturity dimension in that we show portfolios with similar ratings profiles but longer maturity possess substantially larger VaRs.