A Consistent Framework for Stressing Credit Risk Parameters

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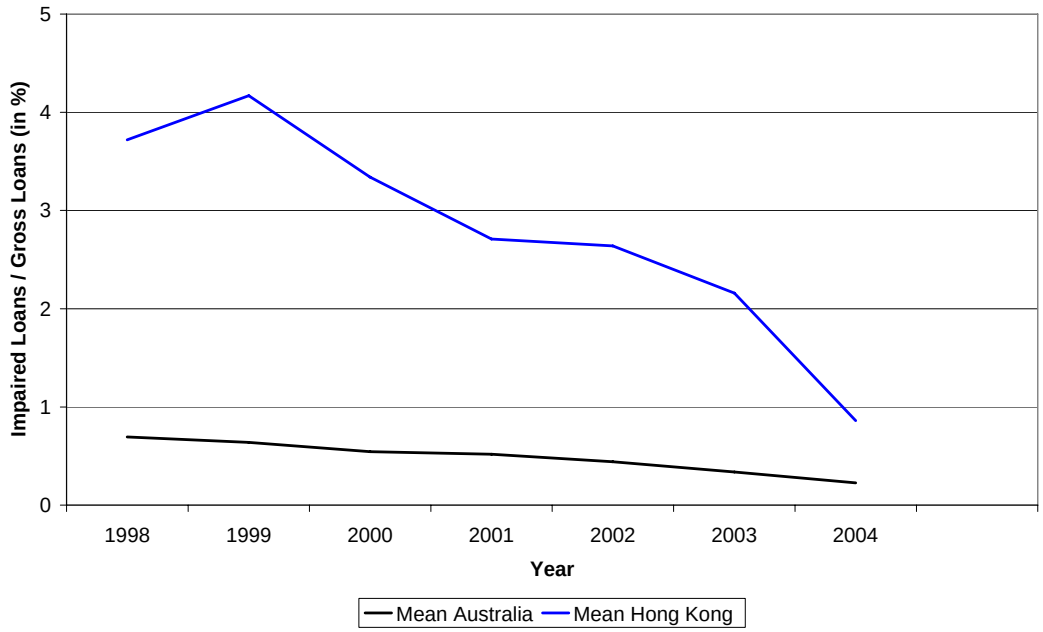
1. Background and aims of project

Starting in 2008, the proposals of the Basel Committee on Banking Supervision (2006) also known as 'Basel II' will be applied in Australia. The five largest Australian banks will then base their regulatory capital on the credit portfolio risk estimated by internal models. It is common practice of banks to focus on a limited set of parameters, such as the probability of default (PD), loss given default (LGD) or asset correlations. The chosen models vary from historic averages to statistical multi-factor models for defined risk segments such as rating, product or collateral categories. A typical model set-up is given by Heitfield (2005).

All models have to be approved by regulators who have an interest in a conservative assessment of the credit portfolio risk. As a consequence, Basel II requires the stress testing of these models. In addition, Basel II calculates regulatory capital based on the following stresses:

- Stress of PDs: PDs are stressed by a one-factor non-linear model where the factor equals the 99.9^{th} percentile of a systematic standard normally distributed random variable and the sensitivity is based on the asset correlation (see third bullet point).
- Stress of LGDs: LGDs are modelled based on an economic downturn condition. This scenario is currently not specified, which has recently caused confusion in the industry.
- Stress of asset correlations: Asset correlations can be interpreted as a measure of the sensitivity of PDs to the business cycle and therefore have a major impact on the stress of the PDs. As a matter of fact, Basel II specifies values which are significantly higher than values implied in empirical data (see Rösch/Scheule, 2004 and 2005). For corporate exposures, these are determined by a decreasing function of the probability of default with values between 24% and 12%.

These models will be calibrated on the data collected by the institutions during the recent years which is particularly a problem for Australian financial institutions. In recent years, they have experienced low and further decreasing levels of losses due to credit risk. These losses were well below the ones of other Asian countries affected by the crisis in the late nineties (e.g., Hong Kong) as well as below the averages of other developed countries. The following chart compares the ratio of impaired loans to gross loans of Hong Kong and Australian institutions (source: Bankscope database):



As a result, bank internal credit risk models will be calibrated to loss levels estimated from low-loss years and therefore may be inadequate to explain future losses.

The aim of the project is to develop a consistent approach for stressing the three fundamental parameters PDs, LGDs and asset correlations derived from different modeling methodologies. This framework will be based on a modular approach which is in line with Basel II and suitable for banks with different degrees of model sophistication. This will enable Australian financial institutions to comply with the Basel II proposals implemented by the Australian Prudential Regulatory Authority.

2. Significance and innovation

The proposed project is significant and innovative with regard to several aspects:

- The project will provide guidance for financial institutions on how to comply with Basel II regulations.
- So far, no consistent approach for stressing credit risk parameters exists. Berkowitz (2000) shows the basic problem that probabilities are never assigned to the stress scenarios. Therefore, the relevance of the stress scenarios is not incorporated into the stress forecasts of a risk model.
- Australia's banking industry has experienced little exposure to credit risk during recent years and the framework will provide Australian banks with a methodology to stress estimates and therefore cover losses given unfavourable economic scenarios.
- The approach will take estimation risk and interdependencies between the risk parameters and their drivers into account. For example, previous studies have shown that risk parameters such as default probabilities and losses given default are positively correlated (compare Altman et al, 2003 or Rösch/Scheule, 2005). The proposed framework will include correlation between the random variables related to the parameter estimates. This will enable financial institutions to forecast the risk parameters, loss distributions and the necessary capital allocation more accurately.

3. Description of Approach

The proposed project consists of four parts. The framework is based on non-linear regression models which incorporate observable information as well as unobservable time-varying random effects for every risk

parameter. Estimation risk and interdependencies between risk parameters will be incorporated by the random nature of the parameters, the default events and the losses given default. Similar models have been applied in previous research of the investigators (see Part 6 of this proposal). Note that a research visit of Dr. Daniel Roesch to Melbourne will be scheduled between March and April 2007.

Part 1 (January to March 2007): Stressing credit risk estimates for the historic average approach
Financial institutions may estimate the credit risk parameters by calculating historic averages for defined risk segments such as rating, product or collateral categories. A framework for stress testing these parameters under the assumption of independence, pre-specified correlations and implied correlations will be derived.

Part 2 (April to June 2007): Stressing credit risk estimates for the multi-factor model approach
More advanced financial institutions may estimate the credit risk parameters by estimating statistical regression models based on observable information on the borrower, the collateral or the economy. A framework for stress testing these parameters under the assumption of independence, pre-specified correlations and implied correlations will be derived.

Part 3 (July to September 2007): Empirical analysis based on a data set provided by Moody's Investors Service
The credit risk parameter will be estimated for a data set provided by Moody's Investors Service based on the historic average approach, the multi-factor model approach and the different stress assumptions. The data set is one of the few publicly available which covers default as well as loss given default histories for corporate borrowers. The distribution of future credit losses will be forecast based on these models and the credit portfolio risk be estimated using different definitions such as the expected loss, credit-value-at-risk or expected shortfall.

Part 4 (October to December 2007): Stressing credit risk estimates in line with Basel II
The regulations for financial institutions are determined by the Basel II proposals. The stressing of certain parameters is prescribed while the stressing of others such as the LGD is based on economic downturn conditions and subject to interpretation. The stressing of these parameters in line with the regulations will be analyzed.

References

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