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**A MACROECONOMETRIC FRAMEWORK FOR CREDIT PORTFOLIO
MODELLING IN SOUTH AFRICA**

by

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SUMMARY

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Abstract

Driven by intense competition for market share, banks across the globe have allowed credit portfolios to become less diversified (across all dimensions – country, industry, sector and size) and have become willing to accept lesser quality assets on their books. As a result, even well capitalised banks could come under severe solvency pressure when global economic conditions turn. The banking industry has realised the need for more sophisticated loan origination and credit and capital management practices. To this end the reforms introduced by the Bank of International Settlement through the New Basel Accord (Basel II) aims to include exposure specific credit risk characteristics within the regulatory capital requirement framework, but is still not able to allow diversification and concentration risk to be fully recognised within the credit portfolio. In order to enhance earnings and liquidity profiles, active credit portfolio management is becoming a central part of capital management within the banking industry. If any risk mitigation or value enhancing activity is to be

pursued, a credit portfolio manager must be able to identify the interdependencies between exposures in a portfolio and relate macroeconomic credit risk into tangible portfolio effects.

The core principle for addressing practical questions in credit portfolio management lies in the ability to link the cyclical or systematic components of firm credit risk with the firm's own idiosyncratic credit risk as well as the systematic credit risk component of every other exposure in the portfolio. Most structural credit portfolio management approaches have opted to represent the general economy or systematic risk by a single risk factor. The systematic component of all exposures, the process generating asset values and therefore the default thresholds are homogeneous across all firms. Indeed this Asymptotic Single Risk Factor (ASRF) model has been the foundation for Basel II. However the ASRF approach does not allow for enough flexibility when answering real life questions. Commercially available credit portfolio models have made an effort to address this issue by introducing more systematic factors in the asset-value-generating process. From a practitioner's point of view, however, these models are often a "black-box" which allows little economic meaning or inference to be attributed to systematic factors.

The methodology proposed by Pesaran, Schuermann, Treutler and Weiner (PSTW) (2006) has made a significant advance in credit risk modelling because it avoids the usage of proprietary balance sheet and distance to default data, instead focussing on credit ratings which are more freely available. Linking an adjusted structural default model to a structural global econometric (GVAR) model means that credit risk analysis and portfolio management can be done by using a conditional loss distribution estimation and simulation process. The GVAR model used in PSTW (2006) comprises a total of 25 countries and accounts for 80 per cent of world production, but does not include an African component.

This thesis proposes a country-specific macroeconometric risk driver engine which is compatible with and could feed into the GVAR model and framework using vector error-correcting (VECM) techniques. This allows conditional loss estimation of a South African-specific credit portfolio and opens the door for credit portfolio modelling on a global scale because such a model can easily be linked into the GVAR

model. By using firm-specific asset value functions, the outcomes from the macroeconometric vector error-correcting model (VECM) is translated into default probabilities and used to perform credit risk analysis and scenario analysis on a fictitious portfolio of corporate bank loans within the South African economy. These results can be used in credit portfolio management or standalone credit risk analysis which means that practical credit portfolio management and value enhancing applications can be performed.

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LIST OF ABBREVIATIONS

| | |
|------|--|
| ADF | Augmented Dickey-Fuller |
| AIC | Akaike information criterion |
| APT | Arbitrage Pricing Theory |
| ASRF | Asymptotic Single Risk Factor |
| BA | Banker's acceptance |
| BIS | Bank of International Settlement |
| bps | Basis points |
| CDF | Cumulative default frequency |
| EL | Expected loss |
| EAD | Exposure at default |
| GDP | Gross domestic product |
| GIRF | Generalized-impulse response function |
| GVAR | Global vector autoregression |
| IFS | International Financial Statistics |
| INS | Information notice system |
| IMF | International Monetary Fund |
| KPSS | Kwiatkowski, Phillips, Schmidt, and Shin |
| LGD | Loss given default |
| MGE | Mean-group estimators |
| OIR | Orthogonalised-impulse-response |
| PD | Probability of default |
| PSTW | Pesaran, Schuermann, Treutler and Weiner |
| PSW | Pesaran, Schuermann and Weiner |
| q.a. | Quarter on quarter annualised |

| | |
|----------|---------------------------------------|
| SARB | South African Reserve Bank |
| Stats SA | Statistics South Africa |
| SD | Standard deviation or unexpected loss |
| Tbill | Treasury bill |
| UL | Unexpected loss |
| VAR | Vector autoregression |
| VECM | Vector error-correcting model |