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**An early warning tool for measuring the build-up of systemic risks**

**in banks and financial systems**

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**Financial markets have become increasingly globalised, with many large firms having a presence in most major markets. Against this backdrop, the global management of systemic risk has led to the imposition of additional regulation on banks and insurers identified as being systemically important.**

**This paper proposes and develops an approach to assess and measure the extent of systemic risk in the financial markets as a whole, and within individual firms. The approach models the impact of a stress situation on default risk and expected capital shortfall.**

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The study shows how expected capital shortfalls, specifically one-month-ahead simulated shortfall values and market returns may be modelled, based on daily bank and market price performance data.

Market returns capture a common driver of bank returns and shortfalls, and thus permit an assessment of the risk posed to individual banks by an event such as a major market correction. Aggregating individual simulated bank shortfalls facilitates an understanding of systemic risk.

Common stress testing techniques, including those prescribed by the Australian Prudential Regulation Authority (APRA) in its industry stress tests, focus on a single adverse scenario and its anticipated impact. However, stress testing that focuses on a single scenario ignores the possibility of other adverse scenarios and the stochastic or probabilistic nature of actual outcomes. Additionally, when various scenarios are considered, there is no coherent framework within which to combine them to assess the overall stresses on individual firms.

For the purposes of stress testing based on more than one adverse event, the scenarios to be considered may represent simulations from a stochastic model. Alternatively, they may relate to market or macro-economic variations during the expectation period such as interest rate or credit spread movements, unemployment rates, and changes in house prices or inflation and economic growth rates. The study assumes the market index return to be the single factor that drives scenarios. Thus, compared to the standard approach, which assumes a single and typically infinitesimal probability value for the market return, the refined approach applied in this study allows for a range of plausible values.

The study shows that an accurate and policy relevant assessment of financial risk requires the separation of Baseline risk (BRISK) and Systemic Risk (SRISK) both within individual firms and in the system.

Baseline risk (BRISK) is related to volatility. High levels of BRISK at the individual firm level are potentially likely to make a correspondingly higher contribution to the overall level of stress. Firm-level BRISK tends to increase in line with the amount of debt that the firm is carrying. A high BRISK value shows the vulnerability of the firm to a capital shortfall and flags to regulators, such as APRA, the necessity for remedial action such as reducing debt or increasing capital. At the aggregate level, BRISK is further significant in terms of being a forward-looking indicator of the exposure of the individual firms and the system as a whole to failure.

Systemic risk (PRISK) measures the impact of a system-wide shock. While such shocks are largely unpredictable the differential impact on firms can be assessed. At the firm level, systemic risk is a function of the prevailing level of macroeconomic stress and the anticipated capital shortfall of the firm.

By separating BRISK and systemic risk factors, nuanced and more focused remedial or regulatory action can be taken either in relation to individual firms or the overall market. For an individual firm with a high level of BRISK or systemic risk, remedies such as reduced leverage or a capital injection can be applied. However, when systemic risk is elevated for all firms, macro-economic measures, such as increased regulation, are likely to be required.

Following are the specific drivers of systemic risk:

* Financial dependence between firms;
* Dependence of individual firms on common macroeconomic factors and market conditions;
* Proportionally large balance sheets of key individual firms; and
* High leverage, with debt levels many times the value of net assets.

A firm’s PRISK reading is not an indication of an imminent capital shortfall, although the contribution of the firm to total overall PRISK enables regulators to identify systemically important firms. Also, a growing level of interdependency between firms increases their individual vulnerability to shocks that impact the overall system.

A firm will typically have an elevated PRISK reading if it has a correspondingly greater anticipated capital shortfall during periods when the system is in distress. For example, a bank may record an elevated PRISK reading if it has a loan book with high loan-to-valuation ratios during a period when the labour market weakens or residential property prices fall.

A firm may record a low PRISK reading even if its BRISK reading is high. For example, a firm that sources its business largely from the overseas markets will be correspondingly less impacted by stresses confined to the local system.

This paper proposes a centralised model and assessment tool for the calculation and monitoring of baseline and systemic risks across firms. The model uses publicly available stock price returns, and makes simplified assumptions regarding capital requirements and debt, and market returns as a driver of firm stock returns.

The model may be refined by identifying and incorporating key factors, apart from market returns, and their balance sheet impact. Such factors may include: interest rates; employment; economic growth and property prices. The impact of each factor will differ according to the specific characteristics of the particular firm’s balance sheet. For example, a bank whose asset base is largely comprised of residential loans will be correspondingly more sensitive to residential property price fluctuations than another that is more exposed to commercial loans. Detailed analysis of individual balance sheet exposures, and the factors that influence them, underpins potential refinements to the modelling of baseline and systemic risk calculations.