DIRECTED RISK RESEARCH PROBLEM STATEMENT

Risk Theme	Systemic risk	**Problem Nr.**	PS16002

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PROJECT TITLE: Network structure and shock propagation in financial networks

PROJECT GOAL:

Build a model to investigate how shocks propagate through different financial networks based on liquidity risk and contagion.

HIGH LEVEL DESCRIPTION OF PROBLEM:

There is a need for a better understanding of the robustness of certain financial structures and how well they can withstand external shocks - the complexity of financial networks make it difficult to gauge the effect of the structure on stability. It is important to note that the ultimate goal of this research is to address the problem of modelling a dynamic banking system as part of a bigger macro-economic model.

When investigating systemic risk, the frictions that are present in real life systems need to be incorporated. Liquidity (or the lack thereof) in financial systems are directly linked to the trust that market players have in the system. The modelling of this trust is difficult and in many ways subjective. Nevertheless it is an important factor and any model of financial contagion should incorporate this.

The problem of understanding the different factors that influence banking system stability (in isolation) is a subset of the bigger problem of understanding the macro-economic consequences of a stressed banking system. The long term aim would be to look at the macro-economic consequences of quantitative easing when the financial system is under strain and when market players start to lose faith in the system.

The Basel Committee on Banking Supervision (BCBS) was instructed by the Financial Stability Board of the G20 to improve its Basel II regulatory framework following the latest international financial crises. This led to the development of Basel III, which is aimed at improving some of the shortcomings of the Basel II framework. One of the most important objectives of Basel III is to ensure that banks are better able to withstand future potential financial crises, thereby aiming to strengthen the system as a whole. The BCBS proposed a phased implementation of the Basel III guidelines and provided timelines for banks to meet the different regulatory guidelines.

Regulatory requirements such as Basel III essentially aim to influence the system in such a way as to make it more robust. In light of this, it is important for regulators to be aware of the properties of the system that make it prone to collapse. These properties need to be monitored and controlled by regulators in order to protect the system as a whole.

When looking at a banking system in isolation, previous research have focused on a network theory approach to represent the banks in the system. Many of these studies made simplifying assumptions regarding the connections between the banks, such as an Erdös-Rényi structure or other generic structures. However, this may not be a representative structure for most real life systems. Previous studies (for example [1] and [2]) suggest that certain banking system represents a ‘tiered’ network where there are a few large and highly interconnected institutions, and a number

of smaller institutions that mainly connected to the larger ones. This highlights the need to look at structures other than that imposed by the Erdös-Rényi assumption.

[1] M. Boss, H. Elsinger, M. Summer, and S. Thurner. Network topology of the interbank market. Quantitative Finance, 4(6):677–684, 2004.

[2] R. Cont, A. Moussa, and E. B. Santos. Network structure and systemic risk in banking systems. Handbook of Systemic Risk, pages 327–368, 2013

PROJECT OBJECTIVES:

Develop a network model that can be used to mimic the behaviour of a banking system when it is subject to an external shock which can be used to gain the insights and resultant control stability envisaged by the new BCBS regime.

OUTPUTS REQUIRED:

- A paper in the academic financial literature
- Practical Guidance to the industry on local / international best practice

STRATEGIC VALUE TO DIRECTED RISK RESEARCH:

This research should contribute to the literature on financial network models of systemic risk and should investigate network structures not previously investigated by means of network models. The outcome of the research will be relevant to the regulatory requirements imposed by the Basel accords and the South African Reserve Bank. This research project forms part of an overarching systemic risk research initiative to develop macro-economic models (e.g. for South Africa) that can be used to study systemic risk.