

# DIRECTED RISK RESEARCH PROPOSAL

<b>Risk Theme</b>	Systemic Risk
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**Client Info:** *(only applicable if proposal is in response to a client problem statement)*

<b>Problem Title</b>	Systemic Banking Crisis Early Warning Systems Using Dynamic Bayesian Networks				
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<b>University</b>		<b>Classification</b>	
<b>Problem Nr.</b>	PS16004	<b>Type</b>	
<b>Proposal Nr.</b>	RP16003	<b>Date</b>	29 July 2016

## PROJECT TITLE:

Systemic Banking Crisis Early Warning Systems Using Dynamic Bayesian Networks

## PROJECT GOAL:

The development and application of dynamic Bayesian networks as early warning systems for systemic banking crises.

## PROJECT SCOPE

The scope of this project includes the development and application of dynamic Bayesian networks for the problem of systemic banking crises. The aim is to identify a crisis before it occurs. This involves identifying a pre-crisis period. The models developed will be tested on a specific dataset involving developed countries in the European Union [1]. 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.

## PROJECT OBJECTIVES

For many years systemic banking crisis early warning systems have been dominated by the signal extraction and logit model methods [2]. These methods do not consider the dynamics of the variables of interest (indicator variables) in the banking system. In this project dynamic Bayesian networks [3] are developed and applied to model the dynamics of indicator variables. In particular, the purpose is to model the dynamics of tranquil and crisis regimes. The model of a crisis regime provides the means to identify crises. Furthermore, as the dynamic Bayesian network is a probability model, it provides the means to identify a crisis with a particular probability.

## RESEARCH OUTPUTS / DELIVERABLES

<b>PUBLICATIONS:</b>	<b>Name(s) / Title(s)</b>
Articles	2

[1] P Laina, J Nyholm and P Sarlin, 2015. Leading indicators of systemic banking crises: Finland in a panel of EU countries. Review of Financial Economics 24, 18 – 35.

[2] Demirgüç-Kunt, A., Detragiache, E., 2005. Cross-country empirical studies of systemic bank distress: A survey. National Institute Economic Review 192 (1), 68–83.

[3] J.J. Dabrowski, J.P. de Villiers and C. Beyers, 2016. Naive Bayes switching linear dynamical system: A model for dynamic system modelling, classification and data fusion. Information Fusion - Under review.

## APPROACH TO BE FOLLOWED

- 1) Study relevant literature on existing systemic banking crisis early warning models as well as literature on dynamic Bayesian networks.
- 2) Obtain a suitable dataset for testing the model on.
- 3) Develop and apply the dynamic Bayesian network models to the dataset
- 4) Compare the dynamic Bayesian network models with the popular existing methods found in literature

## STRATEGIC VALUE TO DIRECTED RISK RESEARCH

This research will add to existing models for banking crisis early warning systems. The results of the model could assist decision makers in regulatory bodies to make decisions on early intervention.