

DIRECTED RISK RESEARCH PROPOSAL

Risk Theme	Market risk
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Client Info: *(only applicable if proposal is in response to a client problem statement)*

PS Title					
Client Name		Designation			
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Research Team:

Team Leader	Pawel Fiedor	Designation	Postdoctoral Research Fellow		
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University	UCT	Classification	Open
Theme No		Type	Technology-Push
Project No	RP15014	Date	2015-06-20

PROJECT TITLE: Analysis of the structural risk on the JSE with complex network approach

PROJECT GOAL:

Analysis of the structural risk on the JSE based on constructing complex networks modelling the market in various time scales.

PROJECT SCOPE

Financial markets are becoming increasingly complex adaptive systems. We most commonly find an assumption that the time series describing stock returns are unpredictable. Within this paradigm the evolution of stock prices can only be explained by random processes (the Efficient-Market Hypothesis). The standard assumption that price formation processes are stochastic leaves researchers with a question of whether these processes are independent for different financial instruments, or whether there exist relationships based on known or unknown common economic factors driving these formation processes. Tools developed in complex networks theory are often used to analyse the interdependencies between financial instruments. Importantly, finding an appropriate network model leads to the possibility of analysing the market structure and risks associated with it. Very few studies construct models which are appropriate for analysing the structure of financial markets (e.g. only a

handful of studies account for non-linearity, which has been shown to be strong on all financial markets). And virtually no studies compare the structure of the markets at various time scales, while it is plausible that the complexity of the financial markets stems from the interplay between its structure at various time scales. There is a need to conduct an appropriate analysis of the market in Johannesburg, accounting for the appropriateness of the model, and for various time scales.

PROJECT OBJECTIVES

The project involves choosing the best complex network approach for analysing the structure of the stock markets and augmenting it with multiscale entropy analysis (e.g. [Fiedor 2014, Physical Review E 89, 052801], [Fiedor 2015, Risks 3(2), 219-233]). Further, it involves careful preparation of historical data on prices on the JSE, in particular cleaning the data and transforming it to an appropriate format. The project involves creating the methodology, but is primarily aimed at analysing the structure of the market in Johannesburg, in various time scales, and drawing conclusions on the structural risks connected with the aforementioned structural properties of the JSE. The project may potentially also involve preparing policy recommendations, as well as trading recommendations, which may improve the outlook with respect to the structural risk within the JSE.

RESEARCH OUTPUTS / DELIVERABLES

PUBLICATIONS:	Name(s) / Title(s)
Articles	1
STUDENTS:	Name(s) of Student(s)
PDRF	Paweł Fiedor
OTHER:	
Dissemination through academic/industry conferences	

APPROACH TO BE FOLLOWED

- 1) Study of the relevant literature on complex asset networks, and multiscale entropy analysis
- 2) Construction of the non-parametric non-linear network models
- 3) Construction and analysis of networks modelling the JSE in various scales, based on the above
- 4) Preparation of the final analysis, evaluation of the usefulness and limitations of the approach

STRATEGIC VALUE TO DIRECTED RISK RESEARCH

The outputs of this research have some value for the theorist working in modelling financial markets appropriately, but is mostly directed at practitioners, appraising them on the risks inherent in the structure of the market, in particular with respect with various time scales, which are of importance to investors with various trading strategies.