# DIRECTED RISK RESEARCH PROPOSAL

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|---|---|
| **Risk Theme** | Foreign Exchange Risk |

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

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| **PS Title** | | | | | |
| **Client Name** | | **Designation** | | | |
| **E-mail** | | **Tel (w)** | | **Mobile** | |

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| **University** | UCT | **Classification** | |
| **Theme No** | | **Type** | Technology-Push |
| **Project No** | RP15010 | **Date** | June 2015 |

## PROJECT TITLE

Stability, Multifractality and Self-Similarity FX Data Analysis for African currencies against the US Dollar.

## PROJECT GOAL

The main objective is to estimate and analyze key parameters influencing variations in African currencies/USD rate and impose accurate distributional hypothesis in the risk management strategy.

## PROJECT SCOPE

The concern in risk management is to understand variability in the historical financial data. Over the years, the mean and standard deviation or coefficient of variation where the key measures to understanding variability. This obviously requires the variance to be finite a key feature of the Gaussian distribution. However, empirical data from different markets do not follow Gaussian distribution. They exhibit leptokurtic and skewness features as well as heavy tails.

A study on the distribution of parallel exchange rates in African countries (H. Fofack and J. P. Nolan , 2001) shows financial data series from African markets reject the Gaussian hypothesis. Positive skewness and fat tails were evidenced in the US Dollar against all other African currencies. A stable

distribution hypothesis is recommended after performing converging variance tests and noticing the empirical distributions exhibited infinite variance.

A statistical study (A. Kabasinskas, S. T. Rachev and L. Sakalauskas, S. Wei and I. Belovas, 2009) on financial data series from the emerging markets of the Baltic States shows non-normal stable models produced better results compared to the Gaussian distribution. In general, emerging markets are illiquid and thus data is limited and exhibits some passivity or stagnation characteristics. This is a challenge towards calibration and parameter estimation. However, it has been observed (A. Kabasinskas, S. T. Rachev and L. Sakalauskas, S. Wei and I. Belovas, 2009) that the distribution of zero returns can still tell much about the nature of the returns. Thus, small data sets could still be used to obtain reliable results. This therefore, poses no challenge in the illiquid African markets.

We seek to extend the methods explored in (A. Kabasinskas, S. T. Rachev and L. Sakalauskas, S. Wei and I. Belovas, 2009) to Africa's emerging foreign exchange markets to estimate relevant market parameters not captured in the results of (H. Fofack and J. P. Nolan , 2001) and (E. van der Merwe Smith and T.W. Pahn, 1992) and discuss the risk implications and possible risk management measures that could be undertaken. The results of (C-S. Huang, C-K. Huang and K. Chinhamu , 2014) are worth considering.

**PROJECT OBJECTIVES**

To estimate essential parameters from foreign exchange data of most African countries against the dollar and investigate the risk implications. We employ stable distributions to get around the issue of infinite variance which is crucial in traditional parameter estimation techniques which require finite variance.

In turn, to capture the evident skewness, kurtosis and fat tails in foreign exchange data.

To explore hedging in FX markets through hedge ratio analysis and a continent-wide futures exchange.

**RESEARCH OUTPUTS / DELIVERABLES**

| **PUBLICATIONS:** | **Name(s) / Title(s)** |
|---|---|
| Articles | 2 |
| **STUDENTS:** | **Name(s) of Student(s)** |
| Ph.D. | **Michael Kateregga** |
| | |
| | |
| **OTHER:** | |
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**APPROACH TO BE FOLLOWED**

Study relevant literature (e.g. (H. Fofack and J. P. Nolan , 2001), (A. Kabasinskas, S. T. Rachev and L. Sakalauskas, S. Wei and I. Belovas, 2009), (E. van der Merwe Smith and T.W. Pahn, 1992)).

1) The first step in determining a suitable model for a given data set is to perform descriptive data analysis that includes finding the mean, variance, coefficients of skewness and kurtosis in the data. Then one can propose potential models for fitting through parameter estimation. Common estimation methods in existence we will adopt in our research include the fractile method ( (E. F. Fama and R. Roll, 1971); (McCulloch, 1986); (Czarnecki, 1994)), the method of sample characteristic function ( (Akgiray, 1989); (S. Mittnik and S. T. Rachev, 1993a), (S. Mittnik and S. T. Rachev, 1993b)), the Likelihood method ( (H.

Fofack and J. P. Nolan , 2001)), method of moments (not applicable to non-normal distributions) and the regression method.

2) We intend to test our model using and comparing the following goodness-of-fit techniques; Chi-square, the method of characteristics, Wald-Wolfowitz method and the Hoel criterion.
3) We also seek to explore some hedging techniques, particularly hedging with futures.
4) Our case studies will include Kenya, South Africa, Morocco Nigeria and the Democratic Republic of Congo for geographical representations although the countries have relatively different economic infrastructures.

**STRATEGIC VALUE TO DIRECTED RISK RESEARCH**

This research will propose the best distributional model that can be exploited by both academics and practitioners to understand African FX markets and risk.

Secondly, we will demonstrate the hedging approach with currency or commodity futures in the African markets context. By developing a generalized distributional model for a continent-wide futures exchange to manage FX risk. The motivation of this objective derives from the following two articles: http://africanbusinessmagazine.com/african-banker/currency-futures-will-hedge-fx-risks/ and http://www.afdb.org/en/documents/document/guidebook-on-african-commodity-and-derivatives-exchanges-42998/.

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