DIRECTED RISK RESEARCH PROPOSAL

Risk Theme	Operational risk (analysis)

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

Problem Title	A simulation comparison of quantile approximation techniques for compound distributions popular in Operational Risk				
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University	NWU	**Classification**	
Problem Nr.	PS15007	**Type**	Technology-Pull
Proposal Nr.	RP15029	**Date**	30 July 2015

PROJECT TITLE

A simulation comparison of quantile approximation techniques for compound distributions popular in Operational Risk.

PROJECT GOAL

Compare different techniques for approximating the quantiles of compound distributions in terms of their practical usefulness.

PROJECT SCOPE

Many banks currently use the loss distribution approach (LDA) for calculating economic and regulatory capital for operational risk under Basel's Advanced Measurement Approach. The LDA requires, amongst others, the modelling of the aggregate loss distribution in each operational risk category (ORC). The aggregate loss distribution is a compound distribution resulting from a random sum of losses resulting from a fitted severity and frequency distribution and is popular in many actuarial contexts as well. In order to calculate the economic or regulatory capital in a particular ORC, an extreme quantile of the aggregate

loss distribution has to be approximated. This is usually done by brute force Monte Carlo simulation which is very computing intensive. However, a number of numerical approximation techniques have been proposed to lessen the computing burden. Such techniques include Panjer recursion, the fast Fourier transform, different orders of the single loss approximation and different orders of perturbative approximations.

This study should focus on investigating various methods for approximating the quantiles of compound distributions. The advantages and limitations of the different approaches should be highlighted and documented. Guidance should be documented to provide practical advice regarding the usage of the different methodologies. The different methodologies should be evaluated using a simulation study.

PROJECT OBJECTIVES

The objective of this project is to compare the proposed methods in terms of their practical usefulness and potential applicability in an operational risk context.

RESEARCH OUTPUTS / DELIVERABLES

PUBLICATIONS:	**Name(s) / Title(s)**
STUDENTS:	**Name(s) of Student(s)**
OTHER:	
Technical report on comparing alternate approximation techniques.	
Possible publication in the academic financial literature	

APPROACH TO BE FOLLOWED

In order to investigate alternative approximation techniques to Monte Carlo simulation we propose the following steps:

1) Study and review the available literature on the topic.

2) Presentation and decision on the best methods to use in our comparison.

3) Implementation and evaluation of the methods.

4) Presentation on pros and cons especially with respect to the impact on capital estimates.

5) Technical documentation and summary.

STRATEGIC VALUE TO DIRECTED RISK RESEARCH

This research will contribute conceptually to operational risk analysis techniques applied in the banking industry.