

DIRECTED RISK RESEARCH PROPOSAL

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

Problem Title	Measures of loan delinquency and loan portfolio optimisation				
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University		Classification	
Problem Nr.	PS16007	Type	
Proposal Nr.	RP16005	Date	

PROJECT TITLE

Measures of loan delinquency and loan portfolio optimisation

PROJECT GOAL

Investigate the optimisation of loan portfolios over different loan delinquency measures and a corresponding range of default definitions.

PROJECT SCOPE

At the outset, this project will shed new light on the concept of loan delinquency by attempting to formulate delinquency measures other than the standard Contractual Delinquency (*CD*) – which is effectively the balance of the number of missed payments.

Classical credit scoring models, in the widest sense, aim to predict (classify) the intrinsic risk level of loans (either new or existing) – as manifested in their future repayment (or non-payment) [1, p. 5], [2]. In training these classifiers, most of the research effort seem to assume that historical loan repayment records are already pre-classified as either good or bad risks, ensuring that the research focus remains on optimizing statistical model performance – see [3], [4], [5], [6]. In turn, these pre-classified records from the good/bad subpopulations exist as a result of applying a default definition (or threshold) on the scale of a chosen delinquency measure – in this case, the standard *CD*-measure, e.g., $CD \geq 4$ denoting a defaulted (“bad”) loan.

The current practice (called the *Pre-classification* exercise) of finding such a threshold using the *CD*-measure, depends largely on the subjective (and qualitative) discretion of the lender (or regulator), as well as on the specific portfolio (e.g., mortgages vs. credit cards) and general loan features (e.g., term vs. product tiers) – see [7, pp. 32-40], [8, pp. 123-124].

A delinquency measure in general should accurately quantify the degree of non-payment (if any). In this project, three different loan delinquency measures are compared, including a novel proposal by the

authors. An optimisation procedure (as discussed below) is then applied to determine the delinquency measure and corresponding default threshold that minimise losses on a given loan portfolio.

PROJECT OBJECTIVES

In assessing different measures of delinquency with different default definitions (or thresholds), this project formulates an intuitive benchmark from a profit-based vantage point on the portfolio-level. This approach therefore requires a portfolio of loans with comprehensive repayment histories. Such a portfolio would inherently depend on the intrinsic risk grade of each loan, as manifested by the difference in the sums of expected instalments and actual repayments. This requires building a comprehensive simulation engine capable of generating both simple and complex portfolios according to different risk grades and a set of input parameters, in a bottom-up fashion, i.e., from the loan-level.

Given a simple simulated portfolio unto which these delinquency measures were applied, a comprehensive net loss function must be formulated in order to assess financial loss across the spectrum of each delinquency measure. However, loan losses only become tangible when one introduces a threshold on a measure, above which loan write-off is signalled. The aim is then to compare these delinquency measures and determine the optimal delinquency measure / default threshold combination in terms of net portfolio losses (or profits).

RESEARCH OUTPUTS / DELIVERABLES

PUBLICATIONS:	Name(s) / Title(s)
Articles	1
STUDENTS:	Name(s) of Student(s)
Ph.D	Arno Botha

PROGRESS

- 1) Formulate new delinquency measures based on the work of [9].
- 2) Engineer a robust simulation engine capable of generating a portfolio (both simple and complex) consisting of loans with detailed repayment histories.
- 3) Compose an intuitive benchmarking approach in comparing different delinquency measures and associated thresholds from a net profit/loss-vantage.
- 4) Compare delinquency measures at fixed thresholds as well as across thresholds, using a simple portfolio as generated by the simulation engine.
- 5) Develop methodology to determine the optimal delinquency measure / default threshold combination in terms of net portfolio loss.

STRATEGIC VALUE TO DIRECTED RISK RESEARCH

This research will broaden the scope of credit risk modelling by introducing and testing alternative delinquency measures, hypothesized to be more risk-attuned and to yield reduced net losses. It provides an objective methodology whereby industry practitioners can decide on the optimal loan delinquency measure and default definition to apply to a loan portfolio. The outcome of this research on delinquency measures will be relevant to both banks and the regulator as it has the potential to contribute to both the balance sheet and risk management.

REFERENCES

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