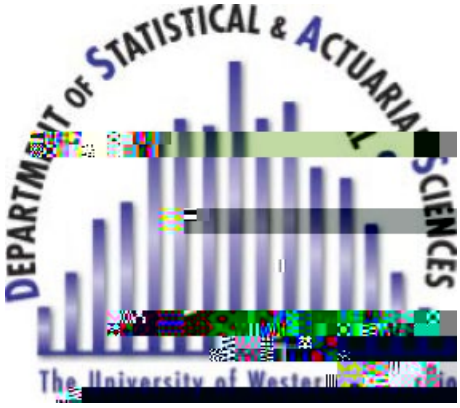
DEPARTMENT OF STATISTICAL & ACTUARIAL SCIENCES

Master's Day

July 28, 2023



19th Annual Master's Day

Contents

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Karzan Saeedi, Statistics, Financial Modelling, supervised by Dr. Ricardas Zitikis

Title: The Euler-based Capital Allocation Rule and its Compatibility with RORAC

This research studies capital allocations in financial institutions, focusing specifically on the Euler method. Our goal is to understand the Euler method and offer a guide to help financial businesses to use this method effectively.

Ruimin (Jasmine) Gao, Statistics, supervised by Dr. Hyukjun Gweon

Title: Label Powerset Classifier Chains for Multilabel Classification

In multi-label classification, each instance may be associated with multiple labels simultaneously. Multi-label data are typically modeled by some combinations of binary or multi-class models. One of the most well-known approaches for multi-label classification is Classifier Chain, in which label dependencies are addressed by a chain of sequential binary classifiers. In this project, we expand the idea of Classifier Chain and use a chain of segregated multi-class classifiers. The performance of the proposed method is examined under different parameter settings. We also compared the proposed method with other commonly used methods using some benchmark datasets.

Jingyi Liu, Statistics, supervised by Dr. Hyukjun Gweon, Dr. Hao Yu

Title: Investigating the Impact of Labeling Errors on Active Learning Performance in Time Series Classification

Active learning is a machine learning framework that can enhance prediction while minimizing the number of labelled instances required for model training. An active learning process interacts with an oracle (e.g., a human expert) to request the labelling of informative unlabeled instances. However, real-world applications often involve human experts prone to make labelling errors, affecting the9 (i3Sr)ted affe

Xinkai Zhuang, Financial Modelling, supervised by Dr. Marcos Escobar-Anel

Title: Comparative Analysis of Characteristics and Prepayment Modeling for Mortgage-Backed Securities: A Focus on NHA MBS in Canada

Mortgage-backed securities (MBS) are debt obligations that represent claims to the cash flows from pools of mortgage loans, most commonly on residential property. While previous studies have primarily focused on MBS in the United States, limited research has been conducted on Canadian MBS (NHA MBS). To address this gap, this project compares mortgage characteristics in the United States and Canada, highlighting the unique term and distinct prepayment behavior of Canadian mortgages. Addressing the risk associated with MBS prepayment behavior, we develop a more suitable piecewise linear model for estimating prepayment rates specifically for NHA MBS, utilizing historical data. Additionally, this project presents a pricing methodology for MBS, akin to bond pricing, considering interest rate term structures and credit spreads. The proposed approach is specifically tailored to the Canadian market and offers practical implications for MBS valuation.

Jueyi Shao, Financial Modelling, supervised by Dr. Marcos Escobar-Anel

Title: Tackling Non-modellable Risk Factors with Variations of Linear Regressions

This paper addresses the challenge of quantifying non-modellable risk factors (NMRFs) in regulatory capital requirements for financial institutions, a process critical to robust financial risk management. Traditionally, NMRFs have been approximated with proxy variables, but this practice is no longer deemed acceptable by current banking regulations according to the fundamental reviews of the trading book. In this work, we propose a methodology to decompose NMRFs using multivariate regression and adding a covariance/correlation term in to the objective values of the optimization process, hence reducing the bias in capital requirement estimations.

Our study focuses on the stock returns of Apple, Google, and Amazon as NMRFs, utilizing the return of the SP500 index as the modellable risk factor. The proposed approach modifies the traditional multivariate regression objective function to minimize the residuals' covariance, thereby leading to representation of NMRF in tune with regulations.

To validate our methodology, we experiment with eight different models, each with the aim to capture the systematic, predictable variation in the NMRFs, referred to as the 'Modellable Component' of the risk. The ultimate goal is to minimize the residual correlation across different NMRFs, thus preventing the overestimation of the residual component in our decomposition, which could otherwise lead to inaccurate capital requirement assessments. This research contributes a potentially more accurate and regulation compliant approach to the complex task of capital requirement estimation, mitigating the risk of under- or over-estimation resulting from nonmodellable risk factors.

Peiyu Huang, Actuarial Science, supervised by Dr. Katsu Goda, Dr. Jiangdon Ren

Title: Pricing the Catastrophe risk bonds for household seismic losses in Victoria, BC

Catastrophe events such as earthquakes, hurricanes, floods, can cause huge losses to insurance companies. An important tool is to transfer part of the risks to financial markets by issuing catastrophe risk bonds (CAT bonds). The CAT bonds can provide a means for investors to diversify their investment portfolio because their returns are uncorrelated with broader financial markets. In this project, based on