



The Hong Kong University of Science and Technology

Department of Mathematics

PhD THESIS EXAMINATION

Dimension Reduction Methods for Financial Market Prediction

By

Mr. Yizhe DENG

ABSTRACT

Return predictability is an important issue in finance and financial engineering. Investor's expectations play a central role in forming asset returns, but the challenge is that expectations are unobservable. This study attempts to obtain investor's expectations via two channels. To fully condense the information embedded in the expectations, we consider dimension reduction approaches to extract the condensed latent factor that helps forecast stock returns. In the first channel, we construct an expected macroeconomic condition factor from survey-based forecasts of future macroeconomic activities, with the purpose of tracking the equity premium. This macro factor exhibits salient counter-cyclical dynamics, produces an out-of-sample R^2 of 3.4% for predicting quarterly stock market excess returns from 1984 to 2018, and dominates a wide array of commonly used macro and financial predictors. The long-term macro forecasts provide incremental information about the time variations of long-horizon equity premiums. A dynamic trading strategy that employs market timing in return and volatility jointly based on the factor can yield a significant and sizable utility gain to a mean-variance investor. In the second channel, we proxy the U.S. volatility risk by a single forward-looking factor extracted from the term structure of option-implied U.S. forward variances. We study the cross-country impact of U.S. stock market volatility risk. A large increase in the U.S. volatility risk significantly predicts future stock market returns on 11 industrialized countries. We also find the strong out-of-sample predictive ability of the U.S. volatility risk. Empirically, our U.S. volatility risk factor can predict future U.S. macroeconomic conditions as well as local stock market volatility, suggesting that the source of the predictability we find stems from the impact of U.S. volatility on the international investment opportunity set. This result is consistent with the international version of the inter-temporal capital asset pricing model and supports the leading unique role of the U.S. in the international stock market risk spillover network.

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- Thesis Supervisor** : Prof Lixin WU, MATH/HKUST
Prof Zhaojun YANG, FINA/SUSTech
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- Member** : Prof Shiqing LING, MATH/HKUST
- Member** : Dr Wei JIANG, IEDA/HKUST
- External Examiner** : Prof Mei Choi CHIU, Department of Mathematics and
Information Technology/The Education University of Hong Kong

(Open to all faculty and students)

The student's thesis is now being displayed on the reception counter in the General Administration Office (Room 3461).