Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

Essays on Return Predictability

Helen Lu

A dissertation submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy in Finance

Department of Economics and Finance

Massey University

10 July 2013

Acknowledgements

I greatly acknowledge the advice, encouragement and support of my supervisors, Ben Jacobsen, Philip Stork and Russell Gregory-Allen. I thank the department of Economics and Finance for providing financial support and an inspiring research environment.

Abstract

This dissertation is a collection of three essays that investigate the momentum effect and the short-run predictability in currency carry trade profits.

The first essay investigates whether tail risks of momentum strategies make them unattractive within the context of prospect utility. Momentum returns have strongly asymmetric tail risks and that asymmetric tail risk is precisely what makes momentum strategies unattractive. This study is the first to document the undesirable tail risk characteristics of momentum returns.

The second essay uncovers economically significant predictability in carry trade profits from shorting the low-yielding currencies. The monthly world equity index return, monthly changes in currency volatility and monthly changes in equity volatility predict carry trade profits from the short leg two months later, while monthly changes in commodity prices, monthly changes in currency volatility and monthly changes in equity volatility predict carry trade profits from the long leg three months later. Investors could have used the discovered leg-specific predictability to time the market and improve their trading outcomes, instead of staying fully invested or predicting carry trade profits from both legs with a single model. Evidence from two tests conducted in this essay points towards the gradual information diffusion model as the most likely explanation for the discovered predictability, while time-varying risk premia do not seem to explain this effect.

The last essay examines return predictability among carry trades, stocks and commodities in a dynamic vector autoregression setting. The predictive effect goes from commodities to stock, from stocks to low-yielding currencies and from commodities to high-yielding currencies. Variables in these markets are more strongly correlated in the high-risk regime than in the low-risk regime. Drops in the world equity index (commodity prices), but not rises, predict decreases in carry trade profits from low-yielding (high-yielding) currencies. Increases in currency volatility, but not decreases, predict drops in carry trade profits from low-yielding currencies. The in-

sample asymmetric effects also exist out-of-sample, but these asymmetric prediction models do not consistently deliver better forecasts than symmetric models.

Table of Contents

| Cha | pter 1 Overview | 1 |
|-----|--|---------|
| Cha | pter 2 Asymmetric Extreme Tails and Prospective Utility of Momentum Re | turns 5 |
| 1. | Introduction | 6 |
| 2. | Related literature | 6 |
| | 2.1.Momentum anomaly | 6 |
| | 2.2.Extreme value theory | 9 |
| | 2.3.Prospect theory | 9 |
| 3. | Data | 10 |
| 4. | Methodologies | 11 |
| | 4.1.Hill estimator, Value at Risk (VaR) and expected shortfall | 11 |
| | 4.2.Statistical tests for tail asymmetry | 15 |
| | 4.3. Moving block bootstrapping for dependent data | 15 |
| | 4.4.Simulations to generate momentum return prospects | 16 |
| 5. | Main results | 17 |
| 6. | Robustness check | 23 |
| | 6.1.Different data frequencies | 23 |
| | 6.2.Reconcile results using daily data with results using monthly data | 24 |
| | 6.3.Different momentum strategies | 25 |
| | 6.4.Rolling window analysis | 26 |
| 7. | Conclusion | 28 |

| Cha | pter 3 Predictability in Carry Trades and an Evaluation of Alternative | |
|-----|---|----|
| | Explanations | 32 |
| 1. | Introduction | 33 |
| 2. | Dynamic carry trade strategies | 39 |
| | 2.1.Construction of dynamic carry trade strategies | 39 |
| | 2.2.Profits from dynamic carry trades | 42 |
| 3. | Predicting carry trade profits from the short leg and the long leg | 47 |
| | 3.1.Predictors for carry trade profits | 47 |
| | 3.2.In-sample evidence on predictability in carry trade profits | 49 |
| 4. | Rolling-window regressions | 59 |
| 5. | Out-of-Sample Evidence on Predictability in Carry Trade Profits | 61 |
| 6. | Economic Significance | 64 |
| 7. | Gradual information diffusion? | 70 |
| | 7.1.Predictive power and lengths of lags between predictors and carry trade profits | 71 |
| | 7.2.Predictors and macro-economic fundamentals | 73 |
| 8. | Predictability exists in currency components but not interest components | 76 |
| 9. | Other predictors for carry trade profits | 76 |
| 10. | Time-varying Risk Premia? | 77 |
| | 10.1.Predictability at longer horizons | 78 |
| | 10.2.Correlation with economic variables | 81 |
| | 10.3.Equilibrium theory | 82 |
| | 10.4.Negative carry trade profits | 82 |
| 11. | Conclusion | 86 |

| Chaj | pter 4 Predictability among Carry Trades, Stocks and Commodities | 88 |
|------------|---|---------|
| 1. | Introduction | 89 |
| 2. | Data | 91 |
| 3. | Symmetric predictability between currency and equity and between currency and commodity | y 93 |
| 4. | Asymmetric predictability between carry trades and stocks and between carry | |
| | trades and commodities | 100 |
| | 4.1.Contemporaneous asymmetric correlations | 101 |
| | 4.2.In-sample asymmetric predictive effects | 103 |
| 5. | Rolling window analysis of asymmetric predictability | 110 |
| 6. | Out-of-sample tests and economic significance asymmetric predictability | 110 |
| 7. | Conclusion | 121 |
| Chaj | pter 5 Conclusion | 122 |
| References | | 124 |
| App | endices | 132 |

List of Tables

| Table 2.1 Summary statistics of momentum returns | 18 |
|--|-------|
| Table 2.2 Daily momentum return characteristics | 24 |
| Table 2.3 Expected shortfalls comparison: estimates from daily data against estimates | nates |
| from monthly data | 25 |
| Table 2.4 Summary statistics of rolling-window expected shortfalls | 31 |
| Table 3.1 Carry Trade Profits | 43 |
| Table 3.2 Predicting carry trade profits in-sample with single predictors | 50 |
| Table 3.3 Predicting carry trade profits in-sample with two predictors | 55 |
| Table 3.4 Out-of-sample performance of carry trade profits predictors | 62 |
| Table 3.5 Economic significance – profits from market-timing strategies | 67 |
| Table 3.6 Predictability in carry trade profits at longer horizons | 79 |
| Table 3.7 Predicting negative carry trade profits | 85 |
| Table 4.1 Predicting the excess world equity index return carry trade payoff in-sa | mple |
| | 94 |
| Table 4.2 Predicting changes in commodity prices in-sample | 95 |
| Table 4.3 Estimates from vector autoregressive models | 97 |
| Table 4.4 Asymmetric contemporaneous pairwise correlations between variables | |
| | 102 |
| Table 4.5 Predicting carry trade profits in-sample with asymmetric effects | 106 |
| Table 4.6 Predicting carry trade profits in-sample with r_{t-2}^{world} and $\Delta \sigma_{t-2}^{equity}$: | |
| Without, or with, asymmetric effects | 109 |
| Table 4.7 Asymmetric predictability in carry trades: Out-of-sample performance | |
| | 115 |

| Table 4.8 Predicting carry trade payoff with asymmetric models: Economic | |
|--|-----|
| significance | 119 |
| Appendix 3.A. Funding and Investment Currencies in Carry Trade | 132 |
| Appendix 3.B. Summary of Predictors for Carry Trade Profits | 133 |
| Appendix 3.C. Changes of predictors over time | 137 |
| Appendix 3.D. Predictability in the currency component of carry trade profits | 139 |
| Appendix 3.E. Predictability in the interest component of carry trade profit | 141 |
| Appendix 3.F. Including contemporaneous effects and control for serial | |
| correlations in predictors | 143 |
| Appendix 3.G. Additional out-of-sample performance of prediction model | 145 |
| Appendix 3.H. Additional economic significance results– profits from | |
| market-timing strategies | 147 |
| Appendix 3.I. In sample performance of all predictors – single predictor | 151 |
| Appendix 3.J. Out-of-sample performance of all predictors – single predictor | 156 |
| Appendix 4.A Symmetric and asymmetric contemporaneous correlation among currency returns and the world equity index return | 158 |

List of Figures

| Figure 2.1 WML monthly returns | 11 |
|---|-----|
| Figure 2.1 Hill plots | 13 |
| Figure 2.2 Asymmetry in expected shortfalls | 21 |
| Figure 2.3 Prospective utility tail contributions | 22 |
| Figure 2.4 Rolling window estimated shortfalls | 29 |
| Figure 3.1 Cumulative returns of investment strategies (1985-2011) | 46 |
| Figure 3.2 Rolling window regressions: predicting carry trade profits | 60 |
| Figure 3.3 Explanatory powers with different lag sizes | 72 |
| Figure 3.4 Predicting ΔIP_t^{OECD} and predicting carry trade profits | 75 |
| Figure 4.1 Impulse responses from a shock to stock returns and from a | |
| shock to commodity prices | 99 |
| Figure 4.2 Rolling window regressions: asymmetric predictive effects | 111 |