

EXCHANGE RATE HEDGING FOR INTERNATIONALLY DIVERSIFIED
EQUITY PORTFOLIOS: THE PERSPECTIVE OF THAI INVESTOR

Mr. Prompong Limpapanasit

A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Arts Program in International Economics and Finance
Faculty of Economics
Chulalongkorn University
Academic Year 2012
Copyright of Chulalongkorn University

บทคัดย่อและแฟ้มข้อมูลฉบับเต็มของวิทยานิพนธ์ตั้งแต่ปีการศึกษา 2554 ที่ให้บริการในคลังปัญญาจุฬาฯ (CUIR)
เป็นแฟ้มข้อมูลของนิสิตเจ้าของวิทยานิพนธ์ที่ส่งผ่านทางบัณฑิตวิทยาลัย

The abstract and full text of theses from the academic year 2011 in Chulalongkorn University Intellectual Repository (CUIR)
are the thesis authors' files submitted through the Graduate School.

การป้องกันความเสี่ยงจากอัตราแลกเปลี่ยนสำหรับการลงทุนในตลาดหลักทรัพย์ระหว่างประเทศจาก
มุมมองของนักลงทุนไทย

นายพร้อมพงศ์ ลิ้มปพนาสีทิต

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาศิลปศาสตรมหาบัณฑิต
สาขาวิชาเศรษฐศาสตร์และการเงินระหว่างประเทศ
คณะเศรษฐศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย
ปีการศึกษา 2555
ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย

Thesis Title	EXCHANGE RATE HEDGING FOR INTERNATIONALLY DIVERSIFIED EQUITY PORTFOLIOS: THE PERSPECTIVE OF THAI INVESTORS
By	Mr. Prompong Limpapanasit
Field of Study	International Economics and Finance
Thesis Advisor	Associate Professor Phornchanok Cumperayot Kouwenberg, Ph.D.
Thesis Co-Advisor	Associate Professor Roy Kouwenberg, Ph.D.

Accepted by the Faculty of Economics, Chulalongkorn University in Partial Fulfillment
of the Requirements for the Master's Degree

..... Dean of the Faculty of Economics
(Associate Professor Chayodom Sabhasri, Ph.D.)

THESIS COMMITTEE

..... Chairman
(Associate Professor Pongsa Pornchaiwiseskul, Ph.D.)

..... Thesis Advisor
(Associate Professor Phornchanok Cumperayot Kouwenberg, Ph.D.)

..... Thesis Co-advisor
(Associate Professor Roy Kouwenberg, Ph.D.)

..... Examiner
(Pituwan Poramapojn, Ph.D.)

..... External Examiner
(Assistant Professor *Thawatchai Jittrapanun*, Ph.D.)

พร้อมพงษ์ ลิ้มปพนาลิทธิ : การป้องกันความเสี่ยงจากอัตราแลกเปลี่ยนสำหรับการลงทุนในตลาด
 หลักทรัพย์ระหว่างประเทศจากมุมมองของนักลงทุนไทย. (EXCHANGE RATE HEDGING
 FOR INTERNATIONALLY DIVERSIFIED EQUITY PORTFOLIOS: THE
 PERSPECTIVE OF THAI INVESTOR) อ.ที่ปรึกษาวิทยานิพนธ์หลัก : รศ.ดร.พรชนก
 คัมภีรยศ คุณเวเนเบิร์ค, อ.ที่ปรึกษาวิทยานิพนธ์ร่วม : รศ.ดร.รอย คุณเวเนเบิร์ค, 148 หน้า.

ถึงแม้ว่าจะมีงานวิจัยก่อนหน้านี้มากมายที่ยืนยันถึงการได้ประโยชน์จากการกระจายความเสี่ยงด้วย
 การลงทุนในสินทรัพย์ต่างประเทศ แต่นักลงทุนส่วนใหญ่ก็ยังคงระงับการลงทุนส่วนใหญ่ไว้ในสินทรัพย์
 ภายในประเทศ เหตุผลหนึ่งที่อธิบายที่มาของปัญหานี้ก็คือ การมีความเสี่ยงหนึ่งเพิ่มขึ้นมาจากการลงทุนใน
 ต่างประเทศ ซึ่งนั่นก็คือ ความเสี่ยงจากอัตราแลกเปลี่ยน เพื่อที่จะพิสูจน์ว่าการป้องกันความเสี่ยงจากอัตรา
 แลกเปลี่ยนจะนำไปสู่การได้ประโยชน์จากการกระจายความเสี่ยงโดยการลงทุนในต่างประเทศหรือไม่ เราได้ทำ
 การทดสอบการใช้กลยุทธ์การป้องกันความเสี่ยงหลายวิธีบนพอร์ตโฟลิโอการลงทุนที่ลงทุนในตลาดหลักทรัพย์
 ของประเทศพัฒนาแล้วและประเทศกำลังพัฒนาหลายประเทศในมุมมองของนักลงทุนไทยในช่วงระยะเวลา
 ระหว่างปี ค.ศ. 2008 ถึงปี ค.ศ. 2011 เราแบ่งขั้นตอนในการทำวิจัยของเราซึ่งเป็นการวิจัยแบบ *out of*
sample ได้ออกเป็นสี่ขั้นตอน ขั้นที่หนึ่ง เราจะประมาณการเมทริกซ์ของผลตอบแทนที่คาดการณ์ไว้และ
variance covariance โดยใช้ข้อมูลในอดีต ขั้นที่สอง เราจะเอาเมทริกซ์เหล่านี้มาใช้ในการคำนวณสัดส่วน
 ในการลงทุนในหุ้นของประเทศต่างๆและสร้างเป็นพอร์ตโฟลิโอการลงทุน ขั้นที่สาม เราจะใช้กลยุทธ์การป้องกัน
 ความเสี่ยงของอัตราแลกเปลี่ยนต่างๆลงบนพอร์ตโฟลิโอที่ได้ ขั้นที่สี่ เราจะวัดผลและทดสอบนัยสำคัญของผลที่
 ดีขึ้นจากการป้องกันความเสี่ยงจากอัตราแลกเปลี่ยน ในการวิจัยของเราพบว่า พอร์ตโฟลิโอที่มีการป้องกัน
 ความเสี่ยงจากอัตราแลกเปลี่ยนมีประสิทธิภาพในผลการดำเนินงานที่ดีขึ้นในทุกกรณี แม้ว่าผลลัพธ์ที่ดีขึ้นเหล่านี้
 จะไม่ได้มีนัยสำคัญที่ระดับนัยสำคัญ 5% ในทุกกรณี แต่ผลลัพธ์ส่วนใหญ่ก็นั้นมีนัยสำคัญ นอกจากนี้เราก็คพบว่า
 การป้องกันความเสี่ยงจากอัตราแลกเปลี่ยนเต็มมูลค่าของหุ้นที่ลงทุนในต่างประเทศเป็นกลยุทธ์ที่ให้ประสิทธิผล
 ของผลการดำเนินงานที่ดีที่สุด และพอร์ตโฟลิโอที่ลงทุนในประเทศพัฒนาแล้วให้ผลลัพธ์ที่ดีกว่าพอร์ตโฟลิโอที่
 ลงทุนในประเทศกำลังพัฒนา

สาขาวิชา.....เศรษฐศาสตร์และการเงินระหว่างประเทศ.....ลายมือชื่อ.....
 ปีการศึกษา.....2555.....ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์หลัก.....
 ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์ร่วม.....

5385630029 : MAJOR INTERNATIONAL ECONOMICS AND FINANCE

KEYWORDS : EXCHANGE RATE HEDGING / INTERNATIONAL EQUITY PORTFOLIO /
MODERN PORTFOLIO THEORY / UNIVERSAL HEDGING / TECHNICAL ANALYSIS

PROMPONG LIMPAPANASIT: EXCHANGE RATE HEDGING FOR
INTERNATIONALLY DIVERSIFIED EQUITY PORTFOLIOS: THE
PERSPECTIVE OF THAI INVESTOR. ADVISOR : ASSOC. PROF.
PHORNCHANOK CUMPERAYOT KOUWENBERG, Ph.D., CO-ADVISOR :
ASSOC. PROF. ROY KOUWENBERG, Ph.D., 148 pp.

Even though many prior studies have confirmed the benefit of international portfolio diversification, most investors still concentrate their investment domestically. One reason for the home-bias problem in investment is the presence of an additional risk from investing abroad, the currency risk. In order to find out whether hedging exchange rate risk can lead to potential gain in international portfolio, over the period 2008 to 2011, we examined implementation of various hedging strategies on international equity portfolios investing in stock markets of developed countries and emerging countries in the viewpoint of Thai investors. We broadly divided our methodology which is an out of sample analysis into 4 steps. First, we used historical time series to estimate expected return and variance covariance matrices. Second, we used these matrices to construct equity portfolios. Third, we implemented various hedging strategies on the equity portfolios. Finally, we measured the results and test for performance improvements of the hedged portfolios. We found that the hedged stock portfolios in all cases have better performances than no hedging. Also, even though not all of the improvements in performances of our hedged portfolios are significant at the 5% level of significance, most of them are. Moreover, we found out that the full hedging is the best performing strategy in our study and the portfolios investing in developed countries have better performances than those investing in emerging countries.

Field of Study : International Economics and Finance.....Student's Signature.....

Academic Year :2012.....Advisor's Signature.....

Co-advisor's Signature.....

ACKNOWLEDGEMENTS

This thesis would not have been possible without the guidance and the help of several individuals who in one way or another contributed and extended their valuable assistance in the preparation and completion of this study. First and foremost, I wish to express my sincere thanks to Assoc. Prof. Dr. Phornchanok Cumperayot Kouwenberg and Assoc. Prof. Dr. Roy Kouwenberg, my thesis advisors, for the patience and guidance they have given me throughout the period of my research. Also, I would like to thank the chairman of my thesis committee Assoc. Prof. Dr. Pongsa Pornchaiwiseskul, the member of my thesis committee Dr. Pituwan Poramapojn, and the external committee Assist. Prof. Dr. Thawatchai Jittrapanun for their insightful comments and guidance. Moreover, I am indebted to Assoc. Prof. Dr. Sothitorn Mallikamas and Miss Lawan Thanasawangkul in helping me gathering various financial time series used in my analysis. Furthermore, I would like to thank the office staffs of the Master of Arts program in International Economics and Finance for their kind and helpful supports.

Last but not least, I owe my deepest gratitude to my family for their support and encouragement in every aspect during the course of my study. My gratitude also goes to my friend Mr. Akkapol Promyos who helped me during the presentation of the defenses my proposal and thesis.

CONTENTS

	Page
ABSTRACT IN THAI	iv
ABSTRACT IN ENGLISH	v
ACKNOWLEDGEMENTS	vi
CONTENTS	vii
LIST OF TABLES	ix
LIST OF FIGURES	xiii
CHAPTER I INTRODUCTION	1
1.1 Background	1
1.2 Objectives	3
1.3 Scope	3
CHAPTER II LITERATURE REVIEW	5
CHAPTER III CONCEPTUAL FRAMEWORK	11
3.1 Interest Rate Parity	11
3.2 Modern Portfolio Theory	14
3.3 Universal Hedging	18
3.4 Determinants of Stock Return	21
CHAPTER IV DATA AND METHODOLOGY	25
4.1 Data	25
4.2 Methodology	27
CHAPTER V EMPIRICAL RESULTS	42
5.1 Expected Return and Variance Covariance Matrix Estimation	42
5.2 Stock Portfolio Construction	45
5.3 Hedging Strategy Implementation	46
5.4 Performance Improvement Evaluation	49
CHAPTER VI CONCLUSIONS AND SUGGESTIONS	73
6.1 Conclusions	73
6.2 Limitations and Suggestions	84
REFERENCES	88

	Page
APPENDICES	91
BIOGRAPHY	166

LIST OF TABLES

	Page
Table 4.1 Details of datasets use in this study.....	25
Table 4.2 Weights for calculating inputs of universal hedging ratio.....	36
Table 5.1 Summary statistics of monthly stock market returns.....	42
Table 5.2 Summary statistics of weekly stock market returns.....	43
Table 5.3 Summary statistics of monthly forward contract returns.....	43
Table 5.4 Summary statistics of weekly forward contract returns.....	44
Table 5.5 Performance of group 1 equal weight portfolio with no hedging.....	49
Table 5.6 Performance of group 1 equal weight portfolio with full hedging.....	50
Table 5.7 Performance of group 1 equal weight portfolio with universal hedging (moving average).....	51
Table 5.8 Performance of group 1 equal weight portfolio with universal hedging (regression).....	51
Table 5.9 Performance of group 1 equal weight portfolio with forward premium hedging.....	52
Table 5.10 Performance of group 1 equal weight portfolio with technical analysis hedging (moving average).....	52
Table 5.11 Performance of group 1 equal weight portfolio with technical analysis hedging (MACD).....	53
Table 5.12 Performance of group 1 optimal utility portfolio (moving average) without hedging.....	54
Table 5.13 Performance of group 1 optimal utility portfolio (moving average) with full hedging.....	54
Table 5.14 Performance of group 1 optimal utility portfolio (moving average) with universal hedging.....	55
Table 5.15 Performance of group 1 optimal utility portfolio (moving average) with optimal utility hedging.....	55
Table 5.16 Performance of group 1 optimal utility portfolio (moving average) with forward premium hedging.....	56
Table 5.17 Performance of group 1 optimal utility portfolio (moving average) with technical analysis hedging (moving average).....	57
Table 5.18 Performance of group 1 optimal utility portfolio (moving average) with technical analysis hedging (MACD).....	57
Table 5.19 Performance of group 1 optimal utility portfolio (regression) without hedging.....	58
Table 5.20 Performance of group 1 optimal utility portfolio (regression) with full hedging.....	58
Table 5.21 Performance of group 1 optimal utility portfolio (regression) with universal hedging.....	59

	Page
Table 5.22 Performance of group 1 optimal utility portfolio (regression) with optimal utility hedging.....	60
Table 5.23 Performance of group 1 optimal utility portfolio (regression) with forward premium hedging.....	60
Table 5.24 Performance of group 1 optimal utility portfolio (regression) with technical analysis hedging (moving average).....	61
Table 5.25 Performance of group 1 optimal utility portfolio (regression) with technical analysis hedging (MACD).....	61
Table 5.26 Performance of group 2 equal weight portfolio with no hedging.....	62
Table 5.27 Performance of group 2 equal weight portfolio with full hedging.....	62
Table 5.28 Performance of group 2 equal weight portfolio with universal hedging (moving average).....	63
Table 5.29 Performance of group 2 equal weight portfolio with universal hedging (regression).....	63
Table 5.30 Performance of group 2 equal weight portfolio with forward premium hedging.....	64
Table 5.31 Performance of group 2 equal weight portfolio with technical analysis hedging (moving average).....	64
Table 5.32 Performance of group 2 equal weight portfolio with technical analysis hedging (MACD).....	65
Table 5.33 Performance of group 2 optimal utility portfolio (moving average) with no hedging.....	65
Table 5.34 Performance of group 2 optimal utility portfolio (moving average) with full hedging.....	66
Table 5.35 Performance of group 2 optimal utility portfolio (moving average) with universal hedging.....	66
Table 5.36 Performance of group 2 optimal utility portfolio (moving average) with optimal utility hedging.....	67
Table 5.37 Performance of group 2 optimal utility portfolio (moving average) with forward premium hedging.....	67
Table 5.38 Performance of group 2 optimal utility portfolio (moving average) with technical analysis hedging (moving average).....	68
Table 5.39 Performance of group 2 optimal utility portfolio (moving average) with technical analysis hedging (MACD).....	68
Table 5.40 Performance of group 2 optimal utility portfolio (regression) with no hedging.....	69
Table 5.41 Performance of group 2 optimal utility portfolio (regression) with full hedging.....	69
Table 5.42 Performance of group 2 optimal utility portfolio (regression) with universal hedging.....	70

	Page
Table 5.43 Performance of group 2 optimal utility portfolio (regression) with optimal utility hedging.....	71
Table 5.44 Performance of group 2 optimal utility portfolio (regression) with forward premium hedging.....	71
Table 5.45 Performance of group 2 optimal utility portfolio (regression) with technical analysis hedging (moving average).....	72
Table 5.46 Performance of group 2 optimal utility portfolio (regression) with technical analysis hedging (MACD).....	72
Table 6.1 Performances of all portfolios and strategies in our study.....	74
Table 6.2 Test of performance improvements among hedging strategies in group 1.....	81
Table 6.3 Test of performance improvements among hedging strategies in group 2.....	82
Table A.1 Summary statistics of Brazil's macroeconomic data.....	92
Table A.2 Summary statistics of Canada's macroeconomic data.....	93
Table A.3 Summary statistics of China's macroeconomic data.....	94
Table A.4 Summary statistics of Germany's macroeconomic data.....	95
Table A.5 Summary statistics of India's macroeconomic data.....	96
Table A.6 Summary statistics of Japan's macroeconomic data.....	97
Table A.7 Summary statistics of Russia's macroeconomic data.....	98
Table A.8 Summary statistics of South Africa's macroeconomic data.....	99
Table A.9 Summary statistics of Thailand's macroeconomic data.....	100
Table A.10 Summary statistics of Britain's macroeconomic data.....	101
Table A.11 Summary statistics of the United States' macroeconomic data.....	102
Table A.12 Expected stock return estimated by moving average method.....	103
Table A.13 Expected stock return estimated by regression method.....	105
Table A.14 Expected forward return estimated by moving average method.....	107
Table A.15 Expected forward return estimated by regression method.....	109
Table A.16 Estimated \sum_r of group 1 and group 2.....	111
Table A.17 Estimated \sum_f of group 1 and group 2.....	120
Table A.18 Estimated \sum_{rf} of group 1 and group 2.....	128
Table A.19 Portfolio weights of group 1 derived by optimal utility method (moving average).....	136
Table A.20 Portfolio weights of group 1 derived by optimal utility method (regression).....	138
Table A.21 Portfolio weights of group 2 derived by optimal utility method (moving average).....	140
Table A.22 Portfolio weights of group 2 derived by optimal utility method (regression).....	142

	Page
Table A.23 Universal hedging ratios calculated by using expected returns estimated by moving average method and regression.....	144
Table A.24 Optimal utility hedging ratios of group 1 calculated by using expected returns estimated by moving average method and regression method.....	146
Table A.25 Optimal utility hedging ratios of group 2 calculated by using expected returns estimated by moving average method and regression method.....	148
Table A.26 Forward premium hedging ratios of group 1 and group 2.....	150
Table A.27 Technical analysis (moving average) hedging ratios of group 1 and group 2.....	152
Table A.28 Technical analysis (MACD) hedging ratios of group 1 and group 2....	154

LIST OF FIGURES

	Page
Figure 3.1 Efficient frontier in risk-return dimensions	16
Figure 3.2 Risk-indifference curves in risk-return dimensions	17
Figure 3.3 Optimal portfolio.....	18
Figure 6.1 Movements in average of stock markets' returns in group 1.....	75
Figure 6.2 Movements in average of stock markets' returns in group 2.....	76
Figure 6.3 Movements in average of forward return of all countries' currencies in group 1	79
Figure 6.4 Movements in average of forward return of all countries' currencies in group 2.....	80
Figure A.1 Movements in currency pair Thai Bath/ Euro.....	156
Figure A.2 Movements in currency pair Thai Bath/ Brazilian Real.....	157
Figure A.3 Movements in currency pair Thai Bath/ British Pound.....	158
Figure A.4 Movements in currency pair Thai Bath/ Canadian Dollar.....	159
Figure A.5 Movements in currency pair Thai Bath/ Chinese Yuan.....	160
Figure A.6 Movements in currency pair Thai Bath/ Indian Rupee	161
Figure A.7 Movements in currency pair Thai Bath/ Japanese Yen.....	162
Figure A.8 Movements in currency pair Thai Bath/ Russian Rouble.....	163
Figure A.9 Movements in currency pair Thai Bath/ South African Rand.....	164
Figure A.10 Movements in currency pair Thai Bath/ US Dollar.....	165

CHAPTER I

INTRODUCTION

1.1 Background

Investors want to choose investment portfolios that give the most possible return with acceptable level of risk exposure. The risk might come from possible loss in the value of financial assets in the portfolio, exchange rates, interest rates, etc. By diversifying asset holding into many different assets, it helps mitigating risk of great loss that might come from any individual asset. Diversifying portfolio only in domestic assets, however, might not be able to eliminate the risk that comes from domestic market risk as domestic securities tend to have high correlations among their return. As a result, extending portfolio diversification into foreign assets might be useful in decreasing overall portfolio risk since systematic market risk tends to differ from country to country.

The international portfolio diversification can provide two benefits: a possible higher profit opportunity when the foreign markets outperform domestic market and a decrease in portfolio exposure to domestic market risk. At the same time, diversifying asset holding into foreign assets, however, gives rise to a new risk, a foreign exchange rate risk, besides market risks associated with the securities composing the portfolio. The volatility of foreign asset returns now does not only depend on the fluctuation of those assets but also the fluctuation of the exchange rates of the corresponding countries as well as the correlation between the two. Highly fluctuate exchange rate can eliminate possible gains from international portfolio diversification. The recent world financial crisis triggered by the subprime mortgage crisis in the United States and continued with the public

debt crisis in European countries provides a good example of the currency risk associated with investing internationally as the exchange rates of these countries become much more volatile than normal time which in turn leads to more volatile portfolio performance.

Since there is some correlation between the stock market and the exchange rate, there are some potential benefits from hedging currency risk. Exchange rate risk is normally hedged by using forward contracts and the portfolio selection and hedging decisions are often considered separately. When hedging, investors have to compare the loss in the expected return from hedging with the corresponding reduction in the volatility of the portfolio. In mean-variance framework, the gain or loss in expected return from currency hedging has the same weight in the investor's objective function as does any change in expected return coming from changes in portfolio weights. Selecting how much to hedge and choosing how much of any asset to add to a portfolio are similar.

In this paper we investigate the benefits from exchange rate hedging on portfolios of international equities. We test whether adding exchange rate hedging to the set of portfolio assets improves the performance of our portfolios. We assume that investors choose optimal stock portfolio weights first then choose how much to hedge. We compare among many strategies of hedging to find which is the optimal hedging. We follow the work of Glen and Jorion (1993) by adding conditional type of hedging in our consideration. At the same time, we extend their work by adding one more conditional strategy, the technical analysis strategy.

There are some more differences between our work and prior studies. First,

most prior studies used an American investor's viewpoint and the other works used a viewpoint of an investor from other developed country or emerging country. On the other hand, our work provides analysis from the viewpoint of an investor in Thailand, a developing country, as we recognize that developing countries also play important roles in the world financial markets. This difference in view point is important as it could greatly influence results of the study because the dynamics of exchange rates and asset prices can greatly differ depending on where the home country is. Furthermore, most prior works choose developed countries as targets for international portfolio diversification. As emerging countries has attracted great amount of investment from around the world in recent years, we select these countries as targets in our study too.

1.2 Objectives

- a) To compare among the performance improvements of various exchange rate hedging strategies.
- b) To compare the effectiveness of exchange rate hedging between the case where international investment targets are developed countries and the case where international investment targets are emerging countries.
- c) To compare among two portfolio selection methods and find out which one give the best performance.

1.3 Scope

We study exchange rate hedging for international stock portfolios investing in Thailand plus five developed countries (US, UK, Germany, Canada, Japan), and

Thailand plus five emerging countries (Brazil, Russia, India, China, South Africa). The total period of our study is from April 2004 to December 2011 where our period of out of sample is from April 2008 to December 2011. Our horizon of analysis is monthly horizon and the analysis is performed on an out of sample basis with a rolling window of 48 months.

CHAPTER II

LITERATURE REVIEW

As a result of a greater unification of world financial markets, a line of studies that has obtained a lot of attention at both academic and practical levels is international portfolio diversification. One initial work that concentrated on the theoretical discussion in favor of international diversification of investment portfolios is Grubel (1968). His generative work applied portfolio theory to description of long-term international asset holdings. The study showed that international diversification of portfolios creates a totally new type of world welfare benefit from international economic relations which is distinct from those the original “gains from trade” and increased productivity flowing from the migration of the factors of production. This finding provided the impulsion for many studies in the field of international portfolio diversification.

A series of researches about benefit of internationally diversified portfolios provide empirical evidence that diversifying asset holding over important foreign markets helps decreasing risk and improving return. For example, Levy and Sarnat (1970) argued that the existence of a relatively high level of positive correlation within an economy implies the possibility that risk reduction might be facilitated by diversifying investment portfolios internationally. They showed estimations of the potential gains from such diversification for the period 1951-1967. They found that by only diversifying into high income countries including the United States, merely a marginal improvement in portfolio can be gained by the investor. If the investor diversifies his portfolio to include such countries as Japan, South Africa, and the developing countries of South America

and Asia, however, he can receive a significant improvement in his portfolio results. Another work that supports international diversification is Solnik (1974) which studied common stocks in eight European countries as well as the United States and tried to determine the factors affecting the stock price movements. The result indicated that stock prices are strongly affected by domestic factor which implies that there are some benefit gains from internationally diversifying in order to reduce domestic risks. Also, Lessard (1976) showed support for international diversification by studied covariance structure of equity returns in international markets and found that country factors are the most important components in covariance structure, reinforcing the critical role of diversification in reducing risk. Moreover, he added that the low correlations between the country factors represent the key to gains from international diversification but the magnitude of these gains will depend on whether markets are segmented or integrated internationally.

Despite many empirical evidences of potential gains from international portfolio diversification, investor hold a surprisingly small portion of assets outside their own countries, this domestically concentrated behaviour is called "home bias". Tesar and Werner (1995) examined long-term international investment patterns in Canada, Germany, Japan, the United Kingdom, and the United States during 1970-1990 period. They discovered that while there has been some increases in international investment position since the 1970s, the portion of foreign securities in investment portfolio is still greatly smaller than it should be from the view point of international diversification. One reason for this reluctance to diversify across countries is the fact that besides market risk, international

investments are vulnerable to the risk involved with exchange rate fluctuation, therefore, some studies suggested that investor should hedge for exchange rate risk. For example, Jorion (1985) and Eun and Resnick (1988) presented that it is crucial to control parameter uncertainty in order to get the potential benefits from international portfolio diversification, and that hedging exchange rate risk can improve the benefits from international securities diversification. In other words, investors can greatly gain from international diversification when they properly manage exchange rate and parameter uncertainties. When none of these uncertainties are managed, however, investors may not be able to gain enough benefits to justify international diversification and they should focus on investing domestically.

Concerning currency hedging, there have been arguments about the characterization of optimal exchange rate hedging. Perold and Schulman (1988) supported the idea that 100% of foreign exchange rate should be optimally hedged as exchange rate hedging is a free lunch. The argument is that hedging gives expected returns of zero with a decrease in risk of a position. They demonstrated that the risk decrease is still huge even when domestic purchasing power is taken into account by studied based on quarterly real returns over 1978-87 period. Also, Eun and Resnick (1988) discovered empirical evidence that the performance of international securities portfolios is improved if 100% of asset holding is hedged against exchange rate risk. Stulz (1984) suggested that active hedging policies are optimal for risk-averse investor. An investor can take a greater or smaller position in a forward contract in absolute value of its exposure in that exchange rate. Currency dynamics, hedging costs, and the nature of managerial compensation

contracts play important parts in the determination of exchange rate hedging. Solnik (1998) argued that foreign exchange rate may partly hedge local inflation or interest rate risk, so some parts of portfolios should be left unhedged. Black (1990) gave a unique view that under assumptions of Siegel's paradox validity and homogenous preference, all investors regardless of nationality have the same optimal "universal currency hedge ratios" which he demonstrated in a general equilibrium framework to be strictly lower than 100%. Every investor has the same hedge ratio, and all investors have the same diversified portfolio of international securities. Because there must be a borrower for each lender and a long position for each short position in exchange rate, in equilibrium, securities returns and their volatilities and correlation will adjust until every securities are held and all sides of all exchange rate contracts are taken.

Empirical results of whether currency hedging improves risk-return performance of international portfolio are mixed and most of the studies have taken viewpoint of a U.S. investor. For example Glen and Jorion (1993), under the perspective of a U.S. investor, compared the hedged and unhedged portfolios holding stocks and bonds of Germany, Britain, France, Japan, and the United States over the 1974-1990 period. They found that hedging results in statistically significant improvements in the performance of unconditional portfolios of bonds only. They also applied conditional strategies which significantly improves the risk-return tradeoff of international portfolio and outperforms unconditional hedging strategies. Another work from a U.S. investor's viewpoint, Madura and Tucker (1992), showed that the gains from hedging exchange rate risk of the portfolios that invest in major stock markets could be affected by the covariance

between the non-U.S. stock markets and their exchange rate. Their finding implies that hedging could adversely influence the risk when the covariances are negative, and adversely affect the returns when there is a downward pressure on foreign stock indices and on the dollar at the same time. Hauser et al.(1994), also took a U.S. investor viewpoint, examined the effect of the risk level on the effectiveness of the hedging portfolios that invest in emerging stock indices. They compared the hedged and unhedged efficient frontiers constructed from emerging stock markets, developed stock markets, and the combination of both markets. The hedged emerging index frontier dominates the unhedged one at lower risk levels but the result is opposite at higher levels. The same outcome occurred in combined market case but the hedged portfolios dominate for all risk levels in the developed market case.

Works of currency hedging for international portfolios from non-US perspective are quite limited. Glen (1990) used a British investor's perspective and found that hedging can reduce variance of a portfolio's return. However, if this insurance is priced by the market in a manner similar to that for other type of risk, then the risk reduction will also be offset by a reduction in return. Eaker et al. (1991) compared a Japanese investor's viewpoint case to that of a U.S. investor's viewpoint. They found that the effect of currency hedging on the risk depends on the perspective of the investor. The direction of the effect is the same in both case but the magnitudes of the impact differ, depending on the numeraire. Suh (2010) studied in a Korean investor's perspective and found that currency hedging dominates in normal time but underperforms no-hedging during a turbulent period.

Another issue about currency hedging for international portfolios is the effect of time horizons on hedging. Froot (1993) argued that the effectiveness of exchange rate hedging on risk reduction holds only at short horizons. At horizons of many years, hedging not only does not decrease but also increase return variance for many portfolios. While hedge returns are dominated by changes in real exchange rates under short horizons, they are dominated by volatilities in differences in unexpected inflation and real interest between countries under long horizons. Cambell et al. (2003) suggested that long-term investors should instead be interested in hedging real interest rate volatilities because of the uncovered interest parity, which implies equated expected returns across exchange rates.

CHAPTER III

CONCEPTUAL FRAMEWORK

3.1 Interest Rate Parity

Interest rate parity is an equilibrium state with no-arbitrage condition which investors will feel indifferent to interest rates on deposits between two countries. The interest rate parity condition means that the expected return on home assets will equal the expected return on foreign currency assets, as a result of equilibrium in the foreign exchange market created by changes in the exchange rate between two countries. Interest rate parity has two assumptions; the first one is that capital is mobile between two countries. The second assumption is that assets between two countries are perfectly substitutable, as a result of their similarities in riskiness and liquidity. According to the two assumptions, investors would be expected to hold those assets with higher returns, whether they are home or foreign assets. Nevertheless, both domestic and foreign assets are held by investors. Thus, no difference can persist between the returns on assets of two countries.

Interest rate parity can be divided into two types: uncovered interest rate parity is the condition in which exposure to currency risk (unexpected changes in exchange rates) is uninhibited, while covered interest rate parity is the condition where currency risk is covered (remove exposure to the risk) by using a forward exchange rate contract. Each of the conditions shows a unique relationship with implications for predicting future exchange rates: the forward exchange rate and

the future spot exchange rate.

- Uncovered interest rate parity

Investors feel indifferent between the interest rates in two countries because the exchange rate is expected to adjust until the return in domestic currency on domestic deposits is the same as the return in domestic currency on foreign deposits, thereby the potential uncovered interest arbitrage opportunities are eliminated. Uncovered interest rate parity helps explaining the determination of the spot exchange rate. Uncovered interest rate parity can be shown in equation form as follows

$$(1 + i) = \frac{E(S_{t+k})}{S_t} (1 + i^*)$$

Where $E(S_{t+k})$ is the expected future spot exchange rate at time $t + k$

k is the number of periods into the future from time t

S_t is the current spot exchange rate at time t (domestic currency/foreign currency)

i is the interest rate in the domestic country

i^* is the interest rate in a foreign country or currency area

The return in domestic currency on domestic deposits, $(1 + i)$, is shown to be equal to the return in domestic currency on foreign deposits, $\frac{E(S_{t+k})}{S_t} (1 + i^*)$.

Uncovered interest rate parity asserts that an investor with domestic deposits will gain the interest rate on domestic deposits, whereas an investor holding foreign deposits will earn the interest rate available in the foreign country, but also a potential gain or loss on exchange rate. Utilizing these assumptions, prior studies have extrapolated a useful approximation of uncovered interest rate parity that. If uncovered interest rate parity holds, such that an investor feels indifferent between domestic versus foreign deposits, then any excess return on foreign deposits must be offset by some expected loss from depreciation of the foreign currency against the domestic currency vice versa. The approximation can be illustrated as follows

$$i = i^* + \frac{\Delta E(S_{t+k})}{S_t}$$

where

$\Delta E(S_{t+k})$ is the change in the expected future spot exchange rate

$\Delta E(S_{t+k}) / S_t$ is the expected rate of depreciation of the domestic currency

A more standard way of explaining the approximation is "the domestic interest rate equals the foreign interest rate plus the expected rate of depreciation of the domestic currency."

- Covered interest rate parity

In this case investors feel indifferent between the interest rates in two countries since the forward exchange rate creates equilibrium such that the return

in domestic currency on domestic deposits is equal to the return in domestic currency on foreign deposit, thus no potential covered interest arbitrage opportunities exist. Moreover, covered interest rate parity helps specifying the forward exchange rate. The covered interest rate parity can be illustrated as follows

$$(1 + i) = \frac{F_t}{S_t} (1 + i^*)$$

where F_t is the forward exchange rate at time t (domestic currency/ foreign currency)

The return in domestic currency on domestic deposits, $(1 + i)$, is shown to be the same as the return in domestic currency on foreign deposits, $\frac{F_t}{S_t} (1 + i^*)$.

Furthermore, the approximation of covered interest can be shown as follows

$$i = i^* + \frac{F_t}{S_t} - 1$$

We use the idea of interest rate parity in the estimation of forward return and to construct hedging strategy

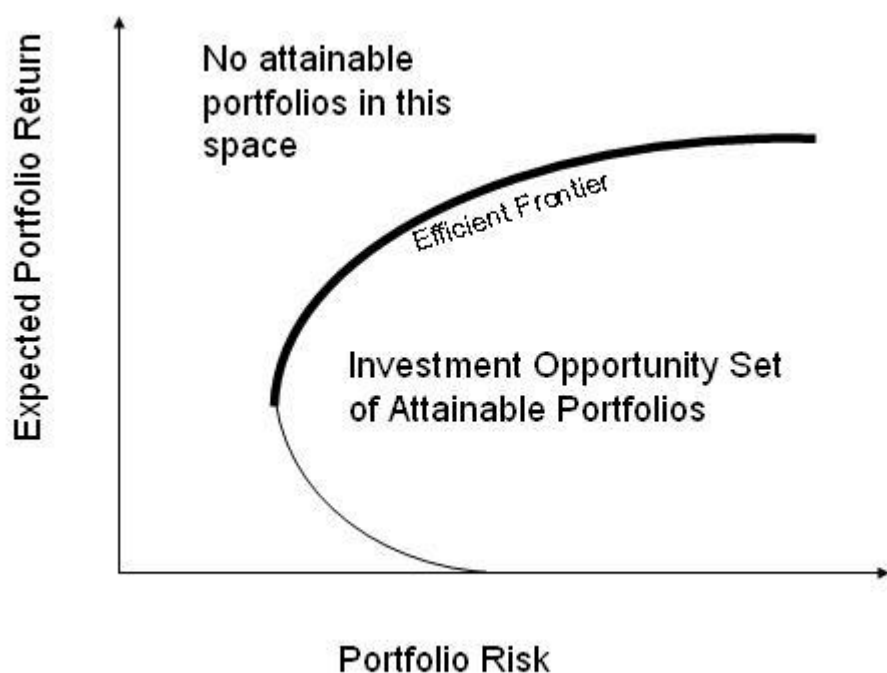
3.2 Modern Portfolio Theory

A portfolio composes of several different assets which are selected for investment gains, but a portfolio also has investment risks. The main objective of portfolio theory or management is to maximize gains while reducing diversifiable

risk. The concept of modern portfolio theory is about selecting assets based on statistical methods that derive the amount of diversification by analyzing expected returns, standard deviations of individual securities to assess their risk, and by selecting assets that have negative or no correlation with other assets in the portfolio in order to reduce portfolio risk. The idea of modern portfolio theory is to have an efficient portfolio that gives the highest return for a given risk, or the lowest risk for a given return.

There is a wide range of risk-return ratios resulting from portfolio combinations, as portfolios can compose of any number of securities with different proportions of each asset. When all these risk-return possibilities which can be called the investment opportunity set were plotted as an area of a graph with the return on the vertical axis and portfolio risk on the horizontal axis, the entire area would compose of all feasible portfolios attainable. Among them, there would be some which yield the greatest return for each risk level, or for each risk level, there would be portfolios that yield the greatest return. The set of all efficient portfolios that give the highest return for each level of risk can be called as the efficient frontier. The efficient frontier can be illustrated as follows

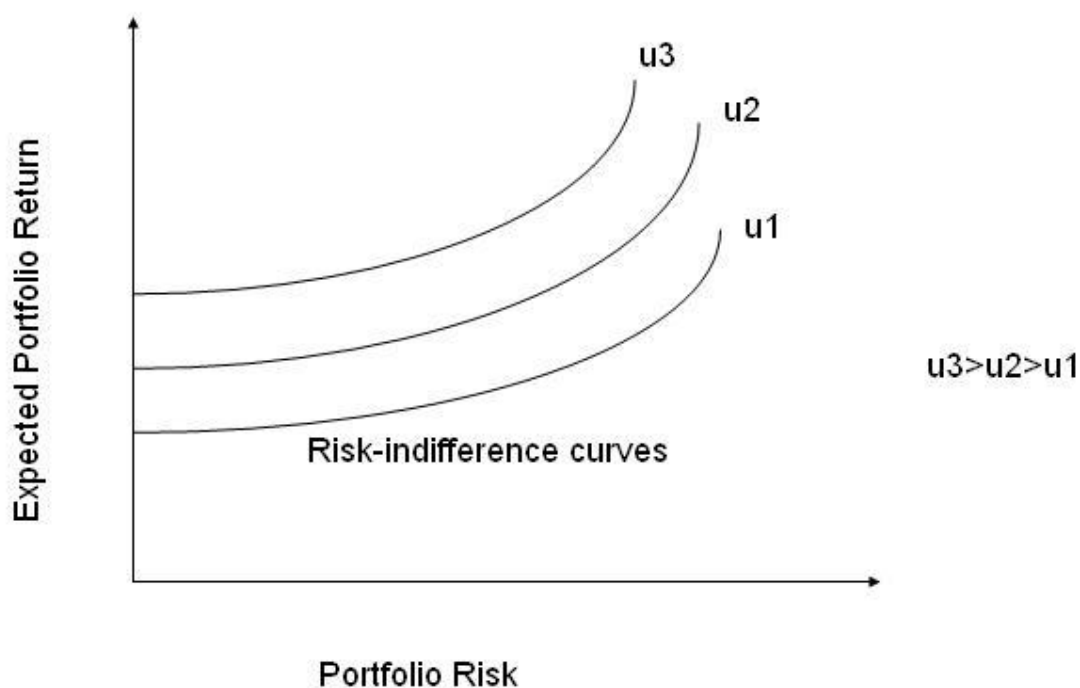
Figure 3.1 Efficient frontier in risk-return dimensions



Even though investors' risk tolerance is different, in their selection of any portfolio in terms of the risk-return trade-off, however, they should be consistent. Since risk can be measured as the sum of the return volatility over time, it is possible to give a utility point (aka utility value, utility function) to any portfolio by subtracting its variance from its expected return to receive a number that would be consistent with an investor's tolerance for risk, or a measure of their satisfaction with the investment. There is no specific equation that would give such a utility quantity as risk aversion is not an objectively measurable quantity. However, an equation can be chosen for its comparative measure of risk tolerance, not for its absolute measure.

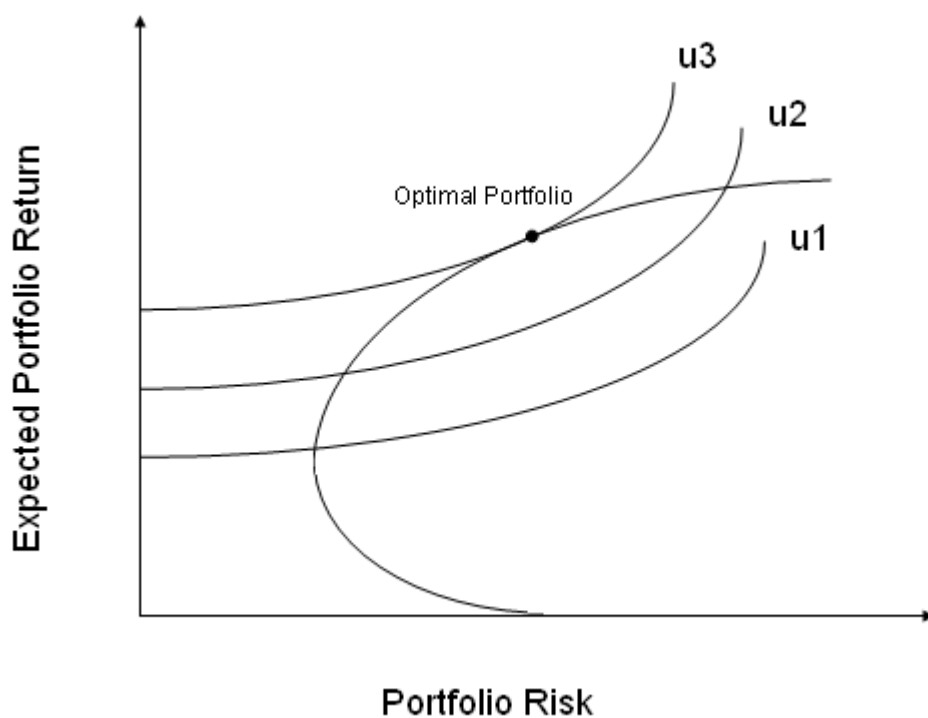
We can draw a risk-indifference curve by using the set of all portfolios with the identical utility. An investor will perceive any portfolio on the risk-indifference curve as being equally acceptable.

Figure 3.2 Risk-indifference curves in risk-return dimensions



Risk-indifference curves are plotted along with the investment opportunity set in the graph below. The optimal portfolio is illustrated as the point where a tangency between the indifferent curve and the efficient frontier occurs.

Figure 3.3 Optimal portfolio



We use the idea of modern portfolio theory in the construction of stock portfolios and to build hedging strategy.

3.3 Universal Hedging

Universal hedging was proposed by Black (1990) which argues that under the assumptions that people can hedge against fluctuations in the value of real exchange rates and no barrier exists in international investment, there exists a universal constant that yields optimal hedge. The formula has three rules: Hedges foreign equities, hedge equities equally for all countries, and do not hedge 100% of foreign equities. The formula applies equally to everyone holding foreign securities no matter which country he is from. That's why it is called "universal hedging".

One may think of hedging as a “zero-sum game” as when domestic investors hedge their foreign investment and foreign investors hedge their investment in domestic country, one side will gain and the other side will lose. Even if someone gains and someone loses, however, the risk exposures of both sides are reduced. Then, why should not they hedge 100% of their investment. Black (1990) use “Siegel’s paradox” to explain this question. When investors in different countries have different consumption baskets, they can increase their expected return by taking some exchange rate risk in their portfolios. For example, assume exchange rate between 2 countries to be 1:1 now which will change into either 1:2 or 2:1 next period with equal probability. Given consumption in one country is apple and orange in another country. To apple consumer, holding orange is risky as its value might decrease in half and this applies to apple holding orange consumer too. However, each will gain in expected return by trading an apple and an orange as the expected value of foreign apple/orange is 1.25.

Another question from the rules, why is the optimal hedge ratio identical for investors in every country? The answer lies in how exchange rates reach equilibrium. With risk-reducing and return-improving properties of international diversification, an investor will want to diversify assets holding internationally. Given no barriers to international investment, every investor will hold a share of a fully diversified portfolio of world assets. With an absence of government participation, some investor must lend when another investor borrows, and some investor must take long position while another takes short. In equilibrium, prices will adjust until everyone is willing to hold all assets and until someone is willing to take the other side of every exchange rate contract no matter what level of

market volatility, exchange rate volatilities, correlations between exchange rates and correlations between exchange rates and asset are.

For example, investor A finds a high correlation between the return on his foreign assets and the corresponding currency movement. In order to reduce his portfolio risk, he will probably want to hedge. Suppose that if investor B in that country takes the other side of A's hedge, his risk will increase. A may be willing to give B some compensation for taking the other side. As a result, the exchange rate contract will be priced so that the hedge reduces A's expected return but increases B's. In equilibrium, both will hedge with A hedging to reduce risk while B hedging to increased expected return. But they will hedge equally, in proportion to their asset holdings.

By extending the above analysis to investors in all possible pairs of countries, the amount that each investor wants to hedge depends on three averages and by using these averages a formula of optimal hedging ratio can be formed as

$$\frac{\mu_m - \sigma_m^2}{\mu_m - \frac{1}{2}\sigma_e^2}$$

where μ_m = the average across investors of the expected excess return
on the world market portfolio (which contains stocks from
all major countries in proportion to each country's market
value) excess of interest rates in each of countries

σ_m = the average across investors of the volatility of the world
market portfolio (where variances are average)

σ_e = the average exchange rate volatility (averaged variance)

across all pairs of countries

Both expected movements in exchange rates and correlations between currency changes and asset returns or other currency changes do not affect optimal hedging ratio. In equilibrium, the expected change and the correlations cancel one another, so they disappear from the formula just like how underlying stock's expected return and its beta cancels one another and does not appear in Black-Scholes option formula. We use this idea of universal hedging to construct hedging strategy.

3.4 Determinants of Stock Return

Based on intuitive financial theory of Fama (1981) and Chen et al. (1986) combined with the results of other prior works, certain relationships can be hypothesized between some factors and stock returns.

- Interest rate

We can describe the impact of economic factors on stock returns by using a simple model of dividend discount valuation. Given the constant dividend growth assumption,

$$P = D_1 / (k - g)$$

where P is stock price

D_1 is dividend after first period

g is constant growth rate of the dividend

k is required rate of return on the stock

There is a negative relation between interest rates and stock return because of two reasons. First, interest rate can affect the level of corporate profits which in

turn affect the price that investors are willing to buy the stock through expectations of better future dividend payments. Companies can finance their capital equipments and operations through borrowing. Thus, a reduction in interest rates lowers the cost of borrowing and creates an incentive for business expansion. Second, since large numbers of stocks are bought with borrowed money, a higher interest rate makes stock transaction more costly. This will reduce demand which leads to lower price and return.

- Inflation

The relation between the inflation and stock return is negative as a higher inflation rate is likely to lead to economic tightening policies, which in turn increases the nominal risk free rate and consequently increase the discount rate in the valuation model. The impact of an increase in discount rate would not necessarily be neutralized by a higher cash flows resulting from inflation. This is because cash flows do not normally grow at the same rate as inflation since nominal contracts disallow the immediate adjustment of the company's revenues and costs.

- Exchange rates

A depreciation of currency will lead to an increase in demand for that country's exports and thereby increasing cash flows to the exporters, given that the demand for export is sufficiently elastic. At the same time, the depreciation will hurt importers as the demand for export is lower. In the end, the impact of exchange rate change on the economy and the stock market will depend on the level of international trade and the trade balance. Therefore, the impact will be determined by relative dominance of import and export sectors.

- Industrial production

Industrial production index is normally viewed as procyclical, it rises during economic boom and declines during a downturn. It is generally used as a proxy for the level of real economic activity which means that an increase in industrial productions would signal economic growth. Therefore, a positive relationship between industrial productions and stock returns should exist through the impact of industrial productions on expected future cash flows.

- Money Supply

An increase in money supply would lead to inflation and may increase discount rate which leads to decreases in stock prices. At the same time, the negative impacts might be countered, however, by the economic stimulus provided by money growth which may increase future cash flows and stock prices. Also, the higher money supply would indicate excess liquidity available for purchasing stocks which results in higher stock prices. Even though the true relationship is ambiguous, most of prior studies found a positive relationship between money supply and stock return.

- Lagged stock return

Many previous studies have confirmed the existence of autocorrelation in stock returns especially in short time horizon, the sign of autocorrelation, however, differs a lot among these studies. One important source of the autocorrelation is sluggishness of stock price adjustment to common information. When stock prices underreact to the information, the prices will later continue the movement until they fully reflect the information, this leads to momentum-like positive autocorrelation. In contrast, when stock prices overreact to the information, the

adjustments will occur in the opposite direction causing negative autocorrelation.

We use this idea of expected stock return's determinants in the estimation of stock returns

CHAPTER IV
DATA AND METHODOLOGY

4.1 Data

We take the viewpoint of a Thai investor to perform the estimation and derive the optimal portfolios. We use datasets that contain monthly and weekly returns on equity indices for Thailand, five developed countries (United States, Britain, Canada, Germany, and Japan), and 5 emerging country (Brazil, Russia, India, China, and South Africa) as well as spot and forward exchange rate, risk free interest rate, and some monthly macroeconomic data (used in return estimation) for these countries. Returns of assets are measure in Thai Baht. The period for an out of sample analysis is from April 2008 to December 2011 with a rolling window of 48 months, so the total range of data used for analysis is from Aril 2004 to December 2011. The list of details on datasets is shown below.

Table 4.1 Details of datasets use in this study

Data	Detail	Source
Thailand stock return	Weekly/Monthly return of SET index	CEIC
US stock return	Weekly/Monthly return of S&P 500 index	CEIC
UK stock return	Weekly/Monthly return of FTSE 100 index	CEIC
Canada stock return	Weekly/Monthly return of S&P TSX COMPOSITE index	CEIC

Germany stock return	Weekly/Monthly return of DAX index	CEIC
Japan stock return	Weekly/Monthly return of TOPIX index	CEIC
Brazil stock return	Weekly/Monthly return of BOVESPA index	CEIC
Russia stock return	Weekly/Monthly return of MICEX index	CEIC
India stock return	Weekly/Monthly return of BSE SENSEX index	CEIC
China stock return	Weekly/Monthly return of SHANGHAI SE COMPOSITE index	CEIC
South Africa stock return	Weekly/Monthly return of FTSE/JSE AFRICA ALL SHR index	CEIC
Forward exchange rates	Monthly/Weekly rates of 1 month forward contract for Thai Baht/ each of the 10 foreign currencies: THB/USD, THB/EUR, THB/CAD, THB/GBP, THB/JPY, THB/BRL, THB/RUB, THB/INR, THB/CNY, and THB/ZAR	Datastream

Spot exchange rates	Monthly/Weekly rates of Thai Baht/ each of the 10 foreign currencies: THB/USD, THB/EUR, THB/CAD, THB/GBP, THB/JPY, THB/BRL, THB/RUB, THB/INR, THB/CNY, and THB/ZAR	OANDA
Risk free interest rates	Monthly discount rate of each of the 11 countries	CEIC
Inflations	Monthly consumer price indices of each of the 11 countries	CEIC
Money supplies	Monthly M2 money supplies of each of the 11 countries	CEIC
Industrial productions	Monthly industrial production indices of each of the 11 countries	CEIC

4.2 Methodology

Our study is an ex ante out of sample analysis performed by using 48 months rolling window. We compare results between 2 broad cases, developed countries as investment targets and emerging countries as targets. Our flow of analysis is as follows: First, at the beginning of each period (month) of out of sample study, we estimate expected returns and variance-covariance matrices beforehand for that period by using historical data from the 48 months rolling window. Then, we use these matrices to calculate the stock portfolio weights and construct international stock

portfolios to hold for that period. Next, we implement various currency hedging strategies on the stock portfolios. We hold the hedged portfolios until the end of that period, then we measure the results of our ex ante portfolios with the actual returns and variances. In the next period, we move our rolling window one period forward and repeat all the procedures again, and then we redo our analysis like this for every period. Finally, after we have the results of all periods, we test for performance improvements and compare results among portfolios and hedging strategies. Here we go in more details about each steps of our study as follows

4.2.1 Sample expected return and variance-covariance matrices estimation.

In this step we estimate sample expected returns and variance-covariance matrices of stocks and forward contracts to use as inputs for calculating portfolio weight in the upcoming step. We apply a rolling window of 48 months for our estimation. Let r_{it} represents the return from the stock index of country i in period t from n total countries and T total periods. We get a sample return vector as

$$r_t = \begin{bmatrix} r_{1t} \\ r_{2t} \\ \vdots \\ r_{nt} \end{bmatrix} \quad t = 1, 2, \dots, T$$

where r_t is assumed multivariate normal. We estimate the sample mean vector and variance-covariance matrix as follow

$$\bar{r} = \frac{1}{T} \sum_{t=1}^T r_t$$

and

$$\Sigma_r = \frac{1}{T-1} \sum_{t=1}^T (r_t - \bar{r})(r_t - \bar{r})'$$

The expected return and covariance matrix of forward contract are obtained in the same manner. In addition to moving average, we also use regression in estimating expected return as forecasting expected return by a pure statistical method might expose to data mining problem. Our regression model for stock returns is shown as

$$r_{it+1} = a + b_1 i_{it} + b_2 CPI_{it} + b_3 S_{it} + b_4 IP_{it} + b_5 M_{it} + b_6 r_{it} + \varepsilon_{it+1}$$

where r_{it} is stock return of country i at time t

i_{it} is interest rate of country i at time t

CPI_{it} is consumer price index of country i at time t

S_{it} is spot exchange rate of country i at time t

IP_{it} is industrial production of country i index at time t

M_{it} is money supply of country i at time t

Since many works on the efficiency of the foreign exchange market have used the forward premium as a factor to forecast expected returns on forward contract, a simple forecasting equation for the return on forward contracts can be written as

$$f_{it+1} = \frac{S_{it+1}}{F_{it}} - 1 = a + b(i_{it} - i_{it}^*) + \varepsilon_{it+1}$$

where f_t is forward contract return of country i at time t

F_{it} is forward exchange rate of country i at time t

i_{it}^* is foreign interest rate of country i at time t

For estimating covariance matrices, we use weekly data in the estimations so that we can gain more observations and more accurate results. For the expected return, we still use monthly data as we need monthly macroeconomic data for the estimations. The estimation is performed in monthly basis.

4.2.2 Stock portfolio weights decision

We assume that investors choose their international stock portfolio first then decide the amount of currency hedging. In choosing portfolio weight for each country's asset, we compare between two different methods: naïve equal weight method, and optimal utility method.

A) Equal weight method

In this case we assign an equal weight of $1/n$ to each country's asset when n is the total number of countries in our consideration. Even though this is the easiest and simplest method, many studies such as DeMiguel et al. (2009) found it performs better than the more complicate portfolio selection techniques. Also, many investors today still use this method in selecting their investment portfolio because of its simplicity.

B) Optimal utility method

In this case we assume that investors' expected utility can be obtained roughly from a weighted average of the mean and variance of the portfolio return with the weight representing constant relative risk aversion. The optimal positions of each of the countries are gained by maximizing this expected utility.

Given

r_j = Stock return of country j measured in domestic currency.

p_j = Portfolio weight for country j's stock.

p, r = The ((n x 1) vectors of corresponding elements.

When $r \sim (\mu_r, \Sigma_r)$ the mean and variance of the rate of return of the stock portfolio are

$$ER = p' \mu_r$$

$$V = p' \Sigma_r p$$

Assume that the expected utility of stock portfolio is specified as follows

$$EU = ER - \frac{\gamma}{2} V$$

$$EU = p' \mu_r - \frac{\gamma}{2} p' \Sigma_r p$$

where γ is constant relative risk aversion. By maximizing the expected utility we can derive the optimal portfolio weights. The form of the problem we want to solve is

$$\max \quad EU = p' \mu_r - \frac{\gamma}{2} p' \Sigma_r p$$

$$\text{st} \quad \sum_{j=1}^n p_j = 1$$

Since the values of p_j resulted from our calculation are very large and exceed the value of total wealth ($|p_j| > 1$), the portfolio becomes too risky to invest as the standard deviation (and variance) is very high. Therefore we implement additional constraints that each of the long/short positions in stocks must not be larger than half of the total wealth value ($|p_j| \leq 0.5$). Now our problem can be written as follows

$$\begin{aligned} \max \quad & EU = p' \mu_r - \frac{\gamma}{2} p' \Sigma_r p \\ \text{st} \quad & p_1 + p_2 + \dots + p_6 - 1 = 0 \\ & 0.5 - p_1 \geq 0 \\ & 0.5 - p_2 \geq 0 \\ & \vdots \\ & 0.5 - p_6 \geq 0 \\ & 0.5 + p_1 \geq 0 \\ & 0.5 + p_2 \geq 0 \\ & \vdots \\ & 0.5 + p_6 \geq 0 \end{aligned}$$

We can construct the Lagrangian equation as follows

$$L = \left[p' \mu_r - \frac{\gamma}{2} (p' \Sigma_r p) \right] + \lambda (p_1 + p_2 + \dots + p_6 - 1) + \nu_1 (0.5 - p_1) + \nu_2 (0.5 - p_2) + \dots + \nu_6 (0.5 - p_6) + \omega_1 (0.5 + p_1) + \omega_2 (0.5 + p_2) + \dots + \omega_6 (0.5 + p_6)$$

where $\lambda, \nu_1, \nu_2, \dots, \nu_6, \omega_1, \omega_2, \dots, \omega_6$ are Lagrangian multipliers.

First-order conditions

$$\frac{\partial L}{\partial p_1} = [1 \ 0 \ \dots \ 0] \mu_r - \gamma [1 \ 0 \ \dots \ 0] \sum_r p + \lambda - \nu_1 + \omega_1 = 0$$

$$= \mu_{r_1} - \gamma (\sum_{r_1 r_1} p_1 + \sum_{r_1 r_2} p_2 + \dots + \sum_{r_1 r_6} p_6) + \lambda - \nu_1 + \omega_1 = 0$$

$$\frac{\partial L}{\partial p_2} = \mu_{r_2} - \gamma (\sum_{r_2 r_1} p_1 + \sum_{r_2 r_2} p_2 + \dots + \sum_{r_2 r_6} p_6) + \lambda - \nu_2 + \omega_2 = 0$$

⋮

$$\frac{\partial L}{\partial p_6} = \mu_m - \gamma (\sum_{r_6 r_1} p_1 + \sum_{r_6 r_2} p_2 + \dots + \sum_{r_6 r_6} p_6) + \lambda - \nu_6 + \omega_6 = 0$$

$$\frac{\partial L}{\partial \lambda} = (p_1 + p_2 + \dots + p_6 - 1) = 0$$

$$\frac{\partial L}{\partial \nu_1} = 0.5 - p_1 = 0$$

$$\frac{\partial L}{\partial \nu_2} = 0.5 - p_2 = 0$$

⋮

$$\frac{\partial L}{\partial \nu_6} = 0.5 - p_6 = 0$$

$$\frac{\partial L}{\partial \omega_1} = 0.5 + p_1 = 0$$

$$\frac{\partial L}{\partial \omega_2} = 0.5 + p_2 = 0$$

⋮

$$\frac{\partial L}{\partial \omega_6} = 0.5 + p_6 = 0$$

For inequality constraints we need additional conditions as follows

$$\nu_1 \geq 0$$

$$v_2 \geq 0$$

$$\vdots$$

$$v_6 \geq 0$$

$$\omega_1 \geq 0$$

$$\omega_2 \geq 0$$

$$\vdots$$

$$\omega_6 \geq 0$$

Also, we need some complementary slackness conditions as follows

$$v_1(0.5 - p_1) = 0$$

$$v_2(0.5 - p_2) = 0$$

$$\vdots$$

$$v_6(0.5 - p_6) = 0$$

$$\omega_1(0.5 + p_1) = 0$$

$$\omega_2(0.5 + p_2) = 0$$

$$\vdots$$

$$\omega_6(0.5 + p_6) = 0$$

Now we have 43 equations in the system and we have 19 variables: $(p_1, p_2, \dots, p_n, \lambda, v_1, v_2, \dots, v_6, \omega_1, \omega_2, \dots, \omega_6)$. Therefore, we can solve for the weight p_j . Following the work of Suh (2011), we assume a constant relative risk aversion γ value of 3.

4.2.3 Hedging Strategies Implementation

In this step we implement several currency hedging strategies and compare their performances. We implement our strategies in monthly basis while we

measure results in weekly basis in order to have more observations for performance improvement analysis. Our strategies can be separated into two groups: Unconditional hedging and conditional hedging which can be explained in details as follows

A) Unconditional hedging strategy

This type of strategy composes of four strategies: No hedging, full hedging, universal hedging, and optimal utility hedging.

1) No hedging

In this strategy, we take no position in the forward exchange rate contract. It serves an important role as a benchmark strategy when examining performance improvement.

2) Full hedging

In this strategy, we hedge 100% of each equity position with forward exchange rate contract of the corresponding country.

3) Universal hedging

In this strategy, we derive hedging ratio by using universal hedging formula proposed by Black (1990). The formula which composes of three averages as inputs can be illustrated as follows

$$\frac{\mu_m - \sigma_m^2}{\mu_m - \frac{1}{2}\sigma_e^2}$$

where μ_m = the average across investors of the expected excess return

on the world market portfolio (which contains stocks from all major countries in proportion to each country's market value) excess of interest rates in each of countries

σ_m = the average across investors of the volatility of the world

market portfolio (where variances are average)

σ_e = the average exchange rate volatility (averaged variance)

across all pairs of countries

According to market capitalization data (as of 2010) from World Federation of Exchange, 11 stock markets used in our study have already accounted for most of the world market capitalization. Therefore we use these stock markets as a proxy for world market portfolio. When we calculate these three averages, we need to give weight for each country according to their size of market capitalization. The weight for averaging can be shown as follows

Table 4.2 Weights for calculating inputs of universal hedging ratio

Country	Capitalization Weight
US	47.58
Japan	9.65
China	9.48
UK	8.5
India	7.6
Canada	5.11
Brazil	3.64
Germany	3.37
Russia	2.23
South Africa	2.18
Thailand	0.65

4) Optimal utility hedging

In this strategy we use the same selection method as we do in deriving optimal stock portfolio with some adjustments. The method can be explain in details as the following

Given

S_j = Current spot exchange rate measured in domestic price of country j currency; $S_1=1$.

F_j = Current forward exchange rate measured in domestic price of country j currency; $F_1=1$.

f_i = Rate of return of forward contract of country j's currency

h_j = Exchange rate hedging ratio for countryj's stock.

f,h = The (n x 1) vectors of corresponding elements.

P = Diagonal matrix with the diagonal elements of p.

When $f \sim (\mu_f, \Sigma_f)$ and $\Sigma_{rf} \equiv Cov(r, f)$, the mean and variance of the rate of return of the hedged portfolio are as follows

$$ER = p' \mu_r - h' P \mu_f$$

$$V = p' \Sigma_r p + h' P \Sigma_f P h - 2p' \Sigma_{rf} P h$$

Assume the expected utility is specified the same way as the stock portfolio case, we get

$$EU = ER - \frac{\gamma}{2} V$$

$$EU = p' \mu_r - h' P \mu_f - \frac{\gamma}{2} (p' \Sigma_r p + h' P \Sigma_f P h - 2 p' \Sigma_{rf} P h)$$

B
y

maximizing the expected utility, the optimal currency hedging ratios can be derived. Our problem can be written as

$$\max \quad EU = p' \mu_r - h' P \mu_f - \frac{\gamma}{2} (p' \Sigma_r p + h' P \Sigma_f P h - 2 p' \Sigma_{rf} P h)$$

First-order conditions

$$\frac{\partial EU}{\partial h} = -P \mu_f - \gamma P \Sigma_f P h + \gamma p' \Sigma_{rf} P = 0$$

$$\gamma P \Sigma_f P h = -P \mu_f + \gamma p' \Sigma_{rf} P$$

$$h = -\frac{1}{\gamma} P^{-1} \Sigma_f^{-1} \mu_f + P^{-1} \Sigma_f^{-1} \Sigma_{rf} p$$

We assume that the constant risk aversion value for hedged portfolio is the same as that of stock portfolio. Also, we give a further constraint that the hedged amount should not be more than the amount of stock investment since we take position in forward contract in order to hedge not to invest in the forward exchange rate. If the calculated hedging ratio is higher than 1, we will use 1 instead.

B) Conditional hedging strategy

In this group of strategies, we decide hedging base on conditions. There are 2 strategies in this category: Forward discount hedging and technical analysis hedging.

1) Forward premium hedging

Since many works on the efficiency of the foreign exchange market have

used the forward premium as a factor to forecast expected returns on forward contract. Applying method proposed by Glen and Jorion (1993), we use interest rate differential as a simple forecasting factor for expected forward return since the forward premium is also the interest rate differential by interest parity.

Our hedging strategy sets hedge position according to the sign of forward premium, $i - i^*$ where i (i^*) is the domestic (foreign) riskless interest rate. When the forward premium is higher than 0 this suggest a positive return for forward contract, therefore we will not use hedging which is the selling of forward contract on foreign currency as forward foreign currency is cheaper than future spot foreign currency and this leads to loss. In the opposite case where forward premium is lower than 0, we will hedge 100% of the investment amount.

2) Technical analysis hedging

As many investors use technical analysis tools in order to predict movements in the exchange rate, we construct another hedging strategy that depends on results from two simple technical analysis tools. We compare between using two technical analysis tools to create hedging rules: Simple moving average and MACD. First, we use simple moving average rule to detect trend momentum. If the short run moving average of exchange rate is higher than the long run moving average we imply that there is an upward trend and we imply that there is an downward trend when short run moving average is lower than long run moving average. If there is an upward trend in exchange rate we will leave our portfolios unhedged in order to gain benefit from the depreciation in home currency and if there is and downward trend we will hedge 100% of our portfolios to prevent loss from the appreciation in home currency. We use 5 months as short run period and

20 months as long run period. Second, we use MACD (Moving Average Convergence Divergence) as another tool to detect trend in exchange rate. MACD composes of 2 lines: MACD line and signal line which can be calculated by using exponential moving average (EMA) as follows

$$\text{MACD line} = 12 \text{ periods EMA} - 25 \text{ periods EMA}$$

$$\text{Signal line} = 9 \text{ periods EMA of MACD line}$$

When the MACD line is higher than the signal line, this indicates an upward trend in exchange rate and we will leave our portfolios unhedged. If the MACD line is lower than the signal line, this indicates a downward trend in exchange rate and we will hedge 100% of our portfolios.

4.2.4 Test of performance improvement

We use a test proposed by Jobson and Korkie (1981) which is applicable to an out of sample study. This method tests the equality of Sharpe ratios between 2 portfolios

$$H_0 : Sh_2 - Sh_1 = 0$$

Rejecting H_0 means there is an improvement in performance. A lot of improvement in statistical properties can be gained by using transformed difference

$$\hat{Sh}_{21} = s_1 \bar{r}_2 - s_2 \bar{r}_1$$

where s_i^2 is the sample variance of the portfolio i's return

\bar{r}_i is the sample mean of the portfolio i's return

This provided a marginal improvement over the regular difference in small

samples. We now test the hypothesis $S\hat{h}_{21} = 0$ by using a test statistic

$$Z = \frac{S\hat{h}_{21}}{\sqrt{\theta}}$$

$$\text{where } \theta = \frac{1}{T} \left[2s_2^2 s_1^2 - 2s_2 s_1 s_{21} + \frac{1}{2} \bar{r}_2^2 s_1^2 + \frac{1}{2} \bar{r}_1^2 s_2^2 - \frac{\bar{r}_2 \bar{r}_1}{2s_2 s_1} (s_{21}^2 + s_2^2 s_1^2) \right]$$

s_{ij}^2 is the sample covariance of the returns of portfolio i and j

The statistic has an asymptotic normal distribution.

CHAPTER V

EMPIRICAL RESULTS

As mentioned in earlier section, we can divide our analysis into 4 steps: expected return and variance covariance matrix estimation, stock portfolio construction, hedging strategy implementation, and performance improvement evaluation. In this chapter, we will show the details of the empirical results in these steps

5.1 Expected Return and Variance Covariance Matrix Estimation

In this step, we estimated the matrices that will be used as inputs in the later steps of our analysis. First, we look at the summary statistics of our main variables: the stock market returns and forward contract returns which are shown as follows

Table 5.1 Summary statistics of monthly stock market returns

	Brazil Bovespa	Canada S&P TSX Composite	China Shanghai SE Composite	Germany DAX	India BSE Sensex	Japan Topix	Russia Micex	South Africa FTSE/JSE Africa All Share	Thailand SET	UK FTSE 100	US S&P 500
Mean	0.018	0.006	0.008	0.005	0.011	-0.003	0.010	0.009	0.007	0.000	0.000
Median	0.017	0.018	0.016	0.009	0.017	-0.008	0.016	0.007	0.013	0.006	0.007
Maximum	0.176	0.135	0.255	0.207	0.307	0.111	0.249	0.164	0.140	0.134	0.126
Minimum	-0.311	-0.170	-0.233	-0.206	-0.272	-0.152	-0.319	-0.274	-0.302	-0.164	-0.157
Std. Dev.	0.077	0.054	0.089	0.063	0.086	0.048	0.097	0.067	0.065	0.053	0.049
Skewness	-0.821	-0.910	-0.391	-0.729	-0.269	-0.133	-0.474	-0.722	-1.212	-0.588	-0.350
Kurtosis	5.580	4.417	3.497	5.294	4.607	3.244	4.014	5.359	7.228	3.816	3.669
Jarque-Bera Probability	36.242 0.000	20.621 0.000	3.329 0.189	28.632 0.000	11.125 0.004	0.504 0.777	7.469 0.024	29.639 0.000	92.034 0.000	7.937 0.019	3.632 0.163
Sum	1.685	0.576	0.763	0.507	1.055	-0.280	0.894	0.861	0.669	-0.030	0.042
Sum Sq. Dev.	0.551	0.273	0.731	0.369	0.679	0.208	0.864	0.414	0.392	0.257	0.221

Table 5.2 Summary statistics of weekly stock market returns

	Brazil Bovespa	Canada S&P TSX Composite	China Shanghai SE Composite	Germany DAX	India BSE Sensex	Japan Topix	Russia Micex	South Africa FTSE/JSE Africa All Share	Thailand SET	UK FTSE 100	US S&P 500
Mean	0.004	0.001	0.001	0.001	0.002	-0.001	0.003	0.002	0.001	0.000	0.000
Median	0.007	0.005	0.000	0.004	0.006	-0.001	0.005	0.005	0.004	0.002	0.000
Maximum	0.218	0.151	0.151	0.158	0.174	0.107	0.417	0.212	0.114	0.167	0.128
Minimum	-0.295	-0.201	-0.128	-0.238	-0.172	-0.158	-0.251	-0.167	-0.234	-0.228	-0.174
Std. Dev.	0.047	0.032	0.038	0.036	0.039	0.026	0.055	0.038	0.031	0.030	0.028
Skewness	-0.610	-0.855	0.299	-0.840	-0.241	-0.234	0.476	-0.097	-1.159	-1.025	-0.272
Kurtosis	8.693	9.126	4.860	9.699	5.138	7.032	12.293	7.578	11.322	13.528	8.631
Jarque-Bera	570.694	680.989	64.242	802.785	80.879	277.403	1468.958	353.400	1256.054	1936.335	538.807
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sum	1.574	0.545	0.380	0.488	0.844	-0.272	1.036	0.897	0.588	0.020	0.022
Sum Sq. Dev.	0.879	0.424	0.590	0.519	0.599	0.282	1.217	0.577	0.382	0.371	0.306

Table 5.3 Summary statistics of monthly forward contract returns

	THB/BRL	THB/CAD	THB/CNY	THB/EUR	THB/INR	THB/JPY	THB/RUB	THB/ZAR	THB/GBP	THB/USD
Mean	-0.008	-0.016	-0.016	-0.018	-0.015	-0.018	-0.012	-0.014	-0.018	-0.017
Median	0.002	-0.009	-0.007	-0.010	-0.006	-0.011	-0.005	-0.006	-0.010	-0.008
Maximum	0.058	0.021	0.017	0.031	0.026	0.056	0.033	0.054	0.037	0.012
Minimum	-0.110	-0.128	-0.117	-0.118	-0.111	-0.125	-0.114	-0.134	-0.126	-0.119
Std. Dev.	0.037	0.030	0.028	0.029	0.027	0.029	0.031	0.037	0.030	0.027
Skewness	-1.004	-1.658	-1.995	-1.331	-1.708	-1.382	-1.475	-0.949	-1.499	-1.998
Kurtosis	3.615	5.833	6.468	4.638	5.738	5.739	5.055	3.969	5.158	6.608
Jarque-Bera	17.104	73.719	108.276	37.861	74.280	58.692	50.078	17.591	52.867	112.328
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sum	-0.709	-1.486	-1.534	-1.716	-1.419	-1.659	-1.150	-1.325	-1.703	-1.575
Sum Sq. Dev.	0.125	0.083	0.071	0.078	0.069	0.077	0.086	0.124	0.084	0.069

Table 5.4 Summary statistics of weekly forward contract returns

	THB/BRL	THB/CAD	THB/CNY	THB/EUR	THB/INR	THB/JPY	THB/RUB	THB/ZAR	THB/GBP	THB/USD
Mean	-0.010	-0.014	-0.013	-0.014	-0.015	-0.014	-0.013	-0.011	-0.014	-0.014
Median	-0.002	-0.006	-0.005	-0.007	-0.006	-0.006	-0.004	-0.004	-0.006	-0.006
Maximum	0.058	0.025	0.022	0.025	0.024	0.038	0.038	0.055	0.023	0.021
Minimum	-0.124	-0.136	-0.123	-0.125	-0.121	-0.131	-0.124	-0.123	-0.126	-0.123
Std. Dev.	0.029	0.027	0.026	0.027	0.026	0.027	0.027	0.029	0.027	0.026
Skewness	-1.824	-2.308	-2.499	-2.259	-2.260	-2.218	-2.280	-1.724	-2.214	-2.478
Kurtosis	6.437	8.054	8.387	7.707	7.688	7.508	7.712	6.059	7.490	8.332
Jarque-Bera	422.863	788.634	908.940	716.557	713.858	673.423	723.792	357.614	669.444	891.939
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sum	-4.015	-5.527	-5.324	-5.673	-5.949	-5.785	-5.143	-4.404	-5.737	-5.829
Sum Sq. Dev.	0.345	0.298	0.277	0.288	0.278	0.289	0.296	0.349	0.296	0.276

From the tables we can see that over the period of our analysis the average stock market returns are mostly positive but it is very low while the average of forward returns are mostly negative and the volatilities of stock returns are generally higher than those of forward returns. As normally seen in financial time series, our stock returns and forward returns have negative skewness values which imply left tailed distributions and have high kurtosis values which imply leptokurtic distributions. From Jarque-Bera normality test, we can see that almost all of these returns have probability values of lower than 0.05 so we can tell that our returns do not have normal distributions. Also, from the summary statistics of other macro-economic variables shown in table A.1-A.11 in the appendices, we can see that many series do not pass the normality test. Since some of our concepts hypothesize under normal distribution situation, we will address this problem in the part about limitations of our study in the next chapter.

For the estimation of the expected returns, we use two different methods:

moving average method and regression method. By using moving average method, we calculate average return at the beginning of each period (month) by using historical data of the last 48 months and use it as an expected return of that period. The full lists of estimated stock returns and estimated forward returns from moving average method can be seen in table A.12 and A.14 in the appendices. For the regression method, we estimate the expected returns in each period by using the equation shown in chapter 4 and using historical data of macroeconomic factors in the last 48 months for regression. The estimated returns of stock markets and forward contracts from regression method are shown in table A.13 and A.15 in the appendices.

For the estimation of variance covariance matrices, at the beginning of each period(month), we use the formula shown in chapter 4 to calculate these matrices and use historical weekly data of the past 209 weeks (approximately 48 months) as inputs. The full lists of estimated Σ_r for group 1 (where country 1, 2, 3, 4, 5, and 6 are Thailand, US, UK, Canada, Germany, and Japan) and group 2 (where country 1, 2, 3, 4, 5, and 6 are Thailand, Brazil, Russia, India, China, and South Africa) are shown in table A.16 in the appendix. The estimated results of Σ_f for group 1 and group 2 can be seen in table A.17 in the appendices. Finally, the full lists of estimated Σ_{rf} for group 1 and group 2 are shown in table A.18 in the appendices.

5.2 Stock Portfolio Construction

In this step we decide how much to hold each of the countries' stock based on two different methods: equal weight method and optimal utility method. For equal weight method, we construct portfolio by holding an equal amount weight

of $p=1/6$ for stock in each country and these weights are constant in all case (group) and over period of study. For optimal utility method, we calculate the weight p for each country's stock holding by applying the formula shown in chapter 4 and using expected return and variance covariance matrices estimated in previous section as inputs for the formula. Since we used two different methods to estimate the expected returns, we have two sets of portfolio's weights for optimal utility method in each case (group) according to the type of expected returns. The full lists of portfolio's weights for group 1 and group 2 can be seen in table A.19-A.22 in the appendices.

5.3 Hedging Strategy Implementation

In this step we decide how much to hedge based on many different strategies which can be divided broadly into two categories: unconditional hedging and conditional hedging.

5.3.1 Unconditional hedging

There are 4 strategies in this group as follows

5.3.1.1 No hedging

In this strategy, we do not hedge our stock portfolio which means that the hedge ratio h is equal to zero for all countries' stocks in all cases. This strategy serves as a benchmark role when we perform improvement evaluation.

5.3.1.2 Full hedging

In this strategy, we hedge all of stock positions hold in our portfolio which means that the hedge ratio h is equal to 1 for all countries' stock

in all cases.

5.3.1.3 Universal hedging

In this strategy, we use the formula proposed by Black (1991) and historical data of the last 48 months to calculate the hedge ratio at the beginning of each period and hedge equally for all countries' stocks. Since we have two types of expected returns, we have two sets of universal hedge ratio. Here we add more constraints to the calculated result to make it more suitable and compliance with the meaning of hedging. First, our hedging ratio should not have minus sign as we hedge by selling forward contract so the sign should be positive according to how we construct the return equation in our model in chapter 4. Second, the hedge ratio should not exceed one since we take position on forward contract in order to hedge the currency risk of the stock position not to hold as another investment, so the amount of hedging should not exceed the amount of stock holding. If the calculated h is higher than one, we replace it with one instead. Also, we replace the value of h with zero if it is lower than zero. The full lists of universal hedge ratio can be seen in table A.23 in the appendices.

5.3.1.4 Optimal utility hedging

In this strategy, we use the equation derived in chapter 4 with estimated expected return and variance covariance matrices as inputs to compute the optimal hedge ratio that maximize utility at the beginning of each period. Just like the Universal hedging, we have 2

sets of the hedge ratio h because this strategy utilizes the estimated expected returns. Also, we implement the same constraints as before so that the resulted hedge ratio is within the range between zero and one. We implement this hedging strategy only on the stock portfolio constructed by optimal utility method. The full lists of optimal hedge ratios are shown in table A.24 and table A.25 in the appendices.

5.3.2 Conditional hedging

There 2 strategies in this group which are

5.3.2.1 Forward premium hedging

In this strategy, we use interest rate differential as a simple forecast factor of forward return. If the interest rate differential is positive, we expect forward return to be positive and decide not to hedge (sell short forward contract) or assign $h=0$. If the interest rate differential is negative, we expect negative forward return and hedge all of the stock positions or assign $h=1$. The full lists of the forward premium hedge ratio can be seen in table A.26 in the appendices.

5.3.2.2 Technical analysis hedging

In this strategy, we use technical analysis tools to detect trend in exchange rate movements. If the technical analysis indicates trend in domestic currency depreciation, we do not hedge our portfolio or assign $h=0$. If the technical analysis indicates appreciation trend in home currency, we hedge full amount of our stock positions or assign $h=1$. For the technical analysis tools, we compare between two tools: the moving average and the MACD. The full lists of the moving

average hedge ratio and the MACD hedge ratio are shown in table A.27 and table A.28 in the appendices.

5.4 Performance Improvement Evaluation

As mentioned before, we can broadly divide our study into two groups according to the investment targets. Group 1 composes of developed countries and group 2 composes of emerging countries. The results are shown as follows

5.4.1 Group 1

In each group, we can separate further into three cases according to the methods of portfolio selection which are equal weight method, optimal utility method that uses moving average type of expected return, and optimal utility method that uses regression type of expected return.

5.4.1.1 Equal weight portfolio

Here are the results of equal weight stock portfolio with different types of strategies.

A) No hedging

The performance of no hedging strategy can be seen in the table below

Table 5.5 Performance of group 1 equal weight portfolio with no hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio
No hedging	-1.1385	23.819	-0.0478

We can see that the average return (per week) of this strategy over the period of study is negative which leads to negative Sharpe ratio. As we get negative value of Sharpe ratio, we

can say that the performance of this strategy is quite disappointing for the investor.

B) Full hedging

The performance of full hedged equal weight portfolio can be shown as follows

Table 5.6 Performance of group 1 equal weight portfolio with full hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	-1.1385	23.819	-0.0478	
Full hedging	30.49917	22.85991	1.334177	2.270383

From the table, we can see that full hedged portfolio has better average return and also a little lower standard deviation than no hedged portfolio. As a result, the Sharpe ratio improves a lot from implementing full amount hedging on equal weight stock portfolio. For the test of performance improvement at significance level of 5%, the Z statistic is higher than the critical value of 1.96. Therefore, we can reject the null hypothesis that the Sharpe ratio is equal or we can say that we have a significant improvement by implementing full hedging strategy.

C) Universal hedging

As we used two types of estimated expected return, we have two sets of result in this case. The result of equal weight portfolio hedge with universal hedging that uses moving average method to estimated expected return can be seen in the table below

Table 5.7 Performance of group 1 equal weight portfolio with universal hedging (moving average), average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	-1.1385	23.819	-0.0478	
Universal hedging (moving average)	25.50748	22.98013	1.10998	1.904341

From the table, we can see that the portfolio with universal hedging has higher return and a little lower standard deviation. Therefore, the hedged portfolio has some improvement as can be seen from the Sharpe ratio. From the test of Z statistics, however, the Z value of this strategy is a little lower than the critical value at 5% significance level. Therefore, we can say that improvement in performance of this strategy is not significant at 5% level. Nevertheless, if we use 10% level of significance instead, the performance improvement is significant since it is higher than the critical value of 1.645. For the universal hedging that uses expected return from regression method, the result can be seen as follows

Table 5.8 Performance of group 1 equal weight portfolio with universal hedging (regression), average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	-1.1385	23.819	-0.0478	
Universal hedging(regression)	28.76963	22.91892	1.255278	2.141704

We have a much higher average return with lower standard deviation which leads to a lot improvement in Sharpe ratio. For the

performance improvement test, the Z statistic is higher than the critical value at 5% significance level which means that universal hedging in this case significantly improve the performance of the stock portfolio.

D) Forward premium hedging

The result of forward hedging on equal weight portfolio is in the table below

Table 5.9 Performance of group 1 equal weight portfolio with forward premium hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	-1.1385	23.819	-0.0478	
Forward premium hedging	4.459197	23.4329	0.190296	0.392801

From the table, we can see that the Sharpe ratio improve quite a little as the forward premium hedging increase average return and lower standard deviation of the stock portfolio a bit. The Z statistic is much lower than the 5% critical value, so we conclude that forward premium does not significantly increase the performance of equal weight portfolio.

E) Technical analysis hedging

First, we look at the result of moving average technical analysis hedging which is shown as follows

Table 5.10 Performance of group 1 equal weight portfolio with technical analysis hedging (moving average), average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	-1.1385	23.819	-0.0478	
Technical analysis	14.70256	23.47261	0.626371	1.110226

hedging (moving average)				
--------------------------	--	--	--	--

We can see that there is an improvement in Sharpe ratio since we have a better return and lower standard deviation.

However, the Z statistic is lower than the critical value at 5% level which means that the improvement from implementing this strategy is not significant. Next, we look at the result of MACD technical analysis hedging which is shown in the table below

Table 5.11 Performance of group 1 equal weight portfolio with technical analysis hedging (MACD), average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	-1.1385	23.819	-0.0478	
Technical analysis hedging (MACD)	11.54897	23.41825	0.493161	0.887497

From the table, the increase in average return in this case is the lower than the moving average rule case while the standard deviation is about the same and this in turn leads to the lower Sharpe ratio. The Z statistic of this strategy is much lower than the critical value of 5% level of significance which means that we cannot reject the null hypothesis that there is no performance improvement.

The next case of analysis for group 1 is the case where we use optimal utility method to construct portfolio. As we use two types of expected return in constructing portfolio, we can separate our result into two sets base on the method of expected return estimation: the optimal utility portfolio that use expected return estimated by moving average method and the optimal utility portfolio that use expected return estimated by regression

method.

5.4.1.2 Optimal utility portfolio (moving average)

The results of various hedging strategies on optimal utility portfolio (moving average) is shown as follows

A) No hedging

The result of no hedged optimal utility portfolio (moving average) can be shown in the table below

Table 5.12 Performance of group 1 optimal utility portfolio (moving average) without hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio
No hedging	8.521143	28.36469	0.300414

Unlike the equal weight case, we have a positive return which leads to positive value of Sharpe ratio.

B) Full hedging

Here is the result of full hedged optimal utility portfolio (moving average)

Table 5.13 Performance of group 1 optimal utility portfolio (moving average) with full hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	8.521143	28.36469	0.300414	
Full hedging	98.57859	26.89777	3.664935	5.159834

We can see that the average return improves greatly compared to no hedging while the standard deviation is a little bit lower and this leads to a sharply increase in Sharpe ratio. For the test of performance improvement, we can see that the Z statistic is a lot higher than the 5% critical value of 1.96. Therefore, we can say that

implementing full hedging improve the performance of the portfolio very significantly.

C) Universal hedging (moving average)

For optimal utility portfolio (moving average), we only perform universal hedging that use moving average expected return.

The result of this strategy result can be shown as follows

Table 5.14 Performance of group 1 optimal utility portfolio (moving average) with universal hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	8.521143	28.36469	0.300414	
Universal hedging	84.99516	27.42085	3.099655	4.331463

From the table, we have a much higher average return and a little lower standard deviation. The Sharpe ratio improves very much and the Z statistics is so much higher than the critical value at 5% level of significance. Therefore, we can conclude that the improvement from adding universal hedging into the portfolio is significant.

D) Optimal utility hedging

For this type of stock portfolio, we only perform optimal utility hedging that use the expected return of stock and forward contract estimated by moving average method. The result of this strategy is shown in the table below

Table 5.15 Performance of group 1 optimal utility portfolio (moving average) with optimal utility hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	8.521143	28.36469	0.300414	
Optimal utility hedging	60.04653	27.3213	2.197792	2.985816

The average return is improved quite a lot in this strategy while the standard deviation is a little lower and this leads to a higher Sharpe ratio. The Z statistic is above the critical value at 5% which means we can reject the null hypothesis that there is no improvement from implement hedging.

E) Forward premium hedging

The result of this strategy is shown as follows

Table 5.16 Performance of group 1 optimal utility portfolio (moving average) with forward premium hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	8.521143	28.36469	0.300414	
Forward premium hedging	24.82549	27.42088	0.90535	0.963885

From the table, the average return increases a little while the standard deviation is a bit lower The Sharpe ratio is higher but the Z statistic is quite a lot lower than the 5% critical value. As a result, we can say that hedging with forward premium cannot significantly improve the performance of the optimal utility portfolio.

F) Technical analysis hedging

First, the result of moving average technical analysis hedging can be shown as follows

Table 5.17 Performance of group 1 optimal utility portfolio (moving average) with technical analysis hedging (moving average), average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	8.521143	28.36469	0.300414	
Technical analysis hedging (moving average)	53.73674	28.48263	1.886649	2.496319

The Sharpe ratio increase a lot as the average return increase much higher than the increase in standard deviation. The Z statistic is higher than the critical value at 5% level, so we can reject the null hypothesis and conclude that this strategy significantly improves the optimal utility portfolio. Next, the result of MACD technical analysis strategy can be shown in the table below

Table 5.18 Performance of group 1 optimal utility portfolio (moving average) with technical analysis hedging (MACD), average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	8.521143	28.36469	0.300414	
Technical analysis hedging (MACD)	44.87492	28.4193	1.57903	2.008915

From the table, this strategy has a lower return increment than the moving average rule strategy while the standard deviation is not much different which means that an increase in the Sharpe ratio is also lower. For the Z statistic, we can see it is higher than the critical value at 5% significance level which means that this strategy

significantly increase the performance of the stock portfolio in this case.

5.4.1.3 Optimal utility portfolio (regression)

Here are the results of implementing various hedging strategies on optimal utility portfolio that uses returns estimated by regression method

A) No hedging

The result of group 1 no hedged portfolio can be shown as follows

Table 5.19 Performance of group 1 optimal utility portfolio (regression) without hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio
No hedging	0.636468	28.70598	0.0030747

We can see that the average return is positive and this leads to a positive value Sharpe ratio

B) Full hedging

The result of full hedged is shown in the table below

Table 5.20 Performance of group 1 optimal utility portfolio (regression) with full hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	0.636468	28.70598	0.022172	
Full hedging	94.84405	26.61959	3.562942	5.424005

From the table, the average return increases greatly and the standard deviation decrease a little. Therefore, the Sharpe ratio improves a lot and the Z statistic is much higher than the critical

value at 5% level of significance. Therefore we can reject the null hypothesis and conclude that the full hedging significantly improve the performance of stock portfolio in this case.

C) Universal hedging (regression)

In this case we only perform universal hedging that use expected return estimated by regression and here is the result of universal hedging (regression)

Table 5.21 Performance of group 1 optimal utility portfolio (regression) with universal hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	0.636468	28.70598	0.022172	
Universal hedging	89.90857	26.88655	3.343998	5.107749

From the table, we can see that an exceptionally high average return and a lower standard deviation yield a high level of Sharpe ratio. For the performance improvement test, the Z statistic exceeds the critical value at 5% level which means that this strategy significantly improves stock portfolio's performance in this case.

D) Optimal utility hedging

For this type of stock portfolio, we only perform optimal utility hedging that use the expected return of stock and forward contract estimated by regression method. Here is the result of this strategy

Table 5.22 Performance of group 1 optimal utility portfolio (regression) with optimal utility hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	0.636468	28.70598	0.022172	
Optimal utility hedging	53.0943	27.28071	1.946221	3.027966

The average return increases quite a lot while the standard deviation decreases a bit. As a result, there is an increment in Sharpe ratio. The Z statistic is above the critical value of 1.96, so we can reject the null hypothesis of zero improvement.

E) Forward premium hedging

The result of this strategy can be shown as follows

Table 5.23 Performance of group 1 optimal utility portfolio (regression) with forward premium hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	0.636468	28.70598	0.022172	
Forward premium hedging	17.42956	27.84198	0.626017	0.960669

This strategy increases the average return and decreases the standard deviation a little. The Sharpe ratio improves a little from implementing this strategy. For the performance improvement test, the Z statistic is much lower than the critical value at 5% level. Therefore, we can say that this strategy does not significantly improve the stock portfolio.

F) Technical analysis hedging

First, we look at the result of moving average rule hedging which is shown as follows

Table 5.24 Performance of group 1 optimal utility portfolio (regression) with technical analysis hedging (moving average), average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	0.636468	28.70598	0.022172	
Technical analysis hedging (moving average)	48.00522	27.95582	1.717181	2.670118

The average return improves quite a lot while the standard deviation decreases just a little. The Sharpe ratio is higher and the Z statistic is quite above the critical value, so we can reject the null hypothesis which means that there is a significant performance improvement. Next, the result of MACD rule hedging is shown as follows

Table 5.25 Performance of group 1 optimal utility portfolio (regression) with technical analysis hedging (MACD), average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	0.636468	28.70598	0.022172	
Technical analysis hedging (MACD)	38.69888	27.77648	1.393225	2.152683

We can see that the average return improvement is quite a lot while the standard deviation is a little lower. The Sharpe ratio increases quite a lot and the Z statistic is higher than the 5% critical value which means that the improvement is significant.

Next, we move on to the results of our analysis in the portfolio investing in emerging countries

5.4.2 Group 2

As before, we separate our study according to how we construct stock

portfolio and they are shown in details as follows

5.4.2.1 Equal weight portfolio

Here are the performances of various hedging strategies on portfolio constructed by equal weight portfolio

A) No hedging

The result of no hedged portfolio can be shown in the table below

Table 5.26 Performance of group 2 equal weight portfolio with no hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio
No hedging	0.288456	26.75632	0.010781

We can see that even though the average return is not negative like the in the result of group 1, it is very close to zero. As a result, the Sharpe ratio for this case is very low.

B) Full hedging

The result of this strategy can be shown as follows

Table 5.27 Performance of group 2 equal weight portfolio with full hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	0.288456	26.75632	0.010781	
Full hedging	23.86466	23.3797	1.020743	1.639669

We can see that the return rises to some extent while the standard deviation is a little lower. Although the Sharpe ratio is improved, the Z statistic is lower than the critical value at 5% which means that we cannot reject the null hypothesis of no performance improvement.

C) Universal hedging (moving average)

The result of this strategy can be shown as follows

Table 5.28 Performance of group 2 equal weight portfolio with universal hedging (moving average), average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	0.288456	26.75632	0.010781	
Universal hedging (moving average)	20.80444	23.89381	0.870704	1.394284

The average return is improved in some amount while the standard deviation is lower. Even though the Sharpe ratio is higher, the test statistic is quite much lower than the critical value of 1.96. Therefore, we conclude that the improvement is not significant.

D) Universal hedging (regression)

The result of this strategy can be seen as follows

Table 5.29 Performance of group 2 equal weight portfolio with universal hedging (regression), average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	0.288456	26.75632	0.010781	
Universal hedging(regression)	22.61765	23.53475	0.961032	1.542425

We can see that the average return rise to some extent while the standard deviation is lower which leads to some improvement in Sharpe ratio. For the test of performance improvement, the Z statistic is lower than the critical value at 5% level which means that the improvement from this strategy is not significant.

E) Forward premium hedging

The result of this strategy is shown in the table below

Table 5.30 Performance of group 2 equal weight portfolio with forward premium hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	0.288456	26.75632	0.010781	
Forward premium hedging	23.58014	23.37133	1.008934	1.620697

From the table, the average return increase while standard is a little lower. The Sharpe ratio is higher but the z statistic is still below the critical value at 5% which means that we can conclude that there is no significant improvement in this strategy.

F) Technical analysis

First, we look at the result of moving average rule hedging in the table below

Table 5.31 Performance of group 2 equal weight portfolio with technical analysis hedging (moving average), average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	0.288456	26.75632	0.010781	
Technical analysis hedging (moving average)	14.73962	25.01957	0.589124	0.935379

The average return increases in some amount while the standard deviation is reduced a little. Even though the Sharpe ratio is higher, the Z statistic is only about half the critical value at 5%. Therefore, we cannot reject the null hypothesis of no performance improvement. Next, the result of MACD rule hedging can be shown as follows

Table 5.32 Performance of group 2 equal weight portfolio with technical analysis hedging (MACD), average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	0.288456	26.75632	0.010781	
Technical analysis hedging (MACD)	10.73823	25.06864	0.428353	0.667159

From the table, the average return rise less than the moving average rule hedging while the standard deviation is about the same. The Sharpe ratio increases but the test statistic is far from the 5% critical value which means that the improvement here is not significant.

5.4.2.2 Optimal utility portfolio (moving average)

Here are the results of various strategies on the portfolio constructed by optimal utility method that use moving average type expected return

A) No hedging

The result no hedged portfolio is shown as follows

Table 5.33 Performance of group 2 optimal utility portfolio (moving average) with no hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio
No hedging	-0.5412	37.89904	-0.01428

We can see that even though the average is negative, it is close to zero. Nevertheless, it yields a negative value of Sharpe ratio which is disappointing.

B) Full hedging

The result of this strategy is shown as follows

Table 5.34 Performance of group 2 optimal utility portfolio (moving average) with full hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	-0.5412	37.89904	-0.01428	
Full hedging	64.19976	32.09153	2.00052	3.062934

From the table, the average return improves a lot while the standard deviation decreases to some extent. As a result, the Sharpe ratio increase considerably and the Z statistic is higher than the critical value at 5% level of significance which means that we can conclude that this strategy significantly improves the performance of the portfolio.

C) Universal hedging

In this case, we only perform universal hedging that use expected return estimated by moving average and here is the result of this strategy

Table 5.35 Performance of group 2 optimal utility portfolio (moving average) with universal hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	-0.5412	37.89904	-0.01428	
Universal hedging	55.41877	33.49163	1.654705	2.540681

From the table, the average return rises a lot while the standard deviation increases a little. Although the Sharpe ratio improves to some extent, the Z statistic is higher than the 5% level critical value of 1.96 which means that the improvement is significant at this level.

D) Optimal utility hedging

For this type of stock portfolio, we only perform optimal utility hedging that use the expected return of stock and forward contract estimated by moving average method. The result of this strategy is shown in the table below

Table 5.36 Performance of group 2 optimal utility portfolio (moving average) with optimal utility hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	-0.5412	37.89904	-0.01428	
Optimal utility hedging	38.19016	34.82289	1.096697	1.699672

From the table, we can see that the average return increase in some amount and the standard deviation decreases a little. Although the Shape improves a little, the Z statistic is not enough to pass the test, so we cannot reject null hypothesis of no improvement at 5% level of significance. Nevertheless, if we use 10% level of significance instead, the improvement is significant as the Z statistic is higher than the critical value of 1.645.

E) Forward premium hedging

Here is the result of this hedging strategy

Table 5.37 Performance of group 2 optimal utility portfolio (moving average) with forward premium hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	-0.5412	37.89904	-0.01428	
Forward premium hedging	63.3462	32.04821	1.976591	3.027725

We can see that the average return increase a lot while the standard deviation is lower. As the Sharpe ratio improves a lot, the Z statistic exceeds the 5% level critical value. Therefore, we can say that the improvement gained here is significant.

F) Technical analysis hedging

First, we look at the result of moving average rule hedging as follows

Table 5.38 Performance of group 2 optimal utility portfolio (moving average) with technical analysis hedging (moving average), average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	-0.5412	37.89904	-0.01428	
Technical analysis hedging (moving average)	38.17178	34.46618	1.107514	1.716706

The average return rises to some extent while the standard deviation decreases a little. There is some improvement in the Sharpe ratio but the Z value is still lower than the 5% level critical value which suggests that this improvement is not significant. However, this Z value is higher than the critical value at 10% level. Therefore, we can say that the improvement gained here is significant at 10% level. Next, we look at the result of MACD rule hedging in the table below

Table 5.39 Performance of group 2 optimal utility portfolio (moving average) with technical analysis hedging (MACD), average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	-0.5412	37.89904	-0.01428	
Technical analysis	27.93759	35.02206	0.797714	1.230843

hedging (MACD)				
----------------	--	--	--	--

We can see that the average return is lower in this case than the moving average rule while the standard deviation is a little higher and this leads to a lower value of Sharpe ratio. The z value is below the critical value at 5% level of significance. Therefore, we cannot reject the null hypothesis of no improvement.

5.4.2.3 Optimal utility portfolio (regression)

Here are the results of various strategies on the portfolio constructed by optimal utility method that use regression type expected return

A) No hedging

Here is the result of this strategy

Table 5.40 Performance of group 2 optimal utility portfolio (regression) with no hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio
No hedging	25.82946	32.97843	0.783223

We can see that the average return is higher than other cases in group 2. As a result, the Sharpe ratio is also higher than other cases.

B) Full hedging

Here is the result of this strategy

Table 5.41 Performance of group 2 optimal utility portfolio (regression) with full hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	25.82946	32.97843	0.783223	
Full hedging	95.14641	32.5048	2.927149	3.251543

We can see that the average return increases a lot while the

standard deviation does not change much. The Sharpe ratio is improved a lot and the Z statistic is more than enough to pass the performance improvement test at 5% level, so we can reject the null hypothesis of no improvement.

C) Universal hedging

In this case, we only perform universal hedging that use expected return estimated by regression. The result of this strategy is shown in the table below

Table 5.42 Performance of group 2 optimal utility portfolio (regression) with universal hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	25.82946	32.97843	0.783223	
Universal hedging	91.39871	32.28935	2.830615	3.112368

We can see that the average return increase considerably while the standard deviation decrease a little. The Sharpe ratio is almost four times of the no hedging value. As a result, the Z value is high enough to pass the performance improvement test.

Therefore, we can reject the null hypothesis of no improvement.

D) Optimal utility hedging

For this type of stock portfolio, we only perform optimal utility hedging that use the expected return of stock and forward contract estimated by regression method. The result of this strategy is shown as follows

Table 5.43 Performance of group 2 optimal utility portfolio (regression) with optimal utility hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	25.82946	32.97843	0.783223	
Optimal utility hedging	60.093	32.28145	1.861534	1.664908

From the table, both the average return increase to some extent while the standard deviation is a bit lower. The Sharpe ratio is a lot higher but the Z value is still lower than the 5% level critical value. Therefore, we can say that the improvement from this hedging strategy is not significant at 5% level. Nevertheless, if we use 10% level of significance instead, the improvement is significant as the Z statistic is higher than the critical value of 1.645.

E) Forward premium hedging

The result of this strategy can be shown as follows

Table 5.44 Performance of group 2 optimal utility portfolio (regression) with forward premium hedging, average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	25.82946	32.97843	0.783223	
Forward premium hedging	94.29285	32.45246	2.905568	3.220178

The average return increases a lot while the standard deviation is almost the same. The Sharpe ratio improves considerably and the Z value is more than enough to pass the performance improvement test at 5% level of significance. Therefore, we can reject the null hypothesis of no improvement.

F) Technical analysis hedging

First, we look at the result of moving average rule hedging shown in the table below

Table 5.45 Performance of group 2 optimal utility portfolio (regression) with technical analysis hedging (moving average), average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	25.82946	32.97843	0.783223	
Technical analysis hedging (moving average)	68.29166	31.7327	2.152091	2.108999

The average return rises in some amount while the standard deviation drops a little. Even though the Sharpe ratio is much higher, the Z value is lower than quite a lot the 5% critical value. Therefore, we can reject the null hypothesis of no improvement.

Next, we look at the result of MACD rule hedging shown as follows

Table 5.46 Performance of group 2 optimal utility portfolio (regression) with technical analysis hedging (MACD), average return and standard deviation are measured in percentage per year

Strategy	Average return	Standard deviation	Sharpe ratio	Z statistic
No hedging	25.82946	32.97843	0.783223	
Technical analysis hedging (MACD)	56.37904	33.26763	1.694712	1.40342

The average return rises less than the moving average rule but the standard deviation is higher. As a result, the improvement in Sharpe ratio of this case is lower. The Z value is much lower than the 5% critical value, so we can say that the improvement of this strategy is not significant.

CHAPTER VI

CONCLUSIONS AND SUGGESTIONS

6.1 Conclusions

We can summarize the results of all cases into a single table as in the table 6.1. From the table, we use the results to answer three main questions of our study: which type of portfolio yields the best result, which hedging strategy gives the best performance, and which group of countries has better result.

6.1.1 Portfolio types comparison

In the case of group 1, we can clearly see from the Sharpe ratios that the portfolios constructed by the optimal utility method that use moving average to estimate expected return give the best performance. For the equal weight portfolio, the average return of the no hedged portfolio is negative which leads to a negative value of Sharpe ratio while the Sharpe ratios of the hedged equal weight portfolios are much lower than those of other types of portfolio as the average returns are a lot lower than other method even though the standard deviation is the lowest. For the optimal utility portfolio that uses regression type expected return, although the standard deviation of the no hedging portfolio is about the same as that of its moving average counterpart, its average return is a lot lower. The optimal utility portfolio (moving average) yields the best Sharpe ratio because the average return is much greater than other portfolio types.

Table 6.1 Performances of all portfolios and strategies in our study

Portfolio	Hedging strategy	Group 1				Group 2			
		Average return	Standard deviation	Sharpe ratio	Z statistic	Average return	Standard deviation	Sharpe ratio	Z statistic
Equal weight	No hedging	-1.1385	23.819	-0.0478		0.288456	26.75632	0.010781	
	Full hedging	30.49917	22.85991	1.334177	2.270383	23.86466	23.3797	1.020743	1.639669
	Universal hedging (MA)	25.50748	22.98013	1.10998	1.904341	20.80444	23.89381	0.870704	1.394284
	Universal hedging (regression)	28.76963	22.91892	1.255278	2.141704	22.61765	23.53475	0.961032	1.542425
	Forward premium hedging	4.459197	23.4329	0.190296	0.392801	23.58014	23.37133	1.008934	1.620697
	Technical analysis hedging(MA)	14.70256	23.47261	0.626371	1.110226	14.73962	25.01957	0.589124	0.935379
	Technical analysis hedging(MACD)	11.54897	23.41825	0.493161	0.887497	10.73823	25.06864	0.428353	0.667159
Optimal utility (MA)	No hedging	8.521143	28.36469	0.300414		-0.5412	37.89904	-0.01428	
	Full hedging	98.57859	26.89777	3.664935	5.159834	64.19976	32.09153	2.00052	3.062934
	Universal hedging	84.99516	27.42085	3.099655	4.331463	55.41877	33.49163	1.654705	2.540681
	Optimal utility hedging	60.04653	27.3213	2.197792	2.985816	38.19016	34.82289	1.096697	1.699672
	Forward premium hedging	24.82549	27.42088	0.90535	0.963885	63.3462	32.04821	1.976591	3.027725
	Technical analysis hedging(MA)	53.73674	28.48263	1.886649	2.496319	38.17178	34.46618	1.107514	1.716706
	Technical analysis hedging(MACD)	44.87492	28.4193	1.57903	2.008915	27.93759	35.02206	0.797714	1.230843
Optimal utility (regression)	No hedging	0.636468	28.70598	0.022172		25.82946	32.97843	0.783223	
	Full hedging	94.84405	26.61959	3.562942	5.424005	95.14641	32.5048	2.927149	3.251543
	Universal hedging	89.90857	26.88655	3.343998	5.107749	91.39871	32.28935	2.830615	3.112368
	Optimal utility hedging	53.0943	27.28071	1.946221	3.027966	60.093	32.28145	1.861534	1.664908
	Forward premium hedging	17.42956	27.84198	0.626017	0.960669	94.29285	32.45246	2.905568	3.220178
	Technical analysis hedging(MA)	48.00522	27.95582	1.717181	2.670118	68.29166	31.7327	2.152091	2.108999
	Technical analysis hedging(MACD)	38.69888	27.77648	1.393225	2.152683	56.37904	33.26763	1.694712	1.40342

In the case of group 2, now the portfolio type that gives the best performance is the optimal utility that uses expected return estimated by regression. For the equal weight method, even though there is no negative value of average return like in the group 1 case and the standard deviation is the lowest among three portfolio types, the average return is too low to yield the highest Sharpe ratios. For the optimal utility method (moving average), unlike in the case of group 1, it performs very poorly as it yields negative returns and has the highest level of standard deviation. The Sharpe ratio indicates that this type of portfolio gives the worst performance in the case of

group 2. For the optimal utility method (regression), the much higher level of average return yields the best values of Sharpe ratio among the three methods.

The reason why the equal weight portfolio performs poorly in both groups is that the world stock markets are in bear market most of the time of our study, so there are many periods of highly negative return as can be seen in figure 6.1 and 6.2 below

Figure 6.1 Movements in average of stock markets' returns in group 1. The black line is an average of actual returns, the dot line is an average of estimated returns (MA), and the grey line is an average of estimated return (regression) in group 1.

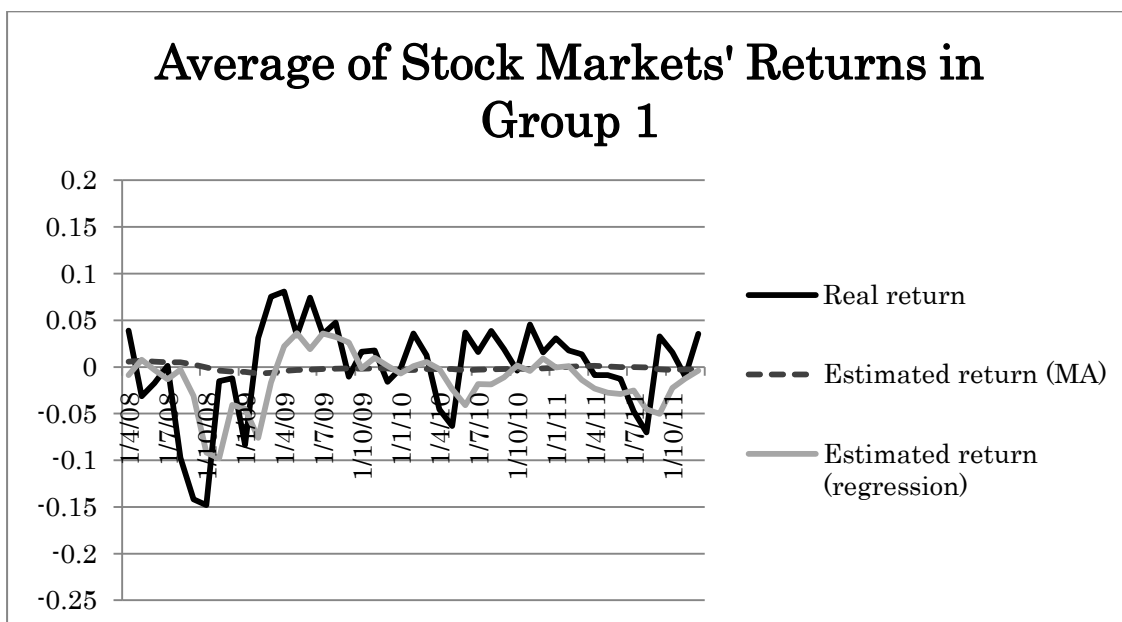
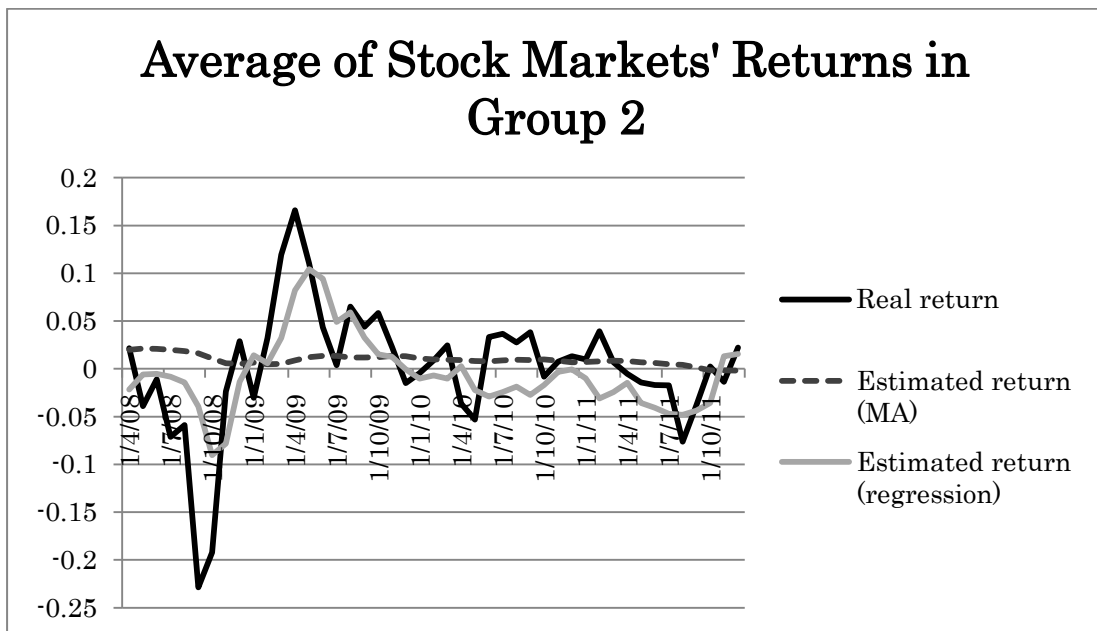


Figure 6.2 Movements in average of stock markets' returns in group 2. The black line is an average of actual returns, the dot line is an average of estimated returns (MA), and the grey line is an average of estimated return (regression) in group 2.



As the equal weight portfolio is constructed by only taking long (buying) position of stock, it tends to perform poorly during the market downturn and perform very well during bull market. For the optimal utility portfolio (moving average), the estimated return is quite constant over time and too sluggish to reflect any sharp movements in the actual return. As a result, it yields a portfolio with quite stable portfolio weights (p). For optimal utility portfolio (regression), the estimated return is more responsive to any sharp changes in actual return. As a result, this return yields a portfolio with more fluctuate p values than the moving average counterpart. The moving average type optimal utility portfolio outperforms the regression type in the case of group 1 as there are less sharp movements in this case. As the movements in return of group 2 are more fluctuate, however, the regression type performs better.

Another finding about portfolio from our results is that the hedged portfolios in each type of portfolio have different level of performance improvements. Since we hedge relative to the stock position, even though the hedging strategy is the same (hedging ratio is the same), the hedging amount and the performance gain (loss) are different among different types of portfolio which have unequal amount of stock positions. The reason why the hedged optimal utility portfolios (regression) have better performance improvements comes from the fact that this type of portfolio just happen to give higher weights in average to stock markets in the countries which have higher level forward returns and this leads to higher gains in performance from hedging. Therefore, we do not use the amount of performance improvement from hedging to evaluate the method of portfolio construction.

In summary, the equal weight portfolio performs poorly in group 1 and moderately in group 2, the optimal utility portfolio (moving average) performs very well in group 1 and poorly in group 2, and the optimal utility portfolio (regression) performs moderately in group 1 and very well in group 2. Therefore, we can say that the regression type optimal utility portfolio is the best portfolio in our study. Nevertheless, this does not mean that this result will always be true as our study is performed only in the period of market downturn. In the bull market, the equal weight portfolio is expected to perform very well and might outperform the optimal utility portfolio. In order to have firmer results, we need a longer period of study that include both bull market and bear market. Unfortunately, because of data limitation, we cannot extend our period of study.

6.1.2 Hedging strategies comparison

In the case of group 1, we can clearly see that the full hedging strategy is the best performing hedging strategy. The strategy has the highest Sharpe ratios and performance improvement levels in all types of portfolio. For the universal hedging, it performs well as it is the second best strategy in all case. The optimal utility hedging gives rather moderate levels of Sharpe ratio and performance improvement in all cases comparing to other strategies. For the forward premium hedging, the strategy performs very poorly as its Sharpe ratios and performance improvements are the lowest in all types of portfolios. For the technical analysis hedging, the moving average rule hedging performs moderately in all cases while the MACD rule hedging performs poorer than the moving average rule hedging.

In the case of group 2, even though the performances of all strategies are worse than in the case of group 1, the best hedging strategy is still the full hedging strategy as it has the highest levels of Sharpe ratio and performance improvement. For the universal hedging, it has quite good values of Sharpe ratios and performance improvements. Comparing to other strategies, the optimal utility hedging performs quite poorly. Unlike in the case of group 1, the forward premium now perform very well as it has the second best levels of Sharpe ratio and performance improvement among hedging strategies. For the technical analysis hedging, the moving average rule hedging performs moderately and a little better than the MACD hedging rule.

The reason why hedging strategies in group 1 have better performance improvement than in group 2 can be seen in figure 6.3 and 6.4 as follows

Figure 6.3 Movements in average of forward return of all countries' currencies in group 1.

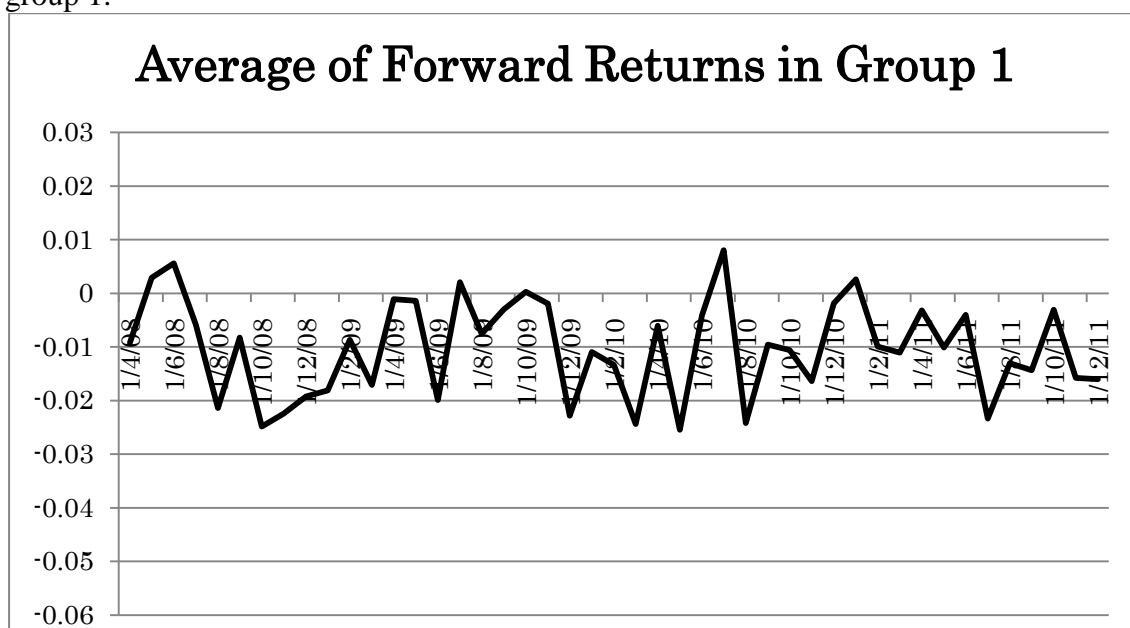
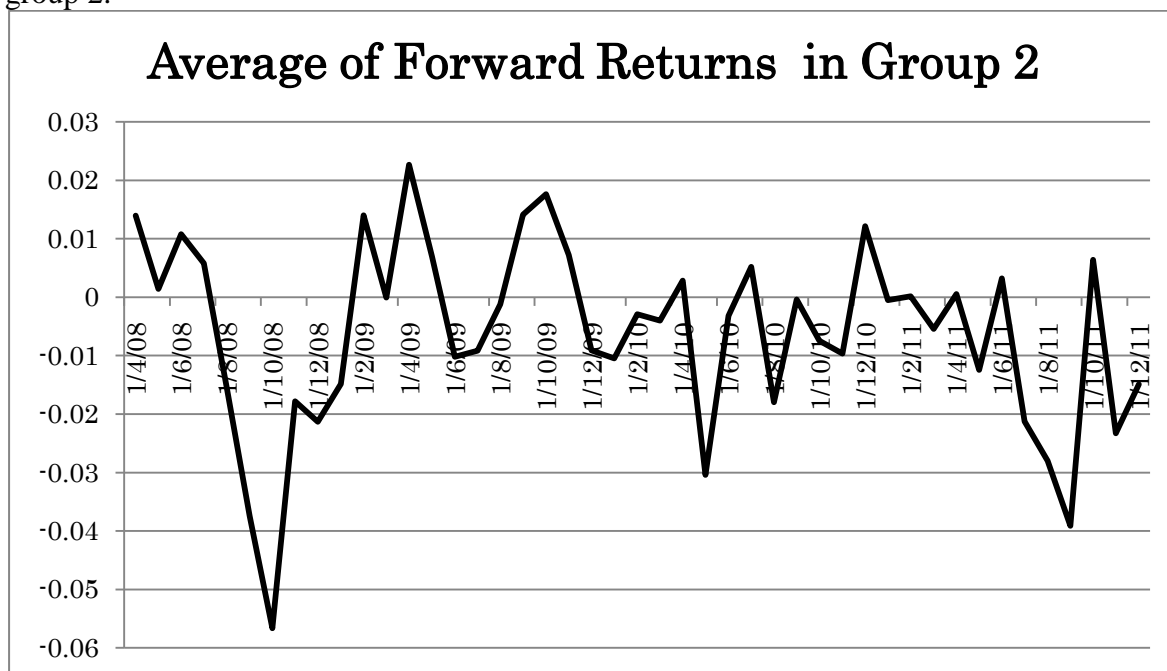


Figure 6.4 Movements in average of forward return of all countries' currencies in group 2.



Although most currencies in both groups are in depreciation trend against Thai Baht, we can see from the pictures that the forward returns in group 1 have clearer downward trend and move in negative zone most of the time while those in group 2 are more fluctuate and have more periods of can positive return. As a result, the hedging is easier to calculate and implement accurately and performs better in group 1 than group 2. The full hedging strategy performs very well because our analysis is in a period of depreciation in foreign currency toward home currency which can be seen in the charts of exchange rate movement shown in figure A.1-A.10 in the appendices. If it is a period of foreign currency appreciation, this strategy is expected to perform poorly. The performance of optimal utility hedging strategy is quite disappointing because it depends on many estimated values: expected stock return, expected forward return, and variance covariance

matrix. As the combined error from these estimations is high, it is very hard for this strategy to yield accurate hedging ratios. On the other hand, the universal hedging depends only on estimated stock returns, so it performs better than the optimal utility hedging. For the forward premium hedging, it performs very poor in group 1 because even though the interest rate differentials suggest mostly positive forward returns, the real forward returns turn out to be mostly negative. Therefore, we can say that the interest rate differential is not a good forecasting factor of forward return. For the technical analysis hedging, both strategies do not perform well as the technical analysis gives many false signals especially in periods of high volatility in exchange rate like in our study.

By looking at the Sharpe ratios improvements, we can say that the full hedging strategy gives the best performance improvements. In order to confirm that the full hedging strategy really is the best strategy, however, we perform the significance test of improvements among our hedging strategies as follows

Table 6.2 Test of performance improvements among hedging strategies in group 1 where the numbers in the table are Z statistics. Negative (positive) value means there is a decline (improvement) in performance from the benchmark strategy.

Group 1's Z statistic		Benchmark strategy						
Portfolio	Hedging strategy	No hedging	Full hedging	Universal hedging	Optimal utility hedging	Forward premium hedging	Technical analysis hedging (MA)	Technical analysis hedging (regression)
Equal weight	No hedging	-	-2.270383	-2.141703	-	-0.392801	-1.110226	-0.891387
	Full hedging	2.270383	-	0.1304284	-	1.8850551	1.1674963	1.387208
	Universal hedging (2.141704	-0.130428	-	-	1.7556324	1.0375429	1.2574043
	Forward premium hedging	0.392801	-1.885055	-1.755632	-	-	-0.719759	-0.500107
	Technical analysis hedging(MA)	1.110226	-1.167496	-1.037543	-	0.7197589	-	0.2202909
	Technical analysis hedging(MACD)	0.887497	-1.393629	-1.262851	-	0.5010214	-0.220191	-
Optimal	No hedging	-	-5.159834	-4.331463	-2.985816	-0.963885	-2.496319	-2.017239

utility (MA)	Full hedging	5.159834	-	0.8757479	2.2825364	4.2702545	2.7537426	3.2278742
	Universal hedging	4.331463	-0.875748	-	1.4106799	3.4208813	1.889715	2.3711557
	Optimal utility hedging	2.985816	-2.282536	-1.41068	-	2.0445253	0.4901632	0.9756332
	Forward premium hedging	0.963885	-4.270254	-3.420881	-2.044525	-	-1.551547	-1.066916
	Technical analysis hedging(MA)	2.496319	-2.753743	-1.889715	-0.490163	1.5515473	-	0.4842027
	Technical analysis hedging(MACD)	2.008915	-3.241742	-2.376489	-0.977552	1.0698783	-0.483759	-
Optimal utility (regression)	No hedging	-	-5.424005	-5.10775	-3.027967	-0.960669	-2.670118	-2.165707
	Full hedging	5.424005	-	0.3400865	2.5219156	4.5409903	2.868803	3.3699377
	Universal hedging	5.107749	-0.340086	-	2.1850391	4.2161101	2.5343369	3.0382956
	Optimal utility hedging	3.027966	-2.521916	-2.185039	-	2.0897615	0.3619522	0.8746323
	Forward premium hedging	0.960669	-4.54099	-4.21611	-2.089761	-	-1.727437	-1.216811
	Technical analysis hedging(MA)	2.670118	-2.868803	-2.534337	-0.361952	1.7274369	-	0.5140875
	Technical analysis hedging(MACD)	2.152683	-3.391735	-3.055374	-0.87852	1.2200923	-0.51329	-

Table 6.3 Test of performance improvements among hedging strategies in group 2 where the numbers in the table are Z statistics. Negative (positive) value means there is a decline (improvement) in performance from the benchmark strategy.

Group 2's Z statistic		Benchmark strategy						
Portfolio	Hedging strategy ¥ Benchmark strategy	No hedging	Full hedging	Universal hedging	Optimal Utility hedging	Forward premium hedging	Technical analysis hedging (MA)	Technical analysis hedging (regression)
Equal weight	No hedging	-	-1.639669	-1.542425	-	-1.620697	-0.935379	-0.6755
	Full hedging	2.270383	-	0.0983784	-	0.0194697	0.70656	0.9693574
	Universal hedging	2.141704	-0.098378	-	-	-0.078929	0.6085415	0.8713203
	Forward premium hedging	0.392801	-0.01947	0.078929	-	-	0.6872962	0.950131
	Technical analysis hedging(MA)	1.110226	-0.70656	-0.608541	-	-0.687296	-	0.2635175
	Technical analysis hedging(MACD)	0.887497	-0.98398	-0.883732	-	-0.964508	-0.263532	-
Optimal utility (MA)	No hedging	-	-3.062935	-2.540681	-1.699672	-3.027725	-1.716706	-1.242982
	Full hedging	5.159834	-	0.5329203	1.3895207	0.0369651	1.3733353	1.8471229
	Universal hedging	4.331463	-0.53292	-	0.857552	-0.496163	0.841104	1.3167724
	Optimal utility hedging	2.985816	-1.389521	-0.857552	-	-1.353144	-0.016655	0.4599594
	Forward premium hedging	0.963885	-0.036965	0.4961627	1.3531439	-	1.336938	1.8109507
	Technical analysis hedging(MA)	2.496319	-1.373335	-0.841104	0.0166549	-1.336938	-	0.4793541
	Technical analysis hedging(MACD)	2.008915	-1.86935	-1.327706	-0.462237	-1.832947	-0.479605	-
Optimal utility (regression)	No hedging	-	-3.251544	-3.112368	-1.664908	-3.220178	-2.108999	-1.405019
	Full hedging	5.424005	-	0.1470368	1.6268813	0.0328516	1.1838848	1.8778395
	Universal hedging	5.107749	-0.147037	-	1.4818296	-0.114198	1.0379731	1.7337407
	Optimal utility hedging	3.027966	-1.626881	-1.48183	-	-1.594514	-0.44839	0.2569297
	Forward premium hedging	0.960669	-0.032852	0.1141975	1.5945137	-	1.1513089	1.8456218

Technical analysis hedging(MA)	2.670118	-1.183885	-1.037973	0.4483898	-1.151309	-	0.7034048
Technical analysis hedging(MACD)	2.152683	-1.879981	-1.736254	-0.257164	-1.847939	-0.705366	-

We can see from table 6.2 and 6.3 that even though the full hedging always has better Sharpe ratio improvements in every case, it does not significantly outperform the universal hedging strategy in any case. Moreover, the full hedging strategy significantly outperforms other strategies (except no hedging strategy) only in the cases of optimal utility portfolios of group 1. These imply that the performance improvements of full hedging strategy are not distinctly better than other strategies' (especially universal hedging strategy) and the better performances might happen by chance in some cases. Also, as it can not significantly outperform other strategies in the period of foreign currency depreciation where it tends to perform well, it is highly possible that the strategy would significantly underperform other strategies in the period of foreign currency appreciation where it tends to perform poorly. For other strategies, the universal hedging strategy has about the same improvements as the full hedging strategy but it has advantage over the fixed rule full hedging as it is a dynamic strategy which can adjust hedge ratios according to market conditions so it is more likely to keep good performances even in the different market situations. The optimal utility only significantly outperforms the forward premium hedging strategy (and no hedging strategy) just in the case of group 1. The forward premium hedging does not significantly outperform any other strategies (except no hedging strategy) in any case. For the technical analysis hedging strategies, they have nearly the same improvements as the optimal utility hedging but do not

significantly outperform any strategy (except no hedging strategy).

In summary, we can say that there are benefits from currency hedging since all hedging strategies improve the performances of our stock portfolios even though these improvements are not significant in all cases. Moreover, the choice of investment destination really affects the performance improvement of our strategies. We can say that the full hedging strategy is the best performing strategy in our study by looking at the Sharpe ratio improvements even though it does not significantly outperform the universal hedging strategy. However, this result might not hold true in all situations as the full hedging tends to perform poorly in the period of highly appreciation of foreign currency relative to home currency and we can see that the performance improvements of the strategy are not distinctly different from other strategies especially in group 2. In order to have firmer results, we need a longer period of study that include both depreciation and appreciation trend in currencies. Unfortunately, because of data limitation, we cannot extend our period of study.

6.1.3 Investment destinations comparison

We can see from figure 6.1, 6.2, 6.3, and 6.4 that the countries in group 2 have higher volatilities in movements of both the stock market returns and the forward returns. The more volatile stocks and forward exchange rates make it harder to get accurate portfolio weights and hedging ratios which leads to poorer performances of the hedged portfolios. Therefore, we can say that group 1 is a better investment destination in our study.

6.2 Limitations and Suggestions

6.2.1 Limitations of our study

As mentioned in chapter 5, even though some of our concepts base on the assumption of normality in the return data, both the stock returns and forward return do not pass the Jarque-Bera test. Since this non-normality is one characteristic that is usually observed from the financial time series, we can not do anything about it and we state this as a limitation of our study.

Another limitation of our analysis is the period of study. Since our analysis is performed only in the period of market downturn and depreciation in foreign currency, our results might be bias to these circumstances and might not hold true in other periods that have different situations. If we have a longer period of study which includes many types of market situations, we may get better results that conform to all circumstances. Unfortunately, we have problem in tracking data back to the past especially the forward returns of many countries in group 2 which we only have data dating from 2004 and cannot go back further. Since we need a part of the data as a rolling window for estimation, the period of out of sample analysis becomes very short and includes only the period of bear market and depreciation in foreign currency.

Finally, from the figures in the results, we can observe that the Sharpe ratios in some cases especially the optimal utility portfolios seem a little higher than those normally seen in practical portfolios. These somewhat overly high Sharpe ratios might result from the movements of forward exchange rate returns in our period of study. As mentioned earlier, the

forward exchange rate returns are mostly negative during the period of study because it is in the time of depreciation trend in foreign currency. As we hedge by selling forward contracts, we accumulate gains quite consistently from hedging exchange rate and this leads to high level of Sharpe ratio. As the optimal utility portfolios have larger stock positions which lead to larger hedging amounts, they are more likely to have these overly high Sharpe ratios problems. Another reason for this limitation might be the absence of transaction costs in the model which is a common problem among many academic papers. If we cover a longer period of study with various currency trends and add the transaction costs into our study, we might gain more realistic numbers of Sharpe ratios for all portfolio cases.

6.2.2 Suggestion for further study

For further study, it would be better if our limitations could be solved. If more data becomes available in the future, the period of study can be extended to include more situations in the stock markets and currency markets. Also, our concept and model of study should be adjusted to be more suitable in working with the data that does not have normal distribution and the transaction costs should be included in the model for more realistic results. Moreover, there are many areas in the technical analysis hedging to be explored as we only study two types of technical analysis tool and there are many tools left. For example, the technical analysis tools that do not use moving average as their main mechanism like our tools or the tools that are not trend detector type. Furthermore, our study is performed in the viewpoint of just one of developing countries and it might yield more implications if we

study in perspectives of other developing countries or change investment destinations.

REFERENCES

- Black, F. 1990. Equilibrium Exchange Rate Hedging. **The Journal of Finance** 45: 899-907.
- Bodie, Z., Kane, A., and Marcus, A. 2010. **Investments**. New York: McGraw-Hill/Irwin.
- Brown, S. J., Elton, E. J., Goetzmann, W. N., and Gruber M. J. 2009. **Modern Portfolio Theory and Investment Analysis**. New York: Wiley.
- Cambell, J. Y., Viceira, L. M., and White, J.S. 2003. Foreign Currency for Long-Term Investors. **The Economic Journal** 113: C1-C25.
- Chen, N. F., Roll, R., and Ross, S. 1986. Economic Forces and The Stock Market. **Journal of Business** 59: 83-403.
- DeMiguel, V., Garlappi, L., and Uppal, R. 2009. Optimal Versus Naïve Diversification: How Inefficient is the 1/N Portfolio Strategy? **Review of Financial Studies** 22: 1915-1953
- Eaker, M., Grant, D., and Woodard, N. 1991. **International Equity Investment and Hedging: A Canadian and American Comparison**. Paper Presented at The Sixth Canadian International Futures and Options, Canadian Securities Institute Conference, October 1991.
- Eun, C. S. and Resnick, B. G. 1988. Exchange Rate Uncertainty, Forward Contracts, and International Portfolio Selection. **Journal of Finance** 43: 197-215.
- Fama, E. F. 1981. Stock Returns, Real Activity, Inflation and Money. **The American Economic Review** 71: 45-565.

- Froot, K. 1993. Currency Hedging Over Long Horizons. **NBER Working Paper** 4355.
- Glen, J. 1990. **Exchange Rate Uncertainty, Forward Contracts and The Performance of Global Equity Portfolios**. Working Paper. The Wharton School, University of Pennsylvania.
- Glen, J., and Jorion, P. 1993. Currency Hedging for International Portfolios. **Journal of Finance** 48: 1865-1886.
- Grubel, H. 1968. Internationally diversified portfolios: Welfare gains and capital flows. **American Economic Review** 58: 1299-1314.
- Hauser, S., Marcus, M., and Yaari, U. 1994. Investing in Emerging Markets: Is It Worthwhile Hedging Foreign Exchange Risk? **The Journal of Portfolio Management** 20: 76-81.
- Jobson, J. D., and Korkie, B. M. 1981. Performance Hypothesis Testing with The Sharpe and Treynor Measures. **The Journal of Finance** 36: 889-908.
- Jorion, P. 1985. International Portfolio Diversification with Estimation Risk. **Journal of Business** 58: 259-278.
- Lessard, D.R. 1976. World, Country, and Industry Relationships in Equity Returns. **Financial Analyst Journal** 32: 32-38.
- Levy, H. and Sarnat, M. 1970. International Diversification of Investment Portfolios. **American Economic Review** 60: 668-675.
- Madura, J., and Tucker, A. L. 1992. Hedging International Stock Portfolios : Lessons from The 1987 Crash. **The Journal of Portfolio Management** 18:

69-73.

- Perold, A., and Schulman, E. 1988. The Free Lunch in Currency Hedging: Implications for Investment Policy and Performance Standards. **Financial Analysts Journal** 44: 45-50.
- Solnik, B.H. 1974. The International Pricing of Risk: An Empirical Examination of the World Market Structure. **Journal of Finance** 29: 365-378.
- Solnik, B. H. 1998. Global Asset Management. **The Journal of Portfolio Management** 24: 43-51.
- Stulz, R.M. 1984. Optimal Hedging Policies. **Journal of Financial and Quantitative Analysis** 19: 127-140.
- Suh, S. 2011. Currency Hedging Failure in International Equity Investments and An Efficient Hedging Strategy: The Perspective of Korean Investors. **Pacific-Basin Finance Journal** 19: 390-403.
- Tesar, I. and Werner, L. 1995. Home Bias and High Turnover. **Journal of International Money and Finance** 4: 467-492.

APPENDICES

APPENDICES

Table A.1 Summary statistics of Brazil's macroeconomic data

	CPI	Interest rate	Industrial production index	Money supply	Lagged return	Exchange rate	Interest differential
Mean	112.5699	13.3172	107.086	868254.7	0.01612	17.06289	-10.5484
Median	111	12.5	107	758408	0.012712	17.43015	-9
Maximum	137	19.75	118	1569030	0.175555	20.91326	-7.5
Minimum	92	8.75	93	409758	-0.31136	13.01457	-17.5
Std. Dev.	12.47293	3.217467	7.234663	339837.9	0.077993	1.729719	3.125817
Skewness	0.238722	0.530973	-0.0933	0.408746	-0.76898	-0.46761	-1.01195
Kurtosis	1.992544	2.252152	1.591331	1.860268	5.370263	2.823981	2.502473
Jarque-Bera	4.816315	6.537153	7.824275	7.623217	30.93587	3.509319	16.83182
Probability	0.089981	0.038061	0.019998	0.022113	1.92E-07	0.172966	0.000221
Sum	10469	1238.5	9959	80747684	1.499144	1586.849	-981
Sum Sq. Dev.	14312.8	952.3925	4815.312	1.06E+13	0.55963	275.2573	898.9073

Table A.2 Summary statistics of Canada's macroeconomic data

	CPI	Interest rate	Industrial production index	Money supply	Lagged return	Exchange rate	Interest differential
Mean	104.914	2.545699	103.7204	1117175	0.005306	31.22046	0.223118
Median	105	2.75	104	1094159	0.015476	31.07121	0.5
Maximum	113	4.75	110	1418584	0.134824	35.32777	2.25
Minimum	97	0.5	96	849209	-0.16985	27.82326	-1.5
Std. Dev.	4.390345	1.480831	3.502687	183100.1	0.054444	1.79714	0.923326
Skewness	-0.00624	0.054178	-0.40467	0.093783	-0.8727	0.259708	-0.08614
Kurtosis	2.049451	1.603051	2.511561	1.494873	4.369637	2.450691	2.576052
Jarque-Bera	3.501838	7.60743	3.462764	8.914777	19.07397	2.214694	0.81146
Probability	0.173614	0.022288	0.17704	0.011593	7.21E-05	0.330434	0.66649
Sum	9757	236.75	9646	1.04E+08	0.493412	2903.503	20.75
Sum Dev. Sq.	1773.312	201.7433	1128.731	3.08E+12	0.272704	297.1336	78.4328

Table A.3 Summary statistics of China's macroeconomic data

	CPI	Interest rate	Industrial production index	Money supply	Lagged return	Exchange rate	Interest differential
Mean	103.2796	3.217097	15	45996.37	0.006848	4.725754	-0.44828
Median	103	3.33	15	41785	0.015372	4.748079	-0.83
Maximum	109	4.14	21	82549	0.254963	5.206897	1.67
Minimum	98	2.7	5	23166	-0.23343	4.016544	-1.58
Std. Dev.	2.538253	0.40783	3.193063	18042.52	0.089456	0.276652	1.037746
Skewness	0.068724	0.817774	-0.87816	0.501382	-0.35169	-0.67445	0.747016
Kurtosis	2.532322	3.40021	3.858704	1.916683	3.431022	2.834081	2.346599
Jarque-Bera	0.920759	10.98634	14.81045	8.444056	2.637021	7.157257	10.30388
Probability	0.631044	0.004115	0.000608	0.014669	0.267534	0.027914	0.005788
Sum	9605	299.19	1395	4277662	0.636903	439.4952	-41.69
Sum Sq. Dev.	592.7312	15.30192	938	2.99E+10	0.736223	7.041323	99.07632

Table A.4 Summary statistics of Germany's macroeconomic data

	CPI	Interest rate	Industrial production index	Money supply	Lagged return	Exchange rate	Interest differential
Mean	104.7097	3.158602	105.4624	7198.892	0.00483	46.35647	-0.38978
Median	106	3	106	7450	0.008563	46.97585	-0.5
Maximum	111	5.25	119	8567	0.20691	52.49179	1.75
Minimum	98	1.75	89	5310	-0.2059	39.39128	-2
Std. Dev.	3.880219	1.25097	8.089928	1101.755	0.063014	3.458771	0.951588
Skewness	-0.07862	0.34079	-0.04785	-0.31684	-0.72316	-0.22169	0.02341
Kurtosis	1.774028	1.680392	1.711738	1.57659	5.373333	1.993996	2.263421
Jarque-Bera	5.91997	8.547931	6.466512	9.407099	29.9326	4.683456	2.110872
Probability	0.05182	0.013926	0.039429	0.009063	3.16E-07	0.096161	0.348041
Sum	9738	293.75	9808	669497	0.449148	4311.151	-36.25
Sum Dev. Sq.	1385.161	143.9731	6021.118	1.12E+08	0.36531	1100.605	83.3078

Table A.5 Summary statistics of India's macroeconomic data

	CPI	Interest rate	Industrial production index	Money supply	Lagged return	Exchange rate	Interest differential
Mean	123.9892	6.569892	124.9892	10737506	0.010825	0.776744	-3.23118
Median	116	6.5	123	10578770	0.016751	0.767902	-3.25
Maximum	172	9	181	16405500	0.307198	0.958874	-1
Minimum	94	4.75	88	5744550	-0.27161	0.605629	-4.75
Std. Dev.	23.50462	1.152953	22.36529	3439616	0.085678	0.092513	1.235369
Skewness	0.535281	0.135352	0.215542	0.181934	-0.25676	0.247416	0.272048
Kurtosis	1.955786	2.160981	2.113483	1.734006	4.645978	1.82139	1.872484
Jarque-Bera	8.666385	3.011778	3.765512	6.723668	11.52015	6.331675	6.073408
Probability	0.013126	0.22182	0.15217	0.034672	0.003151	0.042179	0.047993
Sum	11531	611	11624	9.99E+08	1.006741	72.2372	-300.5
Sum Dev. Sq.	50826.99	122.2957	46018.99	1.09E+15	0.675344	0.787396	140.4046

Table A.6 Summary statistics of Japan's macroeconomic data

	CPI	Interest rate	Industrial production index	Money supply	Lagged return	Exchange rate	Interest differential
Mean	100.2043	0.348387	97.87097	735312.3	-0.00222	0.343561	2.42043
Median	100	0.3	100	728558	-0.00759	0.358342	2.5
Maximum	103	0.75	110	802475	0.110981	0.400695	4.9
Minimum	99	0.1	72	682592	-0.15238	0.249844	0.95
Std. Dev.	0.891495	0.235498	8.719326	34867.01	0.048305	0.036981	1.178504
Skewness	1.070324	0.728239	-0.86479	0.451602	-0.12798	-0.87158	0.462777
Kurtosis	4.623989	2.244141	3.297895	1.960396	3.146323	2.622713	2.197012
Jarque-Bera	27.97639	10.43401	11.93561	7.349153	0.336834	12.3263	5.818081
Probability	8.41E-07	0.005424	0.00256	0.02536	0.845002	0.002106	0.054528
Sum	9319	32.4	9102	68384040	-0.20636	31.95122	225.1
Sum Dev. Sq.	73.11828	5.102258	6994.452	1.12E+11	0.214672	0.125822	127.7762

Table A.7 Summary statistics of Russia's macroeconomic data

	CPI	Interest rate	Industrial production index	Money supply	Lagged return	Exchange rate	Interest differential
Mean	131.2473	10.75269	107.8602	11303.67	0.011505	1.242133	-7.98387
Median	129	11	109	11582	0.019153	1.266088	-7.25
Maximum	178	14	124	21962	0.248772	1.451072	-4.75
Minimum	86	7.75	90	3421	-0.31884	0.959757	-12.75
Std. Dev.	28.92481	1.938068	8.802904	5471.989	0.09691	0.16089	2.233881
Skewness	0.121886	-0.16644	-0.21252	0.215433	-0.51675	-0.28115	-0.57626
Kurtosis	1.674367	1.756077	2.005288	1.980146	4.054932	1.506063	2.048293
Jarque-Bera	7.039819	6.425321	4.534153	4.749771	8.451348	9.873599	8.656867
Probability	0.029602	0.040249	0.103615	0.093025	0.014615	0.007178	0.013188
Sum	12206	1000	10031	1051241	1.069927	115.5184	-742.5
Sum Dev. Sq.	76971.31	345.5618	7129.183	2.75E+09	0.864019	2.38146	459.1008

Table A.8 Summary statistics of South Africa's macroeconomic data

	CPI	Interest rate	Industrial production index	Money supply	Lagged return	Exchange rate	Interest differential
Mean	119.9785	8.016129	103.0215	1297346	0.009617	4.928882	-5.24731
Median	119	7.5	102	1393230	0.007764	4.437258	-5.25
Maximum	150	12	116	1756460	0.163502	6.856408	-2
Minimum	96	5.5	93	748172	-0.27356	3.436177	-9.5
Std. Dev.	17.74088	1.951103	5.445338	321733.5	0.066944	0.991126	2.023468
Skewness	0.119792	0.687388	0.428845	-0.38523	-0.73957	0.566559	-0.1389
Kurtosis	1.500585	2.424076	2.259111	1.646837	5.40612	1.870108	1.997272
Jarque-Bera	8.934378	8.609072	4.977626	9.395602	30.91194	9.922377	4.19523
Probability	0.01148	0.013507	0.083008	0.009115	1.94E-07	0.007005	0.122749
Sum	11158	745.5	9581	1.21E+08	0.894335	458.386	-488
Sum Sq. Dev.	28955.96	350.2258	2727.957	9.52E+12	0.412297	90.37446	376.6868

Table A.9 Summary statistics of Thailand's macroeconomic data

	CPI	Interest rate	Industrial production index	Money supply	Lagged return	Exchange rate
Mean	108.5591	2.768817	166.6351	923911.1	0.005835	34.81876
Median	109	2.75	166.9557	900308	0.012006	33.7867
Maximum	121	5	200.2089	1310974	0.139763	41.6298
Minimum	95	1.25	101.3317	673285	-0.30176	29.6857
Std. Dev.	7.538975	1.235369	19.79123	166545.5	0.066088	3.89488
Skewness	-0.18148	0.272048	-0.44187	0.587037	-1.14714	0.377803
Kurtosis	2.006074	1.872484	2.784444	2.359083	6.840665	1.709378
Jarque-Bera	4.33854	6.073408	3.206463	6.933249	77.556	8.667001
Probability	0.114261	0.047993	0.201245	0.031222	0	0.013122
Sum	10096	257.5	15497.07	85923733	0.542699	3238.145
Sum Sq. Dev.	5228.925	140.4046	36035.73	2.55E+12	0.401817	1395.648

Table A.10 summary statistics of Britain's macroeconomic data

	CPI	Interest rate	Industrial production index	Money supply	Lagged return	Exchange rate	Interest differential
Mean	107.4194	3.196237	95.98925	1596351	-0.00033	61.37582	-0.42742
Median	106	4.5	99	1601423	0.005511	63.0006	0
Maximum	121	5.75	102	2100454	0.133766	75.60973	3
Minimum	97	0.5	88	1019888	-0.16429	46.73462	-3.25
Std. Dev.	6.875164	2.132452	5.186719	370082.8	0.052883	9.94425	1.773744
Skewness	0.330411	-0.38453	-0.40078	-0.00454	-0.58757	-0.09792	0.04422
Kurtosis	1.982387	1.289716	1.341583	1.57489	3.816411	1.472414	1.911327
Jarque-Bera	5.704864	13.62649	13.14733	7.870208	7.93404	9.190994	4.622996
Probability	0.057704	0.001099	0.001397	0.019544	0.01893	0.010097	0.099113
Sum	9990	297.25	8927	1.48E+08	-0.03061	5707.952	-39.75
Sum Sq. Dev.	4348.645	418.3562	2474.989	1.26E+13	0.257289	9097.707	289.4476

Table A.11 Summary statistics of the United States' macroeconomic data

	CPI	Interest rate	Industrial production index	Money supply	Lagged return	Exchange rate	Interest differential
Mean	106.8387	2.160538	99.30108	7644.312	-0.00019	34.81876	0.612151
Median	108	2	99	7522	0.006455	33.7867	0.25
Maximum	116	5.25	106	9618	0.126257	41.6298	3.38
Minimum	96	0.13	90	6161	-0.15723	29.6857	-2
Std. Dev.	5.805339	2.019751	3.977614	988.9344	0.048743	3.89488	1.328211
Skewness	-0.26757	0.394016	-0.36351	0.165303	-0.32781	0.377803	0.241306
Kurtosis	1.944979	1.5708	2.553667	1.749314	3.720376	1.709378	2.350285
Jarque-Bera	5.422872	10.32147	2.820074	6.484872	3.676476	8.667001	2.538296
Probability	0.066441	0.005737	0.244134	0.039069	0.159098	0.013122	0.281071
Sum	9936	200.93	9235	710921	-0.01768	3238.145	56.93
Sum Sq. Dev.	3100.581	375.3041	1455.57	89975188	0.218585	1395.648	162.3012

Table A.12 Expected stock return estimated by moving average method from April 2008 to December 2011

Period	μ_r	μ_r	μ_r	μ_r	μ_r	μ_r	μ_r	μ_r	μ_r	μ_r	μ_r
	Bovespa	S&P TSX Composite	Shanghai SE Composite	DAX	BSE Sensex	Topix	Micex	FTSE/JS E Africa All Share	SET	FTSE 100	S&P 500
Apr-08	0.034449	0.012957	0.020013	0.012781	0.023607	-0.00197	0.021177	0.014065	0.005949	0.004116	0.000354
May-08	0.036395	0.013716	0.019424	0.014533	0.025671	-6.91E-05	0.024828	0.015818	0.006315	0.004472	0.000488
Jun-08	0.033823	0.013599	0.017055	0.011267	0.021176	0.001753	0.028815	0.017655	0.006573	0.002586	-0.00202
Jul-08	0.032215	0.012552	0.018379	0.012638	0.021302	-0.00093	0.027587	0.015891	0.004766	0.002113	-0.00093
Aug-08	0.030255	0.012642	0.016505	0.013274	0.021927	-0.00019	0.026154	0.013353	0.002585	0.003009	-0.00056
Sep-08	0.027017	0.00794	0.014599	0.009824	0.017886	-0.00117	0.021498	0.012707	0.003231	-0.00096	-0.00276
Oct-08	0.019939	0.003732	0.010889	0.00599	0.0118	-0.00279	0.013745	0.008429	-0.00011	-0.00373	-0.00631
Nov-08	0.01382	-0.00032	0.012337	0.001896	0.006575	-0.0058	0.006335	0.002499	-0.00587	-0.00582	-0.00862
Dec-08	0.013089	-0.00229	0.013809	0.000919	0.007383	-0.00604	0.004828	2.04E-05	-0.00755	-0.00738	-0.00822
Jan-09	0.014189	-0.00226	0.017342	-0.00016	0.007193	-0.00473	0.00522	-0.00029	-0.00542	-0.00975	-0.009
Feb-09	0.011003	-0.00422	0.016532	-0.00257	0.005448	-0.00602	0.002476	-0.00024	-0.00704	-0.01169	-0.01152
Mar-09	0.013516	-0.00212	0.021947	-0.00143	0.00851	-0.00713	-0.00043	-0.00307	-0.00851	-0.01046	-0.00882
Apr-09	0.019075	-0.00039	0.023581	0.003323	0.01244	-0.00759	0.005038	-0.00023	-0.00682	-0.00863	-0.0061
May-09	0.020892	0.001454	0.025985	0.002686	0.016412	-0.00556	0.009393	0.003195	-0.00322	-0.00835	-0.00636
Jun-09	0.01988	0.001912	0.027566	0.002025	0.014676	-0.00454	0.014176	0.004976	-0.00059	-0.00898	-0.00693
Jul-09	0.020441	0.000958	0.029687	0.003503	0.01449	-0.00497	0.010196	0.005033	0.000543	-0.00705	-0.00712
Aug-09	0.018793	-0.0002	0.023029	0.004119	0.013301	-0.00429	0.009292	0.005301	0.001463	-0.00539	-0.00661
Sep-09	0.019429	0.000911	0.023939	0.0041	0.013447	-0.00522	0.007588	0.005097	0.001755	-0.00515	-0.00578
Oct-09	0.019909	0.00079	0.026618	0.004016	0.013734	-0.00795	0.007183	0.003748	0.003033	-0.00542	-0.00587
Nov-09	0.021099	0.001279	0.027684	0.004329	0.013748	-0.00801	0.009938	0.006104	0.003278	-0.0051	-0.0056
Dec-09	0.020028	0.000692	0.026844	0.005074	0.0133	-0.00985	0.008557	0.00603	0.003848	-0.00421	-0.00539
Jan-10	0.016385	-0.00199	0.023228	0.002288	0.01078	-0.00986	0.007697	0.004063	0.003789	-0.00619	-0.00673
Feb-10	0.016952	0.000236	0.023576	0.001552	0.010195	-0.01105	0.005575	0.001211	0.001284	-0.00533	-0.00555
Mar-10	0.016867	3.96E-05	0.024187	0.002531	0.009848	-0.00967	0.001613	0.001606	0.002534	-0.00501	-0.0043
Apr-10	0.014992	0.000704	0.020111	0.001848	0.009043	-0.00904	0.003748	0.002797	0.00476	-0.00655	-0.00447
May-10	0.016035	0.001296	0.015545	0.002134	0.01181	-0.00901	0.000988	0.001966	0.003117	-0.00641	-0.00519
Jun-10	0.015165	-0.00053	0.013682	0.000107	0.012021	-0.01015	0.001328	0.001465	0.004356	-0.00985	-0.00621
Jul-10	0.017956	-0.00023	0.016366	6.03E-05	0.011747	-0.01061	-0.00061	0.001914	0.006577	-0.00862	-0.00504
Aug-10	0.017436	-8.69E-05	0.015972	-0.00041	0.010182	-0.00913	0.000499	0.004713	0.007696	-0.00781	-0.00637

Sep-10	0.018457	0.001094	0.014718	8.09E-05	0.01133	-0.01066	-0.00103	0.00297	0.00911	-0.00683	-0.00523
Oct-10	0.017252	6.58E-05	0.015704	0.000195	0.009985	-0.00972	0.000373	0.005491	0.010671	-0.00754	-0.00562
Nov-10	0.014702	-0.00018	0.011243	0.001332	0.008148	-0.00991	0.000497	0.006073	0.009763	-0.00783	-0.00657
Dec-10	0.014007	0.00103	0.005873	0.00077	0.008882	-0.00844	-0.00097	0.004567	0.009722	-0.00683	-0.00507
Jan-11	0.013912	0.002046	0.005459	5.10E-05	0.006598	-0.00809	-0.0007	0.005472	0.011964	-0.00729	-0.00421
Feb-11	0.01522	0.004159	0.00622	0.001891	0.007986	-0.00707	0.001325	0.005293	0.011369	-0.00595	-0.00258
Mar-11	0.015387	0.005042	0.005269	0.001989	0.010692	-0.00541	0.003572	0.00567	0.011148	-0.0052	-0.00178
Apr-11	0.01383	0.00514	0.001518	0.002763	0.009663	-0.00654	0.004425	0.006363	0.01251	-0.00439	-0.00154
May-11	0.012271	0.003736	-0.00102	0.001039	0.007451	-0.00694	0.00365	0.006005	0.012639	-0.00538	-0.00247
Jun-11	0.009754	0.002129	0.000433	0.00062	0.006692	-0.00721	0.004295	0.004655	0.011124	-0.00561	-0.00262
Jul-11	0.008681	0.001139	-0.00324	0.001687	0.004923	-0.00627	0.003479	0.005375	0.009384	-0.00508	-0.00203
Aug-11	0.008536	0.00233	-0.00669	-0.00196	0.00454	-0.00464	0.003845	0.005259	0.009	-0.006	-0.0025
Sep-11	0.004346	-0.00136	-0.01037	-0.00423	0.000564	-0.00621	0.001364	0.004123	0.008961	-0.0079	-0.00556
Oct-11	0.002659	-0.00204	-0.0111	-0.00354	-0.00236	-0.00689	-0.00356	0.000721	0.005139	-0.00791	-0.00364
Nov-11	0.001814	-0.00164	-0.00782	-0.00328	-0.0042	-0.00594	-0.00307	-9.90E-07	0.004947	-0.00678	-0.00212
Dec-11	0.001122	-0.00251	-0.01075	-0.00515	-0.00649	-0.0067	-0.00262	0.000419	0.006784	-0.00668	-0.00164

Table A.13 Expected stock return estimated by regression method from April 2008 to December 2011

Period	μ_r	μ_r	μ_r	μ_r	μ_r	μ_r	μ_r	μ_r	μ_r	μ_r	μ_r
	Bovespa	S&P TSX Composite	Shanghai SE Composite	DAX	BSE Sensex	Topix	Micex	FTSE/JS E Africa All Share	SET	FTSE 100	S&P 500
Apr-08	0.02847	0.019064	-0.09904	-0.02646	-0.03669	0.005085	0.038216	-0.03435	-0.02658	-0.0049	-0.01761
May-08	0.028301	0.054613	-0.06133	-0.02196	-0.00378	0.034319	0.05524	-0.03929	-0.01353	-0.01041	0.004027
Jun-08	-0.01674	0.041646	-0.04699	-0.0558	-0.04537	0.04527	0.086773	0.009272	-0.01786	-0.00982	-0.02196
Jul-08	-0.00466	0.010122	-0.03322	-0.02992	-0.01691	0.044347	0.107924	-0.03427	-0.06822	-0.0457	0.009344
Aug-08	-0.04778	0.008899	0.019084	0.015379	0.025034	0.02078	0.015818	-0.02613	-0.07239	-0.01174	0.021028
Sep-08	-0.14462	-0.02188	0.0283	-0.03434	-0.0358	-0.02346	-0.04828	-0.00947	-0.02663	-0.05495	-0.02467
Oct-08	-0.23953	-0.08366	-0.00133	-0.19126	-0.11837	-0.04546	-0.09073	-0.03723	-0.05407	-0.07892	-0.09758
Nov-08	-0.24287	-0.07348	-0.01258	-0.19068	0.074098	-0.10719	-0.12256	-0.06609	-0.09904	-0.02405	-0.09274
Dec-08	-0.14533	-0.05389	0.162082	-0.07509	0.156623	-0.05704	-0.19081	0.061095	-0.12489	0.085844	-0.01806
Jan-09	-0.06628	-0.05953	0.137608	-0.09144	0.098082	0.0931	-0.09484	0.106689	-0.09683	-0.01881	-0.09469
Feb-09	-0.00876	-0.0704	0.106497	-0.12942	0.021457	-0.02549	-0.03381	0.01838	-0.06964	-0.05727	-0.10243
Mar-09	0.064929	0.019079	0.176407	-0.0142	0.054167	-0.04641	-0.00575	-0.03637	-0.05921	-0.05205	0.053086
Apr-09	0.074772	0.03651	0.121536	0.085595	0.096837	-0.07239	0.16662	0.073811	-0.04076	0.020481	0.103297
May-09	0.091692	0.088212	0.104156	0.077923	0.206325	-0.03651	0.17804	0.063099	-0.01784	0.043339	0.063021
Jun-09	-0.00501	0.033722	0.084732	0.012774	0.107044	0.004127	0.187251	0.168767	0.022706	-0.01723	0.058025
Jul-09	0.00091	0.038455	0.101176	0.021471	0.105626	0.017556	0.022853	0.031215	0.031741	0.014179	0.091025
Aug-09	-0.0181	0.015872	0.105746	0.026001	0.060171	0.031997	0.095703	0.076433	0.034919	0.023528	0.060335
Sep-09	-0.00279	0.036117	-0.01068	0.006525	0.047632	0.021598	0.070666	0.053662	0.038298	0.013916	0.040966
Oct-09	-0.04985	-0.02978	-0.03755	-0.02729	0.012238	0.010304	0.096178	0.03201	0.038676	-0.00783	0.005904
Nov-09	0.001927	0.004287	-0.04095	-0.01983	-0.00815	0.003589	0.050975	0.038342	0.033224	0.005418	0.031573
Dec-09	-0.01814	-0.01777	-0.05809	-0.00956	-0.01653	-0.01909	0.04199	0.021166	0.025809	0.035489	-0.00792
Jan-10	-0.02017	-0.03627	-0.05484	0.009785	-0.04187	0.017232	0.013776	0.025145	0.016183	-0.01506	-0.03291
Feb-10	0.028982	-0.0197	-0.02643	-0.01611	-0.06926	-0.00508	0.024576	0.000173	0.000968	0.05126	-0.00629
Mar-10	0.053171	-0.01461	-0.03536	0.026061	-0.04257	0.001788	-0.03588	0.009603	-0.00937	0.032273	-0.0042
Apr-10	0.012738	-0.01118	-0.0283	-0.00466	-0.04967	0.017982	0.035182	0.040953	0.005252	0.019137	-0.03991
May-10	-0.00635	-0.02885	-0.06857	-0.0165	-0.08699	-0.0001	-0.00034	0.025788	0.001742	-0.01205	-0.08681
Jun-10	-0.0133	-0.04931	-0.07595	-0.04744	-0.06063	-0.02811	-0.03549	0.015574	-0.00404	-0.02989	-0.08623
Jul-10	0.009146	-0.01533	-0.09624	-0.01374	-0.04557	-0.01945	-0.01885	0.021884	-0.01597	-0.00376	-0.0407
Aug-10	-0.02372	-0.01542	-0.0576	-0.02173	-0.06649	0.011013	0.015357	0.041717	-0.02037	0.004102	-0.06991

Sep-10	-0.01912	-0.00414	-0.07402	-0.02288	-0.03057	-0.00925	-0.01839	0.004579	-0.02626	0.01447	-0.01963
Oct-10	-0.02371	0.023075	-0.08829	0.007895	-0.0154	-0.00089	0.001646	0.045265	-0.02034	0.005882	-0.00696
Nov-10	-0.0062	0.021202	-0.03871	-0.02809	-0.01962	-0.01196	0.025844	0.028267	-0.00853	-0.0015	0.003959
Dec-10	-0.00063	0.035486	-0.03453	-0.01352	-0.01693	0.003299	0.022442	0.021366	0.005104	0.014214	0.011047
Jan-11	-0.0303	0.025457	-0.09543	-0.0011	-0.00213	0.005967	0.031541	0.044778	-0.00833	-0.01135	-0.01278
Feb-11	-0.02834	0.022458	-0.09662	0.014268	-0.03312	0.009896	0.009164	0.005112	-0.04169	0.020111	-0.0191
Mar-11	-0.02827	-0.00606	-0.0698	-0.02964	-0.03152	0.016046	-0.00291	0.020191	-0.03358	-0.02123	-0.00843
Apr-11	-0.03928	-0.06527	-0.05186	-0.01775	0.045104	-0.00989	-0.02923	0.002612	-0.01475	-0.01829	-0.01222
May-11	-0.03715	-0.04754	-0.02443	0.001953	-0.07338	-0.03209	-0.05214	-0.00142	-0.02471	-0.03727	-0.02518
Jun-11	-0.03262	-0.07156	-0.04753	-0.0095	-0.06368	-0.01054	-0.06746	-0.0062	-0.02616	-0.02298	-0.03309
Jul-11	-0.06577	-0.02966	-0.04643	-0.01022	-0.05926	-0.00253	-0.05426	-0.01449	-0.0432	-0.02259	-0.04391
Aug-11	-0.08433	-0.02553	-0.00668	-0.09058	-0.10847	-0.01173	-0.03842	-0.019	-0.03165	-0.04433	-0.06933
Sep-11	-0.05365	-0.04172	-0.00703	-0.07219	-0.07582	-0.02496	-0.06786	-0.01019	-0.04696	-0.03042	-0.08514
Oct-11	-0.01883	-0.0058	-0.0398	-0.01023	-0.02741	-0.00775	-0.06479	-0.00805	-0.05463	-0.02901	-0.02643
Nov-11	0.017891	-0.00651	0.009995	-0.0277	-0.03685	-0.01119	0.020313	0.043324	0.025221	-0.03099	-0.02295
Dec-11	0.015418	-0.00521	0.012392	-0.02026	-0.00572	-0.01677	-0.0119	0.024404	0.05944	-0.0233	-0.01674

Table A.14 Expected forward return estimated by moving average method from April 2008 to December 2011

Period	μ_f	μ_f	μ_f	μ_f	μ_f	μ_f	μ_f	μ_f	μ_f	μ_f
	THB/BRL	THB/CAD	THB/CNY	THB/EUR	THB/INR	THB/JPY	THB/RUB	THB/ZAR	THB/USD	THB/GBP
Apr-08	-0.01165	-0.02314	-0.02506	-0.02405	-0.01987	-0.02726	-0.02195	-0.02015	-0.02372	-0.02324
May-08	-0.01097	-0.02264	-0.0253	-0.02381	-0.01975	-0.02736	-0.02198	-0.01868	-0.02384	-0.02308
Jun-08	-0.00986	-0.02267	-0.02548	-0.024	-0.02033	-0.02716	-0.02232	-0.01947	-0.024	-0.02358
Jul-08	-0.00945	-0.02304	-0.02522	-0.02367	-0.02026	-0.02746	-0.02219	-0.02032	-0.02384	-0.02348
Aug-08	-0.01012	-0.02341	-0.02532	-0.02391	-0.02021	-0.02769	-0.02231	-0.02023	-0.02394	-0.02395
Sep-08	-0.01087	-0.02418	-0.02542	-0.02498	-0.02039	-0.02816	-0.02295	-0.02054	-0.02394	-0.02492
Oct-08	-0.01294	-0.02452	-0.02539	-0.0255	-0.02124	-0.02777	-0.02355	-0.0217	-0.02393	-0.02509
Nov-08	-0.01516	-0.02663	-0.02497	-0.02658	-0.02237	-0.02675	-0.02401	-0.02487	-0.02375	-0.02599
Dec-08	-0.01666	-0.02705	-0.02463	-0.02687	-0.02227	-0.02667	-0.02345	-0.02567	-0.02366	-0.02724
Jan-09	-0.01812	-0.02708	-0.02503	-0.02642	-0.02256	-0.02618	-0.02337	-0.02626	-0.02425	-0.02868
Feb-09	-0.01786	-0.0267	-0.02507	-0.02676	-0.02287	-0.02619	-0.02291	-0.02657	-0.0245	-0.02839
Mar-09	-0.01784	-0.02676	-0.0249	-0.02671	-0.02302	-0.02642	-0.02221	-0.02589	-0.02451	-0.0284
Apr-09	-0.01709	-0.02751	-0.02539	-0.02668	-0.02381	-0.02678	-0.02169	-0.02552	-0.02512	-0.02891
May-09	-0.01727	-0.02698	-0.02575	-0.02709	-0.02393	-0.02714	-0.02157	-0.02495	-0.02553	-0.02889
Jun-09	-0.01783	-0.02701	-0.02618	-0.0268	-0.02402	-0.02706	-0.02118	-0.02452	-0.02618	-0.02822
Jul-09	-0.01797	-0.02815	-0.02654	-0.02709	-0.0248	-0.02752	-0.02139	-0.02493	-0.02659	-0.02833
Aug-09	-0.01802	-0.02783	-0.02687	-0.02717	-0.02531	-0.02711	-0.02172	-0.02569	-0.02687	-0.02831
Sep-09	-0.01778	-0.02812	-0.02671	-0.02715	-0.0252	-0.02714	-0.02157	-0.02603	-0.02674	-0.02862
Oct-09	-0.01802	-0.02801	-0.0267	-0.02684	-0.02515	-0.02686	-0.02089	-0.02559	-0.02678	-0.02878
Nov-09	-0.01729	-0.02733	-0.02668	-0.0265	-0.02419	-0.02674	-0.02021	-0.02458	-0.02678	-0.02853
Dec-09	-0.01794	-0.02737	-0.02698	-0.02632	-0.02414	-0.02641	-0.02016	-0.02423	-0.02716	-0.02837
Jan-10	-0.01736	-0.0275	-0.02693	-0.02697	-0.02431	-0.02736	-0.02058	-0.02459	-0.02716	-0.02878
Feb-10	-0.01787	-0.02716	-0.02646	-0.02714	-0.02402	-0.02694	-0.02007	-0.02519	-0.02677	-0.02891
Mar-10	-0.01843	-0.02722	-0.02676	-0.02747	-0.02443	-0.02696	-0.02013	-0.02579	-0.02714	-0.02946
Apr-10	-0.01844	-0.02662	-0.027	-0.02807	-0.02456	-0.02739	-0.02026	-0.02515	-0.02751	-0.02997
May-10	-0.01824	-0.02646	-0.02665	-0.02811	-0.02395	-0.02714	-0.01977	-0.02503	-0.02721	-0.02978
Jun-10	-0.01878	-0.02751	-0.02693	-0.02974	-0.02474	-0.02739	-0.02094	-0.02523	-0.02755	-0.0315
Jul-10	-0.01929	-0.02726	-0.02708	-0.02973	-0.02515	-0.02708	-0.02124	-0.02451	-0.02776	-0.03115
Aug-10	-0.01869	-0.02668	-0.02707	-0.02877	-0.02522	-0.02664	-0.02074	-0.02432	-0.02783	-0.03073
Sep-10	-0.01916	-0.02736	-0.02736	-0.02932	-0.02558	-0.02638	-0.02101	-0.02453	-0.02817	-0.03132
Oct-10	-0.01879	-0.02692	-0.02749	-0.02899	-0.02561	-0.02678	-0.02124	-0.02356	-0.02849	-0.03122

Nov-10	-0.01899	-0.0267	-0.02753	-0.02868	-0.02568	-0.02633	-0.02109	-0.02383	-0.02866	-0.03131
Dec-10	-0.0191	-0.0264	-0.02759	-0.02922	-0.02609	-0.0268	-0.02128	-0.02426	-0.02878	-0.03145
Jan-11	-0.01905	-0.02589	-0.02755	-0.02886	-0.02596	-0.02641	-0.02078	-0.0239	-0.02885	-0.03142
Feb-11	-0.0183	-0.02485	-0.02667	-0.02781	-0.02554	-0.02567	-0.0195	-0.02351	-0.02801	-0.03045
Mar-11	-0.01806	-0.02433	-0.02613	-0.02758	-0.02494	-0.0254	-0.01881	-0.02336	-0.02762	-0.02992
Apr-11	-0.01758	-0.0237	-0.02536	-0.02661	-0.02438	-0.02475	-0.01778	-0.02236	-0.02692	-0.02922
May-11	-0.01573	-0.02224	-0.02384	-0.02509	-0.02355	-0.02323	-0.01622	-0.02118	-0.02552	-0.02764
Jun-11	-0.01535	-0.02133	-0.02251	-0.02417	-0.02262	-0.02155	-0.01505	-0.02061	-0.02412	-0.02649
Jul-11	-0.01396	-0.0202	-0.02114	-0.0227	-0.02113	-0.01977	-0.01352	-0.01898	-0.02275	-0.02547
Aug-11	-0.01236	-0.01829	-0.01923	-0.0213	-0.01922	-0.01773	-0.01166	-0.01727	-0.02085	-0.02369
Sep-11	-0.01063	-0.01766	-0.01761	-0.01988	-0.01809	-0.01665	-0.01093	-0.01668	-0.01951	-0.02221
Oct-11	-0.0113	-0.01706	-0.01613	-0.01955	-0.01749	-0.01529	-0.01072	-0.01671	-0.01799	-0.0213
Nov-11	-0.00922	-0.01552	-0.01454	-0.01765	-0.01632	-0.0135	-0.00853	-0.01538	-0.01652	-0.01967
Dec-11	-0.00825	-0.01426	-0.01288	-0.0168	-0.01541	-0.01239	-0.00728	-0.01391	-0.0149	-0.01842

Table A.15 Expected forward return estimated by regression method from April 2008 to December 2011

Date	μ_f	μ_f	μ_f	μ_f	μ_f	μ_f	μ_f	μ_f	μ_f	μ_f
	THB/BRL	THB/CAD	THB/CNY	THB/EUR	THB/INR	THB/JPY	THB/RUB	THB/ZAR	THB/USD	THB/GBP
Apr-08	-0.04441	-0.02526	-0.02059	-0.03861	-0.01983	-0.02632	-0.03636	-0.04631	0.043357	-0.02465
May-08	-0.03681	-0.01557	-0.02103	-0.04133	-0.01952	-0.02631	-0.03326	-0.04355	0.047549	-0.02367
Jun-08	-0.03396	-0.01546	-0.02147	-0.0413	-0.01992	-0.02619	-0.03231	-0.0436	0.039825	-0.02439
Jul-08	-0.02818	-0.01581	-0.02115	-0.03984	-0.01974	-0.02693	-0.02887	-0.04809	0.035655	-0.02453
Aug-08	-0.02413	-0.01019	-0.02247	-0.02467	-0.02046	-0.02758	-0.02819	-0.04193	0.038077	-0.02389
Sep-08	-0.0256	-0.00454	-0.0237	-0.01589	-0.02108	-0.02824	-0.03036	-0.04023	0.039839	-0.02325
Oct-08	-0.02238	-0.00467	-0.02369	-0.00582	-0.02165	-0.02796	-0.03029	-0.04156	0.032624	-0.02356
Nov-08	-0.02417	0.010894	-0.02321	-0.00819	-0.02253	-0.02649	-0.02999	-0.0496	0.053965	-0.01986
Dec-08	-0.02502	0.009068	-0.02694	-0.00841	-0.02232	-0.02644	-0.01941	-0.04942	0.039248	-0.00573
Jan-09	-0.01897	3.28E-06	-0.0243	-0.01451	-0.02359	-0.02941	0.000937	-0.05217	0.023955	-0.00898
Feb-09	-0.0198	-0.00623	-0.02176	-0.02329	-0.02611	-0.03309	0.011215	-0.05834	0.006511	-0.0107
Mar-09	-0.01545	-0.01883	-0.01978	-0.02338	-0.02796	-0.03622	0.020519	-0.04792	-0.0023	-0.00902
Apr-09	-0.02504	-0.00615	-0.02148	-0.02348	-0.03212	-0.03688	0.022929	-0.03942	-0.00374	-0.00253
May-09	-0.02901	-0.00545	-0.02195	-0.02812	-0.03176	-0.03786	0.019553	-0.03736	-0.00831	-0.00291
Jun-09	-0.02731	-0.00535	-0.02347	-0.02792	-0.02972	-0.03557	0.014769	-0.02714	-0.0094	-0.00105
Jul-09	-0.03324	-0.00705	-0.0245	-0.02831	-0.03251	-0.0362	0.007975	-0.02731	-0.00993	0.00044
Aug-09	-0.03531	-0.00654	-0.02497	-0.02839	-0.03291	-0.03227	0.001305	-0.02784	-0.01023	0.000214
Sep-09	-0.03381	-0.00736	-0.02409	-0.02827	-0.03098	-0.03063	-0.0009	-0.02603	-0.01042	0.000217
Oct-09	-0.03125	-0.00751	-0.02371	-0.02787	-0.02902	-0.02835	-0.00832	-0.02547	-0.01074	-0.00016
Nov-09	-0.03023	-0.00689	-0.02295	-0.02735	-0.02401	-0.0274	-0.01341	-0.0243	-0.01098	-0.00018
Dec-09	-0.02748	-0.00712	-0.02244	-0.02691	-0.02215	-0.02513	-0.01961	-0.0238	-0.01166	-0.00072
Jan-10	-0.02867	-0.00754	-0.02167	-0.0273	-0.02114	-0.0267	-0.02291	-0.02404	-0.01194	-0.00207
Feb-10	-0.02926	-0.00732	-0.02121	-0.02714	-0.0197	-0.02469	-0.02226	-0.02453	-0.01207	-0.00305
Mar-10	-0.02549	-0.00758	-0.02038	-0.02714	-0.01883	-0.02308	-0.02552	-0.02509	-0.01264	-0.00477
Apr-10	-0.02435	-0.0069	-0.02043	-0.02742	-0.01806	-0.02411	-0.02874	-0.02312	-0.01342	-0.00638
May-10	-0.01979	-0.00688	-0.01972	-0.02703	-0.01674	-0.02312	-0.02801	-0.02295	-0.01352	-0.00643
Jun-10	-0.02025	-0.00863	-0.01862	-0.02835	-0.01717	-0.01994	-0.03576	-0.02289	-0.01407	-0.00976
Jul-10	-0.01899	-0.01631	-0.01758	-0.02794	-0.0161	-0.01902	-0.03572	-0.02149	-0.01453	-0.00938
Aug-10	-0.01815	-0.01563	-0.0188	-0.02265	-0.017	-0.01916	-0.03814	-0.02066	-0.00998	-0.00422
Sep-10	-0.01909	-0.00872	-0.02119	-0.01914	-0.01837	-0.02034	-0.04162	-0.02042	-0.00586	-0.00144
Oct-10	-0.01867	-0.01607	-0.0209	-0.01829	-0.0173	-0.02031	-0.04163	-0.01629	-0.00679	-0.00206

Nov-10	-0.01896	-0.0158	-0.02073	-0.01735	-0.0165	-0.01955	-0.04096	-0.01729	-0.00759	-0.00305
Dec-10	-0.01906	-0.01545	-0.02029	-0.01825	-0.01607	-0.0196	-0.04134	-0.01771	-0.00806	-0.00397
Jan-11	-0.01896	-0.00693	-0.01539	-0.01337	-0.01842	-0.02206	-0.04342	-0.0157	-0.00324	-0.00043
Feb-11	-0.01806	0.002321	-0.0202	-0.01073	-0.022	-0.02518	-0.04318	-0.01364	0.002348	0.004777
Mar-11	-0.01775	0.002329	-0.02005	-0.01074	-0.02191	-0.02561	-0.03846	-0.01316	0.001759	0.004106
Apr-11	-0.01704	0.009805	-0.02796	-0.00501	-0.02639	-0.02941	-0.03853	-0.00889	0.006577	0.006902
May-11	-0.01521	0.017793	-0.03572	-0.00321	-0.03091	-0.03088	-0.03678	-0.00401	0.010588	0.011193
Jun-11	-0.01493	0.015686	-0.03522	-0.00441	-0.03042	-0.02796	-0.03162	-0.00434	0.010366	0.009173
Jul-11	-0.01322	0.021134	-0.04127	-0.00025	-0.03297	-0.027	-0.0303	0.000333	0.015486	0.01096
Aug-11	-0.01189	0.022958	-0.04261	-0.00068	-0.03331	-0.02368	-0.02826	0.001606	0.015187	0.010485
Sep-11	-0.01056	0.023608	-0.04212	0.003239	-0.03436	-0.0219	-0.02873	-0.00161	0.018432	0.010839
Oct-11	-0.01123	0.020899	-0.03489	-0.00022	-0.03276	-0.01796	-0.02858	-0.00679	0.018056	0.007218
Nov-11	-0.00814	0.018645	-0.02815	-0.00229	-0.02986	-0.01367	-0.02328	-0.00568	0.013397	0.004919
Dec-11	-0.00714	0.006573	-0.01957	-0.00855	-0.02516	-0.01113	-0.01946	-0.00781	0.00646	-0.00073

Table A.16 Estimated Σ_r of group 1 (where country 1 is Thailand, 2 is US, 3 is UK, 4 is Canada, 5 is Germany, and 6 is Japan) and group 2 (where country 1 is Thailand, 2 is Brazil, 3 is Russia, 4 is India, 5 is China, and 6 is South Africa) from April 2008 to December 2011

Period	Group 1						Group 2					
Apr-08	0.000663	0.000069	0.000152	0.000194	0.000175	0.000184	0.000663	0.000449	0.000249	0.000263	0.000076	0.000341
	0.000069	0.000347	0.000249	0.000254	0.000278	0.000208	0.000449	0.001458	0.000705	0.000575	0.000126	0.000722
	0.000152	0.000249	0.000322	0.000269	0.000306	0.000200	0.000249	0.000705	0.001616	0.000438	0.000149	0.000620
	0.000194	0.000254	0.000269	0.000454	0.000274	0.000225	0.000263	0.000575	0.000438	0.001006	0.000168	0.000457
	0.000175	0.000278	0.000306	0.000274	0.000462	0.000227	0.000076	0.000126	0.000149	0.000168	0.001359	0.000155
	0.000184	0.000208	0.000200	0.000225	0.000227	0.000535	0.000341	0.000722	0.000620	0.000457	0.000155	0.000873
May-08	0.000640	0.000068	0.000149	0.000186	0.000173	0.000183	0.000640	0.000431	0.000233	0.000254	0.000042	0.000324
	0.000068	0.000365	0.000263	0.000263	0.000292	0.000217	0.000431	0.001428	0.000660	0.000538	0.000077	0.000699
	0.000149	0.000263	0.000335	0.000278	0.000318	0.000208	0.000233	0.000660	0.001560	0.000424	0.000094	0.000589
	0.000186	0.000263	0.000278	0.000450	0.000280	0.000224	0.000254	0.000538	0.000424	0.001026	0.000179	0.000444
	0.000173	0.000292	0.000318	0.000280	0.000472	0.000234	0.000042	0.000077	0.000094	0.000179	0.001525	0.000137
	0.000183	0.000217	0.000208	0.000224	0.000234	0.000536	0.000324	0.000699	0.000589	0.000444	0.000137	0.000866
Jun-08	0.000636	0.000066	0.000146	0.000186	0.000160	0.000162	0.000636	0.000411	0.000249	0.000240	0.000047	0.000314
	0.000066	0.000380	0.000274	0.000272	0.000305	0.000236	0.000411	0.001395	0.000712	0.000543	0.000099	0.000691
	0.000146	0.000274	0.000340	0.000282	0.000323	0.000215	0.000249	0.000712	0.001552	0.000405	0.000090	0.000605
	0.000186	0.000272	0.000282	0.000461	0.000284	0.000230	0.000240	0.000543	0.000405	0.001005	0.000199	0.000428
	0.000160	0.000305	0.000323	0.000284	0.000475	0.000233	0.000047	0.000099	0.000090	0.000199	0.001538	0.000140
	0.000162	0.000236	0.000215	0.000230	0.000233	0.000523	0.000314	0.000691	0.000605	0.000428	0.000140	0.000845
Jul-08	0.000638	0.000067	0.000154	0.000189	0.000167	0.000168	0.000638	0.000419	0.000250	0.000255	0.000075	0.000319
	0.000067	0.000387	0.000277	0.000272	0.000312	0.000234	0.000419	0.001405	0.000712	0.000560	0.000130	0.000700
	0.000154	0.000277	0.000344	0.000283	0.000328	0.000218	0.000250	0.000712	0.001538	0.000423	0.000108	0.000608
	0.000189	0.000272	0.000283	0.000464	0.000284	0.000236	0.000255	0.000560	0.000423	0.001032	0.000218	0.000439
	0.000167	0.000312	0.000328	0.000284	0.000483	0.000232	0.000075	0.000130	0.000108	0.000218	0.001607	0.000169
	0.000168	0.000234	0.000218	0.000236	0.000232	0.000526	0.000319	0.000700	0.000608	0.000439	0.000169	0.000852
Aug-08	0.000686	0.000068	0.000148	0.000198	0.000155	0.000190	0.000686	0.000451	0.000258	0.000271	0.000094	0.000329
	0.000068	0.000386	0.000281	0.000276	0.000315	0.000232	0.000451	0.001410	0.000755	0.000558	0.000125	0.000734
	0.000148	0.000281	0.000351	0.000290	0.000338	0.000219	0.000258	0.000755	0.001561	0.000422	0.000092	0.000637

	0.000198	0.000276	0.000290	0.000474	0.000288	0.000239	0.000271	0.000558	0.000422	0.001052	0.000230	0.000448
	0.000155	0.000315	0.000338	0.000288	0.000492	0.000229	0.000094	0.000125	0.000092	0.000230	0.001643	0.000177
	0.000190	0.000232	0.000219	0.000239	0.000229	0.000524	0.000329	0.000734	0.000637	0.000448	0.000177	0.000876
Sep-08	0.000672	0.000060	0.000138	0.000177	0.000140	0.000179	0.000672	0.000421	0.000259	0.000270	0.000087	0.000327
	0.000060	0.000379	0.000276	0.000261	0.000303	0.000218	0.000421	0.001387	0.000748	0.000565	0.000160	0.000746
	0.000138	0.000276	0.000354	0.000293	0.000341	0.000218	0.000259	0.000748	0.001623	0.000405	0.000125	0.000617
	0.000177	0.000261	0.000293	0.000487	0.000285	0.000241	0.000270	0.000565	0.000405	0.001069	0.000225	0.000454
	0.000140	0.000303	0.000341	0.000285	0.000495	0.000228	0.000087	0.000160	0.000125	0.000225	0.001677	0.000184
	0.000179	0.000218	0.000218	0.000241	0.000228	0.000527	0.000327	0.000746	0.000617	0.000454	0.000184	0.000878
Oct-08	0.000685	0.000068	0.000166	0.000198	0.000151	0.000198	0.000685	0.000447	0.000286	0.000271	0.000088	0.000359
	0.000068	0.000390	0.000294	0.000280	0.000310	0.000226	0.000447	0.001449	0.000827	0.000606	0.000159	0.000801
	0.000166	0.000294	0.000401	0.000332	0.000365	0.000243	0.000286	0.000827	0.001716	0.000442	0.000180	0.000666
	0.000198	0.000280	0.000332	0.000526	0.000307	0.000262	0.000271	0.000606	0.000442	0.001107	0.000199	0.000479
	0.000151	0.000310	0.000365	0.000307	0.000506	0.000241	0.000088	0.000159	0.000180	0.000199	0.001713	0.000183
	0.000198	0.000226	0.000243	0.000262	0.000241	0.000537	0.000359	0.000801	0.000666	0.000479	0.000183	0.000934
Nov-08	0.000980	0.000296	0.000444	0.000472	0.000463	0.000405	0.000980	0.000845	0.000527	0.000496	0.000222	0.000564
	0.000296	0.000650	0.000576	0.000537	0.000654	0.000477	0.000845	0.002343	0.001801	0.001117	0.000293	0.001392
	0.000444	0.000576	0.000729	0.000618	0.000752	0.000511	0.000527	0.001801	0.003060	0.001072	0.000247	0.001448
	0.000472	0.000537	0.000618	0.000817	0.000645	0.000500	0.000496	0.001117	0.001072	0.001465	0.000311	0.000886
	0.000463	0.000654	0.000752	0.000645	0.000977	0.000570	0.000222	0.000293	0.000247	0.000311	0.001787	0.000276
	0.000405	0.000477	0.000511	0.000500	0.000570	0.000775	0.000564	0.001392	0.001448	0.000886	0.000276	0.001413
Dec-08	0.001091	0.000333	0.000517	0.000572	0.000534	0.000424	0.001091	0.000936	0.000653	0.000589	0.000182	0.000623
	0.000333	0.000773	0.000738	0.000688	0.000807	0.000528	0.000936	0.002657	0.002144	0.001212	0.000222	0.001655
	0.000517	0.000738	0.000951	0.000832	0.000963	0.000578	0.000653	0.002144	0.003460	0.001194	0.000077	0.001745
	0.000572	0.000688	0.000832	0.001032	0.000850	0.000567	0.000589	0.001212	0.001194	0.001536	0.000276	0.000952
	0.000534	0.000807	0.000963	0.000850	0.001179	0.000635	0.000182	0.000222	0.000077	0.000276	0.001882	0.000204
	0.000424	0.000528	0.000578	0.000567	0.000635	0.000791	0.000623	0.001655	0.001745	0.000952	0.000204	0.001661
Jan-09	0.001135	0.000335	0.000546	0.000608	0.000590	0.000450	0.001135	0.000979	0.000698	0.000630	0.000170	0.000670
	0.000335	0.000780	0.000751	0.000705	0.000816	0.000531	0.000979	0.002744	0.002231	0.001277	0.000209	0.001735
	0.000546	0.000751	0.000998	0.000899	0.001014	0.000601	0.000698	0.002231	0.003483	0.001263	0.000036	0.001833
	0.000608	0.000705	0.000899	0.001130	0.000921	0.000598	0.000630	0.001277	0.001263	0.001610	0.000309	0.000993
	0.000590	0.000816	0.001014	0.000921	0.001254	0.000674	0.000170	0.000209	0.000036	0.000309	0.001955	0.000152
	0.000450	0.000531	0.000601	0.000598	0.000674	0.000808	0.000670	0.001735	0.001833	0.000993	0.000152	0.001760

Feb-09	0.001134	0.000345	0.000566	0.000629	0.000615	0.000454	0.001134	0.001019	0.000718	0.000636	0.000172	0.000706
	0.000345	0.000815	0.000789	0.000748	0.000873	0.000540	0.001019	0.002802	0.002278	0.001297	0.000195	0.001800
	0.000566	0.000789	0.001063	0.000967	0.001092	0.000627	0.000718	0.002278	0.003590	0.001315	0.000019	0.001920
	0.000629	0.000748	0.000967	0.001207	0.000997	0.000619	0.000636	0.001297	0.001315	0.001662	0.000282	0.001037
	0.000615	0.000873	0.001092	0.000997	0.001369	0.000707	0.000172	0.000195	0.000019	0.000282	0.001956	0.000130
	0.000454	0.000540	0.000627	0.000619	0.000707	0.000822	0.000706	0.001800	0.001920	0.001037	0.000130	0.001847
Mar-09	0.001133	0.000352	0.000575	0.000635	0.000626	0.000456	0.001133	0.001021	0.000727	0.000645	0.000180	0.000715
	0.000352	0.000858	0.000829	0.000784	0.000928	0.000558	0.001021	0.002829	0.002293	0.001327	0.000228	0.001855
	0.000575	0.000829	0.001111	0.001011	0.001147	0.000643	0.000727	0.002293	0.003774	0.001399	0.000038	0.001937
	0.000635	0.000784	0.001011	0.001257	0.001049	0.000642	0.000645	0.001327	0.001399	0.001705	0.000303	0.001074
	0.000626	0.000928	0.001147	0.001049	0.001440	0.000731	0.000180	0.000228	0.000038	0.000303	0.002032	0.000166
	0.000456	0.000558	0.000643	0.000642	0.000731	0.000837	0.000715	0.001855	0.001937	0.001074	0.000166	0.001881
Apr-09	0.001133	0.000372	0.000593	0.000657	0.000647	0.000477	0.001133	0.001026	0.000743	0.000672	0.000174	0.000724
	0.000372	0.000939	0.000882	0.000863	0.000998	0.000593	0.001026	0.002845	0.002341	0.001364	0.000216	0.001887
	0.000593	0.000882	0.001162	0.001072	0.001199	0.000684	0.000743	0.002341	0.003855	0.001432	0.000051	0.002009
	0.000657	0.000863	0.001072	0.001337	0.001123	0.000685	0.000672	0.001364	0.001432	0.001794	0.000290	0.001097
	0.000647	0.000998	0.001199	0.001123	0.001511	0.000773	0.000174	0.000216	0.000051	0.000290	0.002060	0.000169
	0.000477	0.000593	0.000684	0.000685	0.000773	0.000885	0.000724	0.001887	0.002009	0.001097	0.000169	0.001935
May-09	0.001139	0.000383	0.000604	0.000668	0.000653	0.000486	0.001139	0.001043	0.000756	0.000683	0.000168	0.000733
	0.000383	0.000942	0.000889	0.000865	0.001005	0.000590	0.001043	0.002859	0.002366	0.001381	0.000215	0.001899
	0.000604	0.000889	0.001173	0.001081	0.001210	0.000685	0.000756	0.002366	0.003895	0.001454	0.000046	0.002016
	0.000668	0.000865	0.001081	0.001338	0.001130	0.000682	0.000683	0.001381	0.001454	0.001806	0.000288	0.001106
	0.000653	0.001005	0.001210	0.001130	0.001521	0.000774	0.000168	0.000215	0.000046	0.000288	0.002046	0.000161
	0.000486	0.000590	0.000685	0.000682	0.000774	0.000881	0.000733	0.001899	0.002016	0.001106	0.000161	0.001943
Jun-09	0.001160	0.000400	0.000628	0.000706	0.000668	0.000494	0.001160	0.001077	0.000812	0.000727	0.000175	0.000758
	0.000400	0.000968	0.000917	0.000910	0.001020	0.000602	0.001077	0.002899	0.002448	0.001432	0.000235	0.001945
	0.000628	0.000917	0.001205	0.001132	0.001229	0.000698	0.000812	0.002448	0.004009	0.001547	0.000066	0.002088
	0.000706	0.000910	0.001132	0.001418	0.001161	0.000703	0.000727	0.001432	0.001547	0.001958	0.000287	0.001151
	0.000668	0.001020	0.001229	0.001161	0.001535	0.000779	0.000175	0.000235	0.000066	0.000287	0.002042	0.000176
	0.000494	0.000602	0.000698	0.000703	0.000779	0.000883	0.000758	0.001945	0.002088	0.001151	0.000176	0.001983
Jul-09	0.001215	0.000413	0.000635	0.000725	0.000691	0.000502	0.001215	0.001094	0.000843	0.000753	0.000174	0.000772
	0.000413	0.000968	0.000918	0.000914	0.001027	0.000602	0.001094	0.002846	0.002468	0.001446	0.000276	0.001947

	0.000635	0.000918	0.001205	0.001133	0.001235	0.000694	0.000843	0.002468	0.004086	0.001577	0.000048	0.002105
	0.000725	0.000914	0.001133	0.001424	0.001177	0.000701	0.000753	0.001446	0.001577	0.001971	0.000277	0.001162
	0.000691	0.001027	0.001235	0.001177	0.001553	0.000781	0.000174	0.000276	0.000048	0.000277	0.002013	0.000175
	0.000502	0.000602	0.000694	0.000701	0.000781	0.000885	0.000772	0.001947	0.002105	0.001162	0.000175	0.001988
Aug-09	0.001217	0.000448	0.000663	0.000775	0.000726	0.000513	0.001217	0.001119	0.000914	0.000794	0.000161	0.000791
	0.000448	0.000999	0.000954	0.000957	0.001071	0.000618	0.001119	0.002877	0.002560	0.001509	0.000295	0.001974
	0.000663	0.000954	0.001247	0.001189	0.001286	0.000713	0.000914	0.002560	0.004226	0.001698	0.000090	0.002165
	0.000775	0.000957	0.001189	0.001489	0.001242	0.000730	0.000794	0.001509	0.001698	0.002069	0.000295	0.001204
	0.000726	0.001071	0.001286	0.001242	0.001608	0.000803	0.000161	0.000295	0.000090	0.000295	0.002014	0.000196
	0.000513	0.000618	0.000713	0.000730	0.000803	0.000898	0.000791	0.001974	0.002165	0.001204	0.000196	0.002004
Sep-09	0.001222	0.000452	0.000669	0.000778	0.000732	0.000518	0.001222	0.001123	0.000914	0.000798	0.000144	0.000796
	0.000452	0.001003	0.000963	0.000959	0.001077	0.000619	0.001123	0.002878	0.002585	0.001499	0.000274	0.001967
	0.000669	0.000963	0.001259	0.001192	0.001296	0.000711	0.000914	0.002585	0.004233	0.001687	0.000093	0.002189
	0.000778	0.000959	0.001192	0.001492	0.001247	0.000731	0.000798	0.001499	0.001687	0.002080	0.000296	0.001205
	0.000732	0.001077	0.001296	0.001247	0.001615	0.000799	0.000144	0.000274	0.000093	0.000296	0.002053	0.000186
	0.000518	0.000619	0.000711	0.000731	0.000799	0.000888	0.000796	0.001967	0.002189	0.001205	0.000186	0.002004
Oct-09	0.001242	0.000460	0.000682	0.000787	0.000749	0.000524	0.001242	0.001126	0.000934	0.000813	0.000158	0.000812
	0.000460	0.001013	0.000978	0.000971	0.001088	0.000626	0.001126	0.002864	0.002597	0.001510	0.000295	0.001978
	0.000682	0.000978	0.001282	0.001209	0.001316	0.000724	0.000934	0.002597	0.004278	0.001713	0.000124	0.002223
	0.000787	0.000971	0.001209	0.001503	0.001262	0.000738	0.000813	0.001510	0.001713	0.002079	0.000296	0.001206
	0.000749	0.001088	0.001316	0.001262	0.001628	0.000811	0.000158	0.000295	0.000124	0.000296	0.002071	0.000200
	0.000524	0.000626	0.000724	0.000738	0.000811	0.000890	0.000812	0.001978	0.002223	0.001206	0.000200	0.002017
Nov-09	0.001249	0.000464	0.000679	0.000790	0.000754	0.000524	0.001249	0.001122	0.000946	0.000800	0.000159	0.000803
	0.000464	0.001021	0.000984	0.000988	0.001105	0.000627	0.001122	0.002878	0.002620	0.001524	0.000307	0.001978
	0.000679	0.000984	0.001293	0.001219	0.001332	0.000726	0.000946	0.002620	0.004349	0.001707	0.000177	0.002236
	0.000790	0.000988	0.001219	0.001531	0.001289	0.000743	0.000800	0.001524	0.001707	0.002083	0.000279	0.001205
	0.000754	0.001105	0.001332	0.001289	0.001651	0.000818	0.000159	0.000307	0.000177	0.000279	0.002071	0.000230
	0.000524	0.000627	0.000726	0.000743	0.000818	0.000887	0.000803	0.001978	0.002236	0.001205	0.000230	0.002013
Dec-09	0.001243	0.000467	0.000676	0.000789	0.000751	0.000520	0.001243	0.001117	0.000944	0.000804	0.000169	0.000799
	0.000467	0.001023	0.000989	0.000988	0.001106	0.000621	0.001117	0.002865	0.002602	0.001512	0.000312	0.001966
	0.000676	0.000989	0.001298	0.001220	0.001336	0.000718	0.000944	0.002602	0.004340	0.001708	0.000182	0.002238
	0.000789	0.000988	0.001220	0.001526	0.001287	0.000733	0.000804	0.001512	0.001708	0.002078	0.000290	0.001207
	0.000751	0.001106	0.001336	0.001287	0.001655	0.000812	0.000169	0.000312	0.000182	0.000290	0.002106	0.000221

	0.000520	0.000621	0.000718	0.000733	0.000812	0.000881	0.000799	0.001966	0.002238	0.001207	0.000221	0.002027
Jan-10	0.001231	0.000473	0.000678	0.000789	0.000759	0.000534	0.001231	0.001118	0.000953	0.000808	0.000169	0.000789
	0.000473	0.001026	0.000992	0.000992	0.001108	0.000629	0.001118	0.002864	0.002587	0.001526	0.000332	0.001970
	0.000678	0.000992	0.001304	0.001226	0.001340	0.000725	0.000953	0.002587	0.004361	0.001708	0.000198	0.002255
	0.000789	0.000992	0.001226	0.001530	0.001291	0.000738	0.000808	0.001526	0.001708	0.002089	0.000306	0.001208
	0.000759	0.001108	0.001340	0.001291	0.001658	0.000819	0.000169	0.000332	0.000198	0.000306	0.002142	0.000233
	0.000534	0.000629	0.000725	0.000738	0.000819	0.000908	0.000789	0.001970	0.002255	0.001208	0.000233	0.002025
Feb-10	0.001231	0.000477	0.000680	0.000795	0.000761	0.000534	0.001231	0.001121	0.000962	0.000819	0.000209	0.000794
	0.000477	0.001031	0.000996	0.001000	0.001111	0.000627	0.001121	0.002881	0.002581	0.001541	0.000384	0.001985
	0.000680	0.000996	0.001309	0.001233	0.001342	0.000725	0.000962	0.002581	0.004333	0.001726	0.000214	0.002241
	0.000795	0.001000	0.001233	0.001542	0.001297	0.000741	0.000819	0.001541	0.001726	0.002096	0.000328	0.001222
	0.000761	0.001111	0.001342	0.001297	0.001654	0.000808	0.000209	0.000384	0.000214	0.000328	0.002082	0.000261
	0.000534	0.000627	0.000725	0.000741	0.000808	0.000910	0.000794	0.001985	0.002241	0.001222	0.000261	0.002035
Mar-10	0.001233	0.000477	0.000679	0.000794	0.000759	0.000534	0.001233	0.001123	0.000957	0.000824	0.000212	0.000790
	0.000477	0.001034	0.001003	0.001008	0.001116	0.000627	0.001123	0.002899	0.002574	0.001558	0.000400	0.002000
	0.000679	0.001003	0.001324	0.001239	0.001357	0.000722	0.000957	0.002574	0.004312	0.001719	0.000209	0.002251
	0.000794	0.001008	0.001239	0.001549	0.001303	0.000735	0.000824	0.001558	0.001719	0.002091	0.000322	0.001225
	0.000759	0.001116	0.001357	0.001303	0.001670	0.000805	0.000212	0.000400	0.000209	0.000322	0.002075	0.000261
	0.000534	0.000627	0.000722	0.000735	0.000805	0.000900	0.000790	0.002000	0.002251	0.001225	0.000261	0.002046
Apr-10	0.001245	0.000478	0.000683	0.000792	0.000768	0.000543	0.001245	0.001105	0.000944	0.000832	0.000210	0.000789
	0.000478	0.001039	0.001007	0.001016	0.001124	0.000633	0.001105	0.002886	0.002558	0.001573	0.000387	0.001996
	0.000683	0.001007	0.001329	0.001248	0.001364	0.000726	0.000944	0.002558	0.004303	0.001740	0.000186	0.002245
	0.000792	0.001016	0.001248	0.001558	0.001319	0.000744	0.000832	0.001573	0.001740	0.002099	0.000325	0.001246
	0.000768	0.001124	0.001364	0.001319	0.001678	0.000809	0.000210	0.000387	0.000186	0.000325	0.002077	0.000238
	0.000543	0.000633	0.000726	0.000744	0.000809	0.000902	0.000789	0.001996	0.002245	0.001246	0.000238	0.002041
May-10	0.001254	0.000477	0.000673	0.000791	0.000761	0.000527	0.001254	0.001096	0.000925	0.000818	0.000200	0.000780
	0.000477	0.001037	0.001004	0.001013	0.001118	0.000626	0.001096	0.002865	0.002546	0.001549	0.000389	0.001983
	0.000673	0.001004	0.001325	0.001242	0.001357	0.000720	0.000925	0.002546	0.004281	0.001729	0.000193	0.002235
	0.000791	0.001013	0.001242	0.001552	0.001313	0.000738	0.000818	0.001549	0.001729	0.002061	0.000320	0.001232
	0.000761	0.001118	0.001357	0.001313	0.001666	0.000800	0.000200	0.000389	0.000193	0.000320	0.002087	0.000241
	0.000527	0.000626	0.000720	0.000738	0.000800	0.000891	0.000780	0.001983	0.002235	0.001232	0.000241	0.002031
Jun-10	0.001241	0.000478	0.000665	0.000787	0.000755	0.000517	0.001241	0.001068	0.000903	0.000788	0.000187	0.000750

	0.000478	0.001062	0.001039	0.001041	0.001153	0.000650	0.001068	0.002878	0.002559	0.001535	0.000477	0.001996
	0.000665	0.001039	0.001374	0.001276	0.001404	0.000752	0.000903	0.002559	0.004257	0.001705	0.000320	0.002240
	0.000787	0.001041	0.001276	0.001579	0.001348	0.000765	0.000788	0.001535	0.001705	0.002023	0.000379	0.001213
	0.000755	0.001153	0.001404	0.001348	0.001714	0.000832	0.000187	0.000477	0.000320	0.000379	0.002044	0.000322
	0.000517	0.000650	0.000752	0.000765	0.000832	0.000907	0.000750	0.001996	0.002240	0.001213	0.000322	0.002043
Jul-10	0.001230	0.000467	0.000663	0.000774	0.000746	0.000497	0.001230	0.001043	0.000858	0.000783	0.000145	0.000723
	0.000467	0.001075	0.001050	0.001046	0.001163	0.000643	0.001043	0.002846	0.002496	0.001514	0.000441	0.001976
	0.000663	0.001050	0.001383	0.001284	0.001410	0.000751	0.000858	0.002496	0.004154	0.001682	0.000245	0.002199
	0.000774	0.001046	0.001284	0.001579	0.001353	0.000755	0.000783	0.001514	0.001682	0.002003	0.000351	0.001199
	0.000746	0.001163	0.001410	0.001353	0.001717	0.000826	0.000145	0.000441	0.000245	0.000351	0.002020	0.000284
	0.000497	0.000643	0.000751	0.000755	0.000826	0.000890	0.000723	0.001976	0.002199	0.001199	0.000284	0.002026
Aug-10	0.001216	0.000463	0.000660	0.000772	0.000738	0.000494	0.001216	0.001039	0.000848	0.000789	0.000139	0.000719
	0.000463	0.001095	0.001067	0.001060	0.001173	0.000652	0.001039	0.002865	0.002501	0.001502	0.000483	0.001985
	0.000660	0.001067	0.001396	0.001292	0.001415	0.000755	0.000848	0.002501	0.004134	0.001670	0.000263	0.002193
	0.000772	0.001060	0.001292	0.001589	0.001357	0.000756	0.000789	0.001502	0.001670	0.001962	0.000363	0.001184
	0.000738	0.001173	0.001415	0.001357	0.001711	0.000823	0.000139	0.000483	0.000263	0.000363	0.002034	0.000304
	0.000494	0.000652	0.000755	0.000756	0.000823	0.000888	0.000719	0.001985	0.002193	0.001184	0.000304	0.002023
Sep-10	0.001220	0.000466	0.000660	0.000779	0.000737	0.000496	0.001220	0.001036	0.000850	0.000791	0.000149	0.000714
	0.000466	0.001102	0.001075	0.001069	0.001183	0.000657	0.001036	0.002861	0.002524	0.001513	0.000503	0.001989
	0.000660	0.001075	0.001408	0.001299	0.001430	0.000764	0.000850	0.002524	0.004113	0.001674	0.000278	0.002206
	0.000779	0.001069	0.001299	0.001596	0.001365	0.000763	0.000791	0.001513	0.001674	0.001965	0.000373	0.001190
	0.000737	0.001183	0.001430	0.001365	0.001728	0.000831	0.000149	0.000503	0.000278	0.000373	0.002015	0.000321
	0.000496	0.000657	0.000764	0.000763	0.000831	0.000891	0.000714	0.001989	0.002206	0.001190	0.000321	0.002032
Oct-10	0.001230	0.000473	0.000669	0.000783	0.000747	0.000494	0.001230	0.001036	0.000853	0.000801	0.000149	0.000727
	0.000473	0.001109	0.001084	0.001075	0.001192	0.000658	0.001036	0.002847	0.002515	0.001522	0.000506	0.001998
	0.000669	0.001084	0.001416	0.001300	0.001441	0.000760	0.000853	0.002515	0.004105	0.001684	0.000283	0.002220
	0.000783	0.001075	0.001300	0.001594	0.001371	0.000759	0.000801	0.001522	0.001684	0.001984	0.000366	0.001204
	0.000747	0.001192	0.001441	0.001371	0.001741	0.000829	0.000149	0.000506	0.000283	0.000366	0.002023	0.000328
	0.000494	0.000658	0.000760	0.000759	0.000829	0.000888	0.000727	0.001998	0.002220	0.001204	0.000328	0.002037
Nov-10	0.001230	0.000468	0.000666	0.000781	0.000746	0.000490	0.001230	0.001032	0.000847	0.000798	0.000160	0.000724
	0.000468	0.001104	0.001078	0.001069	0.001187	0.000655	0.001032	0.002830	0.002499	0.001514	0.000508	0.001995
	0.000666	0.001078	0.001409	0.001294	0.001435	0.000758	0.000847	0.002499	0.004079	0.001671	0.000284	0.002207
	0.000781	0.001069	0.001294	0.001586	0.001365	0.000756	0.000798	0.001514	0.001671	0.001976	0.000358	0.001197

	0.000746	0.001187	0.001435	0.001365	0.001740	0.000825	0.000160	0.000508	0.000284	0.000358	0.002046	0.000335
	0.000490	0.000655	0.000758	0.000756	0.000825	0.000883	0.000724	0.001995	0.002207	0.001197	0.000335	0.002019
Dec-10	0.001247	0.000480	0.000681	0.000790	0.000756	0.000497	0.001247	0.001048	0.000846	0.000821	0.000183	0.000736
	0.000480	0.001109	0.001087	0.001075	0.001192	0.000661	0.001048	0.002849	0.002497	0.001534	0.000523	0.001997
	0.000681	0.001087	0.001423	0.001301	0.001443	0.000765	0.000846	0.002497	0.004072	0.001667	0.000280	0.002199
	0.000790	0.001075	0.001301	0.001588	0.001370	0.000762	0.000821	0.001534	0.001667	0.002005	0.000379	0.001203
	0.000756	0.001192	0.001443	0.001370	0.001744	0.000833	0.000183	0.000523	0.000280	0.000379	0.002050	0.000338
	0.000497	0.000661	0.000765	0.000762	0.000833	0.000884	0.000736	0.001997	0.002199	0.001203	0.000338	0.002013
Jan-11	0.001224	0.000489	0.000683	0.000795	0.000757	0.000501	0.001224	0.001059	0.000857	0.000830	0.000199	0.000752
	0.000489	0.001115	0.001089	0.001080	0.001191	0.000668	0.001059	0.002845	0.002496	0.001544	0.000503	0.002001
	0.000683	0.001089	0.001425	0.001303	0.001443	0.000767	0.000857	0.002496	0.004072	0.001675	0.000247	0.002207
	0.000795	0.001080	0.001303	0.001590	0.001371	0.000765	0.000830	0.001544	0.001675	0.002014	0.000363	0.001207
	0.000757	0.001191	0.001443	0.001371	0.001741	0.000836	0.000199	0.000503	0.000247	0.000363	0.001910	0.000315
	0.000501	0.000668	0.000767	0.000765	0.000836	0.000878	0.000752	0.002001	0.002207	0.001207	0.000315	0.002009
Feb-11	0.001198	0.000481	0.000677	0.000774	0.000746	0.000496	0.001198	0.001042	0.000856	0.000832	0.000186	0.000746
	0.000481	0.001111	0.001089	0.001078	0.001188	0.000667	0.001042	0.002836	0.002500	0.001542	0.000494	0.001998
	0.000677	0.001089	0.001426	0.001303	0.001442	0.000768	0.000856	0.002500	0.004069	0.001671	0.000244	0.002204
	0.000774	0.001078	0.001303	0.001585	0.001371	0.000765	0.000832	0.001542	0.001671	0.002027	0.000355	0.001208
	0.000746	0.001188	0.001442	0.001371	0.001745	0.000835	0.000186	0.000494	0.000244	0.000355	0.001898	0.000310
	0.000496	0.000667	0.000768	0.000765	0.000835	0.000883	0.000746	0.001998	0.002204	0.001208	0.000310	0.002012
Mar-11	0.001208	0.000482	0.000674	0.000783	0.000743	0.000500	0.001208	0.001050	0.000854	0.000839	0.000198	0.000745
	0.000482	0.001116	0.001094	0.001083	0.001191	0.000673	0.001050	0.002844	0.002489	0.001553	0.000498	0.001993
	0.000674	0.001094	0.001429	0.001308	0.001444	0.000772	0.000854	0.002489	0.004078	0.001666	0.000253	0.002208
	0.000783	0.001083	0.001308	0.001592	0.001374	0.000770	0.000839	0.001553	0.001666	0.002017	0.000369	0.001212
	0.000743	0.001191	0.001444	0.001374	0.001746	0.000838	0.000198	0.000498	0.000253	0.000369	0.001843	0.000305
	0.000500	0.000673	0.000772	0.000770	0.000838	0.000886	0.000745	0.001993	0.002208	0.001212	0.000305	0.002013
Apr-11	0.001216	0.000482	0.000676	0.000782	0.000748	0.000503	0.001216	0.001046	0.000854	0.000843	0.000199	0.000746
	0.000482	0.001116	0.001097	0.001084	0.001196	0.000680	0.001046	0.002809	0.002468	0.001532	0.000473	0.001981
	0.000676	0.001097	0.001437	0.001314	0.001454	0.000786	0.000854	0.002468	0.004078	0.001662	0.000240	0.002205
	0.000782	0.001084	0.001314	0.001602	0.001378	0.000780	0.000843	0.001532	0.001662	0.002019	0.000365	0.001214
	0.000748	0.001196	0.001454	0.001378	0.001760	0.000858	0.000199	0.000473	0.000240	0.000365	0.001835	0.000297
	0.000503	0.000680	0.000786	0.000780	0.000858	0.000921	0.000746	0.001981	0.002205	0.001214	0.000297	0.002015

May-11	0.001212	0.000479	0.000673	0.000779	0.000743	0.000496	0.001212	0.001045	0.000852	0.000849	0.000194	0.000746
	0.000479	0.001109	0.001089	0.001075	0.001188	0.000679	0.001045	0.002791	0.002458	0.001521	0.000456	0.001969
	0.000673	0.001089	0.001428	0.001304	0.001446	0.000781	0.000852	0.002458	0.004055	0.001662	0.000236	0.002196
	0.000779	0.001075	0.001304	0.001594	0.001365	0.000775	0.000849	0.001521	0.001662	0.001995	0.000346	0.001205
	0.000743	0.001188	0.001446	0.001365	0.001754	0.000854	0.000194	0.000456	0.000236	0.000346	0.001792	0.000279
	0.000496	0.000679	0.000781	0.000775	0.000854	0.000926	0.000746	0.001969	0.002196	0.001205	0.000279	0.002014
Jun-11	0.001216	0.000476	0.000664	0.000776	0.000733	0.000493	0.001216	0.001037	0.000839	0.000846	0.000199	0.000745
	0.000476	0.001105	0.001084	0.001072	0.001182	0.000678	0.001037	0.002790	0.002464	0.001512	0.000441	0.001978
	0.000664	0.001084	0.001421	0.001301	0.001440	0.000780	0.000839	0.002464	0.004042	0.001656	0.000246	0.002202
	0.000776	0.001072	0.001301	0.001593	0.001360	0.000771	0.000846	0.001512	0.001656	0.001985	0.000346	0.001210
	0.000733	0.001182	0.001440	0.001360	0.001757	0.000860	0.000199	0.000441	0.000246	0.000346	0.001784	0.000272
	0.000493	0.000678	0.000780	0.000771	0.000860	0.000930	0.000745	0.001978	0.002202	0.001210	0.000272	0.002017
Jul-11	0.001212	0.000484	0.000670	0.000787	0.000730	0.000488	0.001212	0.001038	0.000833	0.000844	0.000215	0.000750
	0.000484	0.001109	0.001084	0.001076	0.001176	0.000675	0.001038	0.002791	0.002459	0.001516	0.000435	0.001975
	0.000670	0.001084	0.001421	0.001305	0.001433	0.000778	0.000833	0.002459	0.004059	0.001658	0.000233	0.002203
	0.000787	0.001076	0.001305	0.001604	0.001355	0.000771	0.000844	0.001516	0.001658	0.001989	0.000355	0.001211
	0.000730	0.001176	0.001433	0.001355	0.001740	0.000857	0.000215	0.000435	0.000233	0.000355	0.001756	0.000252
	0.000488	0.000675	0.000778	0.000771	0.000857	0.000937	0.000750	0.001975	0.002203	0.001211	0.000252	0.002011
Aug-11	0.001194	0.000486	0.000673	0.000786	0.000733	0.000496	0.001194	0.001024	0.000824	0.000839	0.000210	0.000736
	0.000486	0.001114	0.001080	0.001073	0.001172	0.000672	0.001024	0.002762	0.002428	0.001511	0.000469	0.001936
	0.000673	0.001080	0.001411	0.001292	0.001422	0.000769	0.000824	0.002428	0.004026	0.001650	0.000255	0.002172
	0.000786	0.001073	0.001292	0.001590	0.001342	0.000766	0.000839	0.001511	0.001650	0.001987	0.000369	0.001201
	0.000733	0.001172	0.001422	0.001342	0.001729	0.000846	0.000210	0.000469	0.000255	0.000369	0.001731	0.000284
	0.000496	0.000672	0.000769	0.000766	0.000846	0.000930	0.000736	0.001936	0.002172	0.001201	0.000284	0.001977
Sep-11	0.001175	0.000507	0.000688	0.000789	0.000768	0.000482	0.001175	0.001003	0.000861	0.000847	0.000216	0.000727
	0.000507	0.001135	0.001111	0.001097	0.001225	0.000682	0.001003	0.002756	0.002499	0.001526	0.000440	0.001935
	0.000688	0.001111	0.001451	0.001329	0.001487	0.000778	0.000861	0.002499	0.004121	0.001694	0.000262	0.002221
	0.000789	0.001097	0.001329	0.001614	0.001397	0.000760	0.000847	0.001526	0.001694	0.002015	0.000359	0.001211
	0.000768	0.001225	0.001487	0.001397	0.001843	0.000877	0.000216	0.000440	0.000262	0.000359	0.001641	0.000258
	0.000482	0.000682	0.000778	0.000760	0.000877	0.000897	0.000727	0.001935	0.002221	0.001211	0.000258	0.001972
Oct-11	0.001207	0.000509	0.000695	0.000809	0.000756	0.000471	0.001207	0.001038	0.000901	0.000862	0.000214	0.000757
	0.000509	0.001160	0.001128	0.001107	0.001257	0.000694	0.001038	0.002792	0.002556	0.001532	0.000423	0.001973
	0.000695	0.001128	0.001470	0.001345	0.001519	0.000789	0.000901	0.002556	0.004199	0.001727	0.000252	0.002266

	0.000809	0.001107	0.001345	0.001629	0.001412	0.000763	0.000862	0.001532	0.001727	0.002011	0.000336	0.001232
	0.000756	0.001257	0.001519	0.001412	0.001915	0.000902	0.000214	0.000423	0.000252	0.000336	0.001633	0.000247
	0.000471	0.000694	0.000789	0.000763	0.000902	0.000896	0.000757	0.001973	0.002266	0.001232	0.000247	0.002004
Nov-11	0.001235	0.000524	0.000707	0.000834	0.000790	0.000486	0.001235	0.001081	0.000933	0.000877	0.000241	0.000779
	0.000524	0.001172	0.001141	0.001122	0.001285	0.000691	0.001081	0.002861	0.002618	0.001545	0.000473	0.002006
	0.000707	0.001141	0.001485	0.001359	0.001548	0.000791	0.000933	0.002618	0.004256	0.001744	0.000284	0.002296
	0.000834	0.001122	0.001359	0.001655	0.001447	0.000775	0.000877	0.001545	0.001744	0.001979	0.000369	0.001240
	0.000790	0.001285	0.001548	0.001447	0.001965	0.000913	0.000241	0.000473	0.000284	0.000369	0.001648	0.000274
	0.000486	0.000691	0.000791	0.000775	0.000913	0.000902	0.000779	0.002006	0.002296	0.001240	0.000274	0.002021
Dec-11	0.001231	0.000521	0.000706	0.000826	0.000796	0.000477	0.001231	0.001078	0.000932	0.000873	0.000227	0.000778
	0.000521	0.001181	0.001156	0.001138	0.001316	0.000685	0.001078	0.002872	0.002636	0.001562	0.000461	0.002023
	0.000706	0.001156	0.001504	0.001374	0.001581	0.000790	0.000932	0.002636	0.004276	0.001767	0.000283	0.002308
	0.000826	0.001138	0.001374	0.001653	0.001471	0.000780	0.000873	0.001562	0.001767	0.001982	0.000339	0.001271
	0.000796	0.001316	0.001581	0.001471	0.002016	0.000929	0.000227	0.000461	0.000283	0.000339	0.001602	0.000268
	0.000477	0.000685	0.000790	0.000780	0.000929	0.000889	0.000778	0.002023	0.002308	0.001271	0.000268	0.002031

Table A.17 Estimated Σ_f of group 1 (where country 2 is US, 3 is UK, 4 is Canada, 5 is Germany, and 6 is Japan) and group 2 (where country 2 is Brazil, 3 is Russia, 4 is India, 5 is China, and 6 is South Africa) from April 2008 to December 2011

Period	Group1					Group2				
Apr-08	0.001224	0.001217	0.001221	0.001209	0.001189	0.001337	0.001227	0.001230	0.001228	0.001253
	0.001217	0.001250	0.001232	0.001231	0.001199	0.001227	0.001216	0.001213	0.001211	0.001220
	0.001221	0.001232	0.001262	0.001227	0.001195	0.001230	0.001213	0.001224	0.001212	0.001218
	0.001209	0.001231	0.001227	0.001234	0.001197	0.001228	0.001211	0.001212	0.001215	0.001210
	0.001189	0.001199	0.001195	0.001197	0.001202	0.001253	0.001220	0.001218	0.001210	0.001352
May-08	0.001218	0.001212	0.001218	0.001205	0.001186	0.001337	0.001225	0.001227	0.001224	0.001256
	0.001212	0.001245	0.001229	0.001227	0.001196	0.001225	0.001213	0.001209	0.001206	0.001222
	0.001218	0.001229	0.001261	0.001225	0.001193	0.001227	0.001209	0.001219	0.001206	0.001218
	0.001205	0.001227	0.001225	0.001231	0.001195	0.001224	0.001206	0.001206	0.001208	0.001211
	0.001186	0.001196	0.001193	0.001195	0.001201	0.001256	0.001222	0.001218	0.001211	0.001355
Jun-08	0.001209	0.001202	0.001209	0.001194	0.001176	0.001333	0.001220	0.001220	0.001220	0.001249
	0.001202	0.001231	0.001218	0.001214	0.001183	0.001220	0.001203	0.001197	0.001197	0.001207
	0.001209	0.001218	0.001252	0.001215	0.001184	0.001220	0.001197	0.001209	0.001196	0.001204
	0.001194	0.001214	0.001215	0.001219	0.001184	0.001220	0.001197	0.001196	0.001200	0.001197
	0.001176	0.001183	0.001184	0.001184	0.001190	0.001249	0.001207	0.001204	0.001197	0.001334
Jul-08	0.001206	0.001199	0.001206	0.001192	0.001171	0.001334	0.001220	0.001220	0.001220	0.001246
	0.001199	0.001228	0.001215	0.001212	0.001178	0.001220	0.001200	0.001195	0.001194	0.001202
	0.001206	0.001215	0.001249	0.001212	0.001178	0.001220	0.001195	0.001206	0.001194	0.001200
	0.001192	0.001212	0.001212	0.001217	0.001180	0.001220	0.001194	0.001194	0.001198	0.001192
	0.001171	0.001178	0.001178	0.001180	0.001183	0.001246	0.001202	0.001200	0.001192	0.001328
Aug-08	0.001204	0.001197	0.001203	0.001191	0.001171	0.001333	0.001218	0.001220	0.001219	0.001243
	0.001197	0.001224	0.001212	0.001209	0.001178	0.001218	0.001198	0.001194	0.001192	0.001200
	0.001203	0.001212	0.001246	0.001209	0.001177	0.001220	0.001194	0.001207	0.001193	0.001198
	0.001191	0.001209	0.001209	0.001216	0.001180	0.001219	0.001192	0.001193	0.001196	0.001190
	0.001171	0.001178	0.001177	0.001180	0.001184	0.001243	0.001200	0.001198	0.001190	0.001323

Sep-08	0.001196	0.001188	0.001194	0.001182	0.001163	0.001321	0.001208	0.001207	0.001208	0.001242
	0.001188	0.001215	0.001203	0.001200	0.001169	0.001208	0.001189	0.001182	0.001183	0.001198
	0.001194	0.001203	0.001237	0.001200	0.001169	0.001207	0.001182	0.001196	0.001182	0.001192
	0.001182	0.001200	0.001200	0.001206	0.001171	0.001208	0.001183	0.001182	0.001187	0.001186
	0.001163	0.001169	0.001169	0.001171	0.001176	0.001242	0.001198	0.001192	0.001186	0.001327
Oct-08	0.001193	0.001182	0.001188	0.001175	0.001159	0.001313	0.001199	0.001198	0.001198	0.001228
	0.001182	0.001210	0.001195	0.001193	0.001163	0.001199	0.001184	0.001175	0.001178	0.001187
	0.001188	0.001195	0.001228	0.001191	0.001163	0.001198	0.001175	0.001188	0.001175	0.001181
	0.001175	0.001193	0.001191	0.001198	0.001165	0.001198	0.001178	0.001175	0.001184	0.001176
	0.001159	0.001163	0.001163	0.001165	0.001174	0.001228	0.001187	0.001181	0.001176	0.001312
Nov-08	0.001188	0.001170	0.001175	0.001162	0.001158	0.001377	0.001194	0.001185	0.001183	0.001260
	0.001170	0.001206	0.001190	0.001185	0.001141	0.001194	0.001176	0.001161	0.001171	0.001178
	0.001175	0.001190	0.001223	0.001181	0.001135	0.001185	0.001161	0.001182	0.001160	0.001168
	0.001162	0.001185	0.001181	0.001187	0.001146	0.001183	0.001171	0.001160	0.001183	0.001160
	0.001158	0.001141	0.001135	0.001146	0.001192	0.001260	0.001178	0.001168	0.001160	0.001336
Dec-08	0.001186	0.001166	0.001170	0.001158	0.001154	0.001395	0.001193	0.001184	0.001179	0.001270
	0.001166	0.001209	0.001189	0.001182	0.001133	0.001193	0.001176	0.001158	0.001170	0.001176
	0.001170	0.001189	0.001229	0.001180	0.001127	0.001184	0.001158	0.001181	0.001156	0.001164
	0.001158	0.001182	0.001180	0.001184	0.001140	0.001179	0.001170	0.001156	0.001182	0.001157
	0.001154	0.001133	0.001127	0.001140	0.001188	0.001270	0.001176	0.001164	0.001157	0.001343
Jan-09	0.001183	0.001160	0.001168	0.001154	0.001153	0.001422	0.001191	0.001175	0.001179	0.001274
	0.001160	0.001207	0.001190	0.001179	0.001127	0.001191	0.001173	0.001151	0.001167	0.001170
	0.001168	0.001190	0.001233	0.001184	0.001124	0.001175	0.001151	0.001171	0.001149	0.001151
	0.001154	0.001179	0.001184	0.001187	0.001139	0.001179	0.001167	0.001149	0.001181	0.001152
	0.001153	0.001127	0.001124	0.001139	0.001190	0.001274	0.001170	0.001151	0.001152	0.001336
Feb-09	0.001171	0.001148	0.001159	0.001143	0.001142	0.001418	0.001188	0.001164	0.001170	0.001266
	0.001148	0.001217	0.001189	0.001172	0.001110	0.001188	0.001183	0.001139	0.001157	0.001160
	0.001159	0.001189	0.001230	0.001175	0.001112	0.001164	0.001139	0.001159	0.001136	0.001142
	0.001143	0.001172	0.001175	0.001180	0.001126	0.001170	0.001157	0.001136	0.001170	0.001144
	0.001142	0.001110	0.001112	0.001126	0.001178	0.001266	0.001160	0.001142	0.001144	0.001327
Mar-09	0.001166	0.001142	0.001154	0.001137	0.001136	0.001414	0.001187	0.001157	0.001166	0.001265
	0.001142	0.001208	0.001182	0.001164	0.001101	0.001187	0.001189	0.001134	0.001154	0.001156

	0.001154	0.001182	0.001226	0.001170	0.001106	0.001157	0.001134	0.001150	0.001129	0.001134
	0.001137	0.001164	0.001170	0.001175	0.001119	0.001166	0.001154	0.001129	0.001166	0.001139
	0.001136	0.001101	0.001106	0.001119	0.001172	0.001265	0.001156	0.001134	0.001139	0.001322
Apr-09	0.001160	0.001138	0.001147	0.001134	0.001130	0.001416	0.001192	0.001151	0.001164	0.001275
	0.001138	0.001207	0.001178	0.001163	0.001097	0.001192	0.001197	0.001128	0.001153	0.001166
	0.001147	0.001178	0.001220	0.001168	0.001100	0.001151	0.001128	0.001140	0.001121	0.001133
	0.001134	0.001163	0.001168	0.001177	0.001116	0.001164	0.001153	0.001121	0.001161	0.001141
	0.001130	0.001097	0.001100	0.001116	0.001168	0.001275	0.001166	0.001133	0.001141	0.001335
May-09	0.001152	0.001129	0.001142	0.001127	0.001123	0.001395	0.001182	0.001136	0.001150	0.001265
	0.001129	0.001199	0.001173	0.001154	0.001088	0.001182	0.001195	0.001122	0.001148	0.001166
	0.001142	0.001173	0.001217	0.001162	0.001097	0.001136	0.001122	0.001130	0.001112	0.001126
	0.001127	0.001154	0.001162	0.001169	0.001110	0.001150	0.001148	0.001112	0.001154	0.001137
	0.001123	0.001088	0.001097	0.001110	0.001161	0.001265	0.001166	0.001126	0.001137	0.001338
Jun-09	0.001143	0.001126	0.001136	0.001121	0.001117	0.001381	0.001178	0.001129	0.001141	0.001263
	0.001126	0.001204	0.001175	0.001156	0.001088	0.001178	0.001197	0.001122	0.001144	0.001169
	0.001136	0.001175	0.001216	0.001160	0.001092	0.001129	0.001122	0.001130	0.001105	0.001131
	0.001121	0.001156	0.001160	0.001167	0.001107	0.001141	0.001144	0.001105	0.001147	0.001136
	0.001117	0.001088	0.001092	0.001107	0.001160	0.001263	0.001169	0.001131	0.001136	0.001343
Jul-09	0.001136	0.001120	0.001124	0.001117	0.001112	0.001368	0.001172	0.001120	0.001133	0.001258
	0.001120	0.001200	0.001165	0.001152	0.001084	0.001172	0.001193	0.001114	0.001139	0.001166
	0.001124	0.001165	0.001202	0.001153	0.001082	0.001120	0.001114	0.001119	0.001096	0.001124
	0.001117	0.001152	0.001153	0.001164	0.001105	0.001133	0.001139	0.001096	0.001140	0.001132
	0.001112	0.001084	0.001082	0.001105	0.001159	0.001258	0.001166	0.001124	0.001132	0.001338
Aug-09	0.001129	0.001116	0.001120	0.001110	0.001108	0.001372	0.001176	0.001120	0.001132	0.001258
	0.001116	0.001197	0.001165	0.001148	0.001080	0.001176	0.001196	0.001112	0.001135	0.001167
	0.001120	0.001165	0.001203	0.001150	0.001078	0.001120	0.001112	0.001112	0.001088	0.001119
	0.001110	0.001148	0.001150	0.001157	0.001100	0.001132	0.001135	0.001088	0.001133	0.001126
	0.001108	0.001080	0.001078	0.001100	0.001159	0.001258	0.001167	0.001119	0.001126	0.001332
Sep-09	0.001127	0.001111	0.001116	0.001108	0.001106	0.001363	0.001173	0.001116	0.001127	0.001251
	0.001111	0.001192	0.001158	0.001144	0.001075	0.001173	0.001196	0.001111	0.001133	0.001164
	0.001116	0.001158	0.001196	0.001145	0.001073	0.001116	0.001111	0.001109	0.001086	0.001115
	0.001108	0.001144	0.001145	0.001154	0.001097	0.001127	0.001133	0.001086	0.001131	0.001123

	0.001106	0.001075	0.001073	0.001097	0.001158	0.001251	0.001164	0.001115	0.001123	0.001327
Oct-09	0.001124	0.001110	0.001112	0.001110	0.001108	0.001343	0.001168	0.001108	0.001118	0.001244
	0.001110	0.001193	0.001156	0.001146	0.001078	0.001168	0.001201	0.001113	0.001134	0.001167
	0.001112	0.001156	0.001191	0.001146	0.001073	0.001108	0.001113	0.001109	0.001084	0.001116
	0.001110	0.001146	0.001146	0.001160	0.001102	0.001118	0.001134	0.001084	0.001129	0.001122
	0.001108	0.001078	0.001073	0.001102	0.001165	0.001244	0.001167	0.001116	0.001122	0.001328
Nov-09	0.001116	0.001104	0.001105	0.001103	0.001101	0.001342	0.001169	0.001108	0.001114	0.001241
	0.001104	0.001189	0.001151	0.001141	0.001073	0.001169	0.001202	0.001112	0.001130	0.001166
	0.001105	0.001151	0.001188	0.001141	0.001068	0.001108	0.001112	0.001108	0.001079	0.001115
	0.001103	0.001141	0.001141	0.001155	0.001096	0.001114	0.001130	0.001079	0.001121	0.001116
	0.001101	0.001073	0.001068	0.001096	0.001160	0.001241	0.001166	0.001115	0.001116	0.001327
Dec-09	0.001111	0.001101	0.001101	0.001100	0.001099	0.001328	0.001165	0.001103	0.001107	0.001236
	0.001101	0.001187	0.001149	0.001140	0.001073	0.001165	0.001201	0.001111	0.001127	0.001163
	0.001101	0.001149	0.001185	0.001140	0.001067	0.001103	0.001111	0.001106	0.001075	0.001113
	0.001100	0.001140	0.001140	0.001154	0.001097	0.001107	0.001127	0.001075	0.001116	0.001111
	0.001099	0.001073	0.001067	0.001097	0.001161	0.001236	0.001163	0.001113	0.001111	0.001323
Jan-10	0.001107	0.001097	0.001098	0.001095	0.001096	0.001329	0.001165	0.001101	0.001105	0.001235
	0.001097	0.001183	0.001145	0.001135	0.001067	0.001165	0.001199	0.001105	0.001123	0.001157
	0.001098	0.001145	0.001184	0.001136	0.001063	0.001101	0.001105	0.001100	0.001072	0.001108
	0.001095	0.001135	0.001136	0.001149	0.001091	0.001105	0.001123	0.001072	0.001114	0.001108
	0.001096	0.001067	0.001063	0.001091	0.001158	0.001235	0.001157	0.001108	0.001108	0.001319
Feb-10	0.001107	0.001095	0.001096	0.001092	0.001097	0.001321	0.001160	0.001096	0.001102	0.001230
	0.001095	0.001180	0.001142	0.001130	0.001068	0.001160	0.001196	0.001103	0.001121	0.001154
	0.001096	0.001142	0.001181	0.001132	0.001063	0.001096	0.001103	0.001098	0.001070	0.001104
	0.001092	0.001130	0.001132	0.001142	0.001089	0.001102	0.001121	0.001070	0.001114	0.001106
	0.001097	0.001068	0.001063	0.001089	0.001161	0.001230	0.001154	0.001104	0.001106	0.001314
Mar-10	0.001100	0.001088	0.001089	0.001087	0.001092	0.001315	0.001157	0.001091	0.001096	0.001223
	0.001088	0.001173	0.001135	0.001124	0.001062	0.001157	0.001194	0.001099	0.001117	0.001149
	0.001089	0.001135	0.001176	0.001127	0.001057	0.001091	0.001099	0.001093	0.001065	0.001097
	0.001087	0.001124	0.001127	0.001139	0.001086	0.001096	0.001117	0.001065	0.001109	0.001099
	0.001092	0.001062	0.001057	0.001086	0.001159	0.001223	0.001149	0.001097	0.001099	0.001306

Apr-10	0.001099	0.001086	0.001090	0.001084	0.001091	0.001320	0.001160	0.001095	0.001099	0.001228
	0.001086	0.001170	0.001133	0.001121	0.001059	0.001160	0.001196	0.001099	0.001117	0.001151
	0.001090	0.001133	0.001178	0.001125	0.001056	0.001095	0.001099	0.001092	0.001065	0.001099
	0.001084	0.001121	0.001125	0.001134	0.001082	0.001099	0.001117	0.001065	0.001109	0.001101
	0.001091	0.001059	0.001056	0.001082	0.001158	0.001228	0.001151	0.001099	0.001101	0.001310
May-10	0.001096	0.001081	0.001087	0.001079	0.001086	0.001323	0.001160	0.001096	0.001099	0.001227
	0.001081	0.001164	0.001129	0.001113	0.001051	0.001160	0.001193	0.001098	0.001115	0.001148
	0.001087	0.001129	0.001175	0.001118	0.001050	0.001096	0.001098	0.001092	0.001063	0.001098
	0.001079	0.001113	0.001118	0.001126	0.001074	0.001099	0.001115	0.001063	0.001107	0.001098
	0.001086	0.001051	0.001050	0.001074	0.001150	0.001227	0.001148	0.001098	0.001098	0.001305
Jun-10	0.001090	0.001072	0.001079	0.001068	0.001077	0.001337	0.001168	0.001101	0.001102	0.001242
	0.001072	0.001151	0.001119	0.001100	0.001037	0.001168	0.001190	0.001093	0.001109	0.001151
	0.001079	0.001119	0.001169	0.001106	0.001036	0.001101	0.001093	0.001085	0.001056	0.001098
	0.001068	0.001100	0.001106	0.001114	0.001060	0.001102	0.001109	0.001056	0.001102	0.001096
	0.001077	0.001037	0.001036	0.001060	0.001140	0.001242	0.001151	0.001098	0.001096	0.001312
Jul-10	0.001087	0.001072	0.001077	0.001066	0.001078	0.001338	0.001168	0.001100	0.001101	0.001248
	0.001072	0.001155	0.001120	0.001100	0.001040	0.001168	0.001191	0.001091	0.001107	0.001156
	0.001077	0.001120	0.001169	0.001106	0.001037	0.001100	0.001091	0.001082	0.001053	0.001103
	0.001066	0.001100	0.001106	0.001114	0.001061	0.001101	0.001107	0.001053	0.001100	0.001100
	0.001078	0.001040	0.001037	0.001061	0.001144	0.001248	0.001156	0.001103	0.001100	0.001314
Aug-10	0.001079	0.001066	0.001072	0.001061	0.001073	0.001326	0.001163	0.001091	0.001093	0.001240
	0.001066	0.001152	0.001116	0.001099	0.001038	0.001163	0.001189	0.001086	0.001103	0.001154
	0.001072	0.001116	0.001167	0.001103	0.001033	0.001091	0.001086	0.001073	0.001045	0.001097
	0.001061	0.001099	0.001103	0.001114	0.001059	0.001093	0.001103	0.001045	0.001093	0.001095
	0.001073	0.001038	0.001033	0.001059	0.001141	0.001240	0.001154	0.001097	0.001095	0.001310
Sep-10	0.001071	0.001058	0.001063	0.001053	0.001068	0.001320	0.001157	0.001083	0.001086	0.001239
	0.001058	0.001145	0.001107	0.001093	0.001033	0.001157	0.001186	0.001079	0.001097	0.001153
	0.001063	0.001107	0.001157	0.001095	0.001027	0.001083	0.001079	0.001064	0.001037	0.001094
	0.001053	0.001093	0.001095	0.001108	0.001055	0.001086	0.001097	0.001037	0.001086	0.001092
	0.001068	0.001033	0.001027	0.001055	0.001140	0.001239	0.001153	0.001094	0.001092	0.001310
Oct-10	0.001068	0.001055	0.001061	0.001053	0.001067	0.001319	0.001157	0.001081	0.001084	0.001241
	0.001055	0.001142	0.001106	0.001093	0.001032	0.001157	0.001186	0.001077	0.001095	0.001155

Nov-10	0.001061	0.001106	0.001158	0.001096	0.001028	0.001081	0.001077	0.001060	0.001034	0.001096
	0.001053	0.001093	0.001096	0.001113	0.001057	0.001084	0.001095	0.001034	0.001084	0.001094
	0.001067	0.001032	0.001028	0.001057	0.001141	0.001241	0.001155	0.001096	0.001094	0.001316
	0.001060	0.001047	0.001054	0.001045	0.001060	0.001309	0.001148	0.001072	0.001076	0.001231
	0.001047	0.001133	0.001099	0.001084	0.001025	0.001148	0.001179	0.001069	0.001088	0.001147
	0.001054	0.001099	0.001152	0.001090	0.001022	0.001072	0.001069	0.001051	0.001026	0.001086
	0.001045	0.001084	0.001090	0.001105	0.001050	0.001076	0.001088	0.001026	0.001076	0.001085
Dec-10	0.001060	0.001025	0.001022	0.001050	0.001135	0.001231	0.001147	0.001086	0.001085	0.001304
	0.001058	0.001042	0.001053	0.001038	0.001056	0.001307	0.001144	0.001066	0.001073	0.001226
	0.001042	0.001126	0.001096	0.001076	0.001018	0.001144	0.001175	0.001063	0.001084	0.001140
	0.001053	0.001096	0.001152	0.001085	0.001019	0.001066	0.001063	0.001042	0.001020	0.001078
	0.001038	0.001076	0.001085	0.001097	0.001042	0.001073	0.001084	0.001020	0.001074	0.001079
Jan-11	0.001056	0.001018	0.001019	0.001042	0.001129	0.001226	0.001140	0.001078	0.001079	0.001295
	0.001054	0.001037	0.001050	0.001034	0.001056	0.001310	0.001146	0.001064	0.001072	0.001229
	0.001037	0.001120	0.001091	0.001071	0.001017	0.001146	0.001175	0.001059	0.001082	0.001141
	0.001050	0.001091	0.001149	0.001081	0.001020	0.001064	0.001059	0.001037	0.001015	0.001076
	0.001034	0.001071	0.001081	0.001093	0.001042	0.001072	0.001082	0.001015	0.001071	0.001078
Feb-11	0.001056	0.001017	0.001020	0.001042	0.001133	0.001229	0.001141	0.001076	0.001078	0.001297
	0.001062	0.001044	0.001057	0.001042	0.001063	0.001317	0.001155	0.001068	0.001080	0.001233
	0.001044	0.001126	0.001098	0.001079	0.001024	0.001155	0.001188	0.001066	0.001093	0.001147
	0.001057	0.001098	0.001155	0.001089	0.001027	0.001068	0.001066	0.001038	0.001019	0.001078
	0.001042	0.001079	0.001089	0.001104	0.001051	0.001080	0.001093	0.001019	0.001079	0.001083
Mar-11	0.001063	0.001024	0.001027	0.001051	0.001141	0.001233	0.001147	0.001078	0.001083	0.001300
	0.001052	0.001035	0.001047	0.001033	0.001055	0.001307	0.001147	0.001058	0.001071	0.001221
	0.001035	0.001119	0.001089	0.001070	0.001017	0.001147	0.001182	0.001058	0.001086	0.001138
	0.001047	0.001089	0.001146	0.001079	0.001018	0.001058	0.001058	0.001029	0.001011	0.001068
	0.001033	0.001070	0.001079	0.001094	0.001043	0.001071	0.001086	0.001011	0.001071	0.001073
Apr-11	0.001055	0.001017	0.001018	0.001043	0.001135	0.001221	0.001138	0.001068	0.001073	0.001287
	0.001038	0.001021	0.001034	0.001019	0.001038	0.001295	0.001134	0.001046	0.001057	0.001209
	0.001021	0.001108	0.001077	0.001058	0.001002	0.001134	0.001170	0.001046	0.001072	0.001127
	0.001034	0.001077	0.001135	0.001067	0.001003	0.001046	0.001046	0.001018	0.000998	0.001058
	0.001019	0.001058	0.001067	0.001082	0.001027	0.001057	0.001072	0.000998	0.001056	0.001061

	0.001038	0.001002	0.001003	0.001027	0.001114	0.001209	0.001127	0.001058	0.001061	0.001276
May-11	0.000983	0.000971	0.000982	0.000967	0.000980	0.001234	0.001074	0.000999	0.000998	0.001157
	0.000971	0.001061	0.001029	0.001011	0.000947	0.001074	0.001111	0.001000	0.001014	0.001075
	0.000982	0.001029	0.001084	0.001017	0.000947	0.000999	0.001000	0.000981	0.000952	0.001017
	0.000967	0.001011	0.001017	0.001034	0.000972	0.000998	0.001014	0.000952	0.000999	0.001010
	0.000980	0.000947	0.000947	0.000972	0.001055	0.001157	0.001075	0.001017	0.001010	0.001230
Jun-11	0.000960	0.000946	0.000959	0.000940	0.000954	0.001213	0.001048	0.000978	0.000975	0.001133
	0.000946	0.001035	0.001005	0.000983	0.000920	0.001048	0.001078	0.000974	0.000985	0.001045
	0.000959	0.001005	0.001062	0.000992	0.000922	0.000978	0.000974	0.000961	0.000930	0.000992
	0.000940	0.000983	0.000992	0.001004	0.000941	0.000975	0.000985	0.000930	0.000975	0.000983
	0.000954	0.000920	0.000922	0.000941	0.001026	0.001133	0.001045	0.000992	0.000983	0.001204
Jul-11	0.000917	0.000905	0.000915	0.000898	0.000909	0.001159	0.000999	0.000930	0.000926	0.001084
	0.000905	0.000997	0.000963	0.000943	0.000877	0.000999	0.001031	0.000929	0.000939	0.000999
	0.000915	0.000963	0.001017	0.000948	0.000876	0.000930	0.000929	0.000918	0.000886	0.000948
	0.000898	0.000943	0.000948	0.000963	0.000897	0.000926	0.000939	0.000886	0.000930	0.000938
	0.000909	0.000877	0.000876	0.000897	0.000979	0.001084	0.000999	0.000948	0.000938	0.001159
Aug-11	0.000783	0.000776	0.000780	0.000766	0.000781	0.001022	0.000860	0.000798	0.000791	0.000948
	0.000776	0.000872	0.000833	0.000816	0.000754	0.000860	0.000892	0.000795	0.000802	0.000862
	0.000780	0.000833	0.000880	0.000815	0.000747	0.000798	0.000795	0.000791	0.000756	0.000817
	0.000766	0.000816	0.000815	0.000834	0.000771	0.000791	0.000802	0.000756	0.000797	0.000804
	0.000781	0.000754	0.000747	0.000771	0.000858	0.000948	0.000862	0.000817	0.000804	0.001025
Sep-11	0.000670	0.000660	0.000661	0.000651	0.000666	0.000896	0.000739	0.000681	0.000670	0.000827
	0.000660	0.000753	0.000712	0.000698	0.000636	0.000739	0.000772	0.000679	0.000681	0.000744
	0.000661	0.000712	0.000756	0.000695	0.000626	0.000681	0.000679	0.000681	0.000642	0.000702
	0.000651	0.000698	0.000695	0.000719	0.000655	0.000670	0.000681	0.000642	0.000680	0.000683
	0.000666	0.000636	0.000626	0.000655	0.000741	0.000827	0.000744	0.000702	0.000683	0.000908
Oct-11	0.000616	0.000605	0.000612	0.000599	0.000610	0.000857	0.000690	0.000637	0.000614	0.000793
	0.000605	0.000699	0.000663	0.000646	0.000579	0.000690	0.000717	0.000629	0.000623	0.000697
	0.000612	0.000663	0.000713	0.000649	0.000576	0.000637	0.000629	0.000637	0.000590	0.000661
	0.000599	0.000646	0.000649	0.000670	0.000601	0.000614	0.000623	0.000590	0.000625	0.000629
	0.000610	0.000579	0.000576	0.000601	0.000683	0.000793	0.000697	0.000661	0.000629	0.000879

Nov-11	0.000527	0.000517	0.000521	0.000510	0.000518	0.000778	0.000604	0.000556	0.000526	0.000713
	0.000517	0.000613	0.000574	0.000559	0.000489	0.000604	0.000627	0.000542	0.000529	0.000612
	0.000521	0.000574	0.000622	0.000559	0.000483	0.000556	0.000542	0.000555	0.000501	0.000580
	0.000510	0.000559	0.000559	0.000581	0.000509	0.000526	0.000529	0.000501	0.000530	0.000541
	0.000518	0.000489	0.000483	0.000509	0.000589	0.000713	0.000612	0.000580	0.000541	0.000799
Dec-11	0.000425	0.000417	0.000411	0.000409	0.000413	0.000668	0.000496	0.000449	0.000415	0.000599
	0.000417	0.000516	0.000467	0.000462	0.000387	0.000496	0.000523	0.000438	0.000422	0.000498
	0.000411	0.000467	0.000504	0.000454	0.000373	0.000449	0.000438	0.000454	0.000397	0.000469
	0.000409	0.000462	0.000454	0.000485	0.000408	0.000415	0.000422	0.000397	0.000424	0.000424
	0.000413	0.000387	0.000373	0.000408	0.000482	0.000599	0.000498	0.000469	0.000424	0.000681

Table A.18 Estimated \sum_{jf} of group 1 (where country 2 is US, 3 is UK, 4 is Canada, 5 is Germany, and 6 is Japan) and group 2 (where country 2 is Brazil, 3 is Russia, 4 is India, 5 is China, and 6 is South Africa) from April 2008 to December 2011

Period	Group 1					Group 2				
Apr-08	0.000103	0.000099	0.000119	0.000108	0.000088	0.000226	0.000022	0.000030	0.000002	0.000178
	0.000117	0.000137	0.000144	0.000132	0.000100	0.000214	0.000134	0.000127	0.000111	0.000217
	0.000056	0.000089	0.000130	0.000088	0.000050	0.000059	-0.000022	0.000024	-0.000034	0.000058
	0.000076	0.000097	0.000104	0.000102	0.000066	-0.000181	-0.000183	-0.000155	-0.000170	-0.000149
	0.000111	0.000129	0.000131	0.000118	0.000112	0.000196	0.000131	0.000133	0.000102	0.000267
May-08	0.000110	0.000109	0.000129	0.000115	0.000091	0.000250	0.000048	0.000053	0.000029	0.000200
	0.000123	0.000144	0.000151	0.000138	0.000103	0.000231	0.000152	0.000144	0.000133	0.000216
	0.000072	0.000105	0.000145	0.000103	0.000059	0.000065	-0.000014	0.000029	-0.000027	0.000059
	0.000083	0.000106	0.000114	0.000109	0.000068	-0.000172	-0.000169	-0.000144	-0.000156	-0.000133
	0.000118	0.000136	0.000138	0.000125	0.000117	0.000213	0.000148	0.000148	0.000121	0.000278
Jun-08	0.000111	0.000108	0.000127	0.000113	0.000087	0.000254	0.000065	0.000063	0.000047	0.000216
	0.000124	0.000141	0.000150	0.000135	0.000099	0.000262	0.000170	0.000150	0.000152	0.000254
	0.000078	0.000108	0.000151	0.000108	0.000061	0.000079	0.000001	0.000043	-0.000011	0.000096
	0.000088	0.000107	0.000116	0.000110	0.000066	-0.000165	-0.000167	-0.000141	-0.000153	-0.000122
	0.000132	0.000144	0.000147	0.000133	0.000118	0.000213	0.000149	0.000142	0.000122	0.000281
Jul-08	0.000104	0.000100	0.000121	0.000105	0.000079	0.000243	0.000055	0.000055	0.000036	0.000207
	0.000117	0.000133	0.000143	0.000127	0.000092	0.000252	0.000162	0.000144	0.000143	0.000248
	0.000075	0.000105	0.000148	0.000106	0.000060	0.000069	-0.000008	0.000035	-0.000020	0.000090
	0.000080	0.000099	0.000108	0.000100	0.000056	-0.000164	-0.000166	-0.000140	-0.000157	-0.000112
	0.000124	0.000137	0.000139	0.000129	0.000111	0.000205	0.000142	0.000137	0.000115	0.000274
Aug-08	0.000105	0.000102	0.000123	0.000106	0.000080	0.000224	0.000041	0.000042	0.000021	0.000179
	0.000115	0.000133	0.000145	0.000126	0.000091	0.000248	0.000162	0.000140	0.000142	0.000247
	0.000069	0.000100	0.000143	0.000100	0.000054	0.000068	-0.000012	0.000036	-0.000024	0.000084
	0.000083	0.000103	0.000114	0.000102	0.000060	-0.000160	-0.000159	-0.000132	-0.000150	-0.000114
	0.000129	0.000142	0.000143	0.000133	0.000114	0.000200	0.000138	0.000133	0.000110	0.000267

Sep-08	0.000106	0.000104	0.000123	0.000107	0.000080	0.000217	0.000038	0.000038	0.000016	0.000188
	0.000114	0.000133	0.000142	0.000127	0.000089	0.000233	0.000146	0.000121	0.000124	0.000234
	0.000070	0.000105	0.000146	0.000105	0.000058	0.000068	-0.000012	0.000043	-0.000024	0.000081
	0.000080	0.000104	0.000109	0.000103	0.000055	-0.000158	-0.000161	-0.000136	-0.000156	-0.000119
	0.000124	0.000141	0.000140	0.000132	0.000111	0.000200	0.000138	0.000134	0.000110	0.000270
Oct-08	0.000104	0.000103	0.000119	0.000103	0.000074	0.000222	0.000027	0.000031	-0.000002	0.000185
	0.000105	0.000133	0.000134	0.000122	0.000076	0.000231	0.000127	0.000107	0.000096	0.000214
	0.000058	0.000099	0.000132	0.000095	0.000043	0.000061	-0.000030	0.000034	-0.000041	0.000072
	0.000073	0.000103	0.000105	0.000101	0.000047	-0.000154	-0.000162	-0.000147	-0.000168	-0.000133
	0.000124	0.000144	0.000141	0.000134	0.000107	0.000201	0.000127	0.000125	0.000093	0.000265
Nov-08	0.000082	0.000130	0.000157	0.000113	-0.000013	0.000458	0.000035	0.000041	-0.000051	0.000357
	0.000077	0.000156	0.000173	0.000127	-0.000025	0.000464	0.000144	0.000099	0.000051	0.000457
	0.000019	0.000112	0.000155	0.000099	-0.000055	0.000172	-0.000032	0.000050	-0.000080	0.000183
	0.000039	0.000139	0.000156	0.000112	-0.000079	-0.000130	-0.000165	-0.000119	-0.000184	-0.000105
	0.000103	0.000174	0.000180	0.000146	0.000024	0.000331	0.000129	0.000135	0.000053	0.000393
Dec-08	0.000078	0.000154	0.000185	0.000127	-0.000024	0.000531	0.000034	0.000056	-0.000060	0.000410
	0.000074	0.000183	0.000216	0.000148	-0.000041	0.000568	0.000160	0.000135	0.000051	0.000527
	0.000014	0.000133	0.000202	0.000119	-0.000072	0.000188	-0.000033	0.000064	-0.000087	0.000188
	0.000033	0.000159	0.000194	0.000129	-0.000096	-0.000156	-0.000166	-0.000127	-0.000177	-0.000107
	0.000102	0.000183	0.000194	0.000152	0.000018	0.000405	0.000139	0.000150	0.000053	0.000449
Jan-09	0.000076	0.000155	0.000183	0.000124	-0.000029	0.000565	0.000031	0.000052	-0.000066	0.000418
	0.000065	0.000191	0.000221	0.000146	-0.000054	0.000612	0.000165	0.000142	0.000053	0.000539
	0.000010	0.000155	0.000212	0.000124	-0.000087	0.000194	-0.000039	0.000058	-0.000100	0.000185
	0.000026	0.000173	0.000210	0.000142	-0.000105	-0.000186	-0.000158	-0.000106	-0.000177	-0.000107
	0.000100	0.000191	0.000202	0.000160	0.000012	0.000454	0.000137	0.000140	0.000052	0.000463
Feb-09	0.000074	0.000154	0.000183	0.000127	-0.000031	0.000590	0.000062	0.000064	-0.000052	0.000434
	0.000062	0.000213	0.000231	0.000153	-0.000062	0.000611	0.000155	0.000145	0.000041	0.000547
	0.000013	0.000174	0.000221	0.000130	-0.000092	0.000197	-0.000061	0.000063	-0.000098	0.000203
	0.000022	0.000193	0.000219	0.000158	-0.000109	-0.000172	-0.000139	-0.000099	-0.000166	-0.000107
	0.000098	0.000205	0.000203	0.000166	0.000008	0.000466	0.000147	0.000149	0.000053	0.000478
Mar-09	0.000064	0.000149	0.000174	0.000119	-0.000038	0.000576	0.000043	0.000046	-0.000075	0.000425
	0.000052	0.000210	0.000226	0.000151	-0.000069	0.000615	0.000189	0.000143	0.000035	0.000541

	0.000001	0.000169	0.000213	0.000126	-0.000104	0.000197	-0.000050	0.000063	-0.000104	0.000206
	0.000008	0.000186	0.000209	0.000150	-0.000119	-0.000172	-0.000136	-0.000097	-0.000168	-0.000107
	0.000091	0.000202	0.000196	0.000161	0.000001	0.000460	0.000137	0.000142	0.000040	0.000466
Apr-09	0.000074	0.000155	0.000191	0.000136	-0.000032	0.000606	0.000076	0.000065	-0.000054	0.000460
	0.000056	0.000216	0.000237	0.000162	-0.000066	0.000653	0.000231	0.000157	0.000055	0.000577
	0.000008	0.000174	0.000227	0.000141	-0.000100	0.000214	-0.000034	0.000069	-0.000093	0.000237
	0.000018	0.000196	0.000227	0.000170	-0.000110	-0.000154	-0.000116	-0.000085	-0.000151	-0.000107
	0.000093	0.000211	0.000204	0.000169	0.000001	0.000490	0.000170	0.000156	0.000058	0.000498
May-09	0.000077	0.000161	0.000193	0.000139	-0.000028	0.000614	0.000088	0.000074	-0.000046	0.000476
	0.000061	0.000225	0.000243	0.000167	-0.000059	0.000660	0.000242	0.000169	0.000063	0.000586
	0.000017	0.000186	0.000235	0.000149	-0.000087	0.000228	-0.000016	0.000084	-0.000079	0.000255
	0.000028	0.000210	0.000237	0.000179	-0.000099	-0.000151	-0.000110	-0.000081	-0.000149	-0.000097
	0.000097	0.000217	0.000209	0.000175	0.000007	0.000499	0.000181	0.000163	0.000066	0.000516
Jun-09	0.000073	0.000160	0.000195	0.000135	-0.000040	0.000621	0.000099	0.000089	-0.000043	0.000488
	0.000066	0.000236	0.000257	0.000175	-0.000058	0.000692	0.000270	0.000202	0.000078	0.000618
	0.000023	0.000202	0.000255	0.000159	-0.000089	0.000242	0.000009	0.000120	-0.000071	0.000285
	0.000027	0.000215	0.000242	0.000179	-0.000105	-0.000131	-0.000098	-0.000068	-0.000137	-0.000090
	0.000101	0.000224	0.000216	0.000180	0.000009	0.000510	0.000193	0.000178	0.000071	0.000530
Jul-09	0.000068	0.000158	0.000191	0.000132	-0.000046	0.000600	0.000093	0.000084	-0.000051	0.000486
	0.000059	0.000230	0.000251	0.000169	-0.000067	0.000676	0.000252	0.000190	0.000058	0.000599
	0.000010	0.000189	0.000242	0.000149	-0.000106	0.000232	-0.000001	0.000111	-0.000083	0.000276
	0.000021	0.000210	0.000239	0.000175	-0.000116	-0.000117	-0.000095	-0.000069	-0.000135	-0.000092
	0.000096	0.000221	0.000209	0.000178	0.000004	0.000505	0.000189	0.000176	0.000066	0.000524
Aug-09	0.000068	0.000162	0.000201	0.000134	-0.000052	0.000613	0.000111	0.000097	-0.000046	0.000499
	0.000064	0.000240	0.000268	0.000177	-0.000070	0.000695	0.000272	0.000199	0.000051	0.000627
	0.000010	0.000198	0.000256	0.000154	-0.000118	0.000249	0.000016	0.000119	-0.000086	0.000292
	0.000023	0.000217	0.000257	0.000180	-0.000123	-0.000095	-0.000076	-0.000054	-0.000123	-0.000073
	0.000097	0.000224	0.000215	0.000180	0.000002	0.000513	0.000200	0.000181	0.000066	0.000529
Sep-09	0.000074	0.000171	0.000209	0.000142	-0.000045	0.000622	0.000117	0.000105	-0.000040	0.000498
	0.000067	0.000246	0.000272	0.000183	-0.000068	0.000689	0.000271	0.000192	0.000043	0.000625
	0.000010	0.000198	0.000256	0.000153	-0.000119	0.000247	0.000018	0.000121	-0.000084	0.000295
	0.000029	0.000224	0.000264	0.000187	-0.000121	-0.000118	-0.000097	-0.000074	-0.000142	-0.000096

	0.000093	0.000216	0.000209	0.000176	-0.000003	0.000519	0.000205	0.000184	0.000069	0.000529
Oct-09	0.000072	0.000170	0.000210	0.000143	-0.000047	0.000591	0.000104	0.000087	-0.000060	0.000481
	0.000065	0.000246	0.000275	0.000185	-0.000070	0.000676	0.000273	0.000188	0.000034	0.000622
	0.000003	0.000194	0.000252	0.000152	-0.000124	0.000233	0.000015	0.000115	-0.000093	0.000292
	0.000027	0.000225	0.000268	0.000191	-0.000122	-0.000115	-0.000094	-0.000071	-0.000141	-0.000093
	0.000083	0.000210	0.000202	0.000172	-0.000011	0.000503	0.000200	0.000178	0.000059	0.000523
Nov-09	0.000074	0.000171	0.000216	0.000148	-0.000048	0.000611	0.000119	0.000109	-0.000046	0.000502
	0.000071	0.000252	0.000283	0.000194	-0.000068	0.000702	0.000297	0.000215	0.000049	0.000656
	0.000009	0.000199	0.000266	0.000162	-0.000123	0.000252	0.000025	0.000130	-0.000079	0.000308
	0.000031	0.000227	0.000279	0.000199	-0.000123	-0.000099	-0.000077	-0.000054	-0.000129	-0.000071
	0.000082	0.000208	0.000201	0.000171	-0.000014	0.000516	0.000213	0.000192	0.000070	0.000540
Dec-09	0.000070	0.000169	0.000214	0.000146	-0.000050	0.000599	0.000115	0.000104	-0.000052	0.000496
	0.000070	0.000252	0.000285	0.000196	-0.000067	0.000690	0.000288	0.000204	0.000037	0.000637
	0.000005	0.000195	0.000261	0.000158	-0.000126	0.000236	0.000019	0.000120	-0.000090	0.000296
	0.000028	0.000226	0.000280	0.000199	-0.000123	-0.000096	-0.000078	-0.000057	-0.000130	-0.000077
	0.000070	0.000198	0.000190	0.000161	-0.000024	0.000508	0.000210	0.000188	0.000064	0.000532
Jan-10	0.000074	0.000172	0.000220	0.000150	-0.000048	0.000599	0.000119	0.000109	-0.000051	0.000497
	0.000068	0.000251	0.000287	0.000196	-0.000073	0.000690	0.000288	0.000202	0.000033	0.000637
	0.000005	0.000195	0.000263	0.000159	-0.000127	0.000240	0.000021	0.000118	-0.000093	0.000293
	0.000024	0.000224	0.000278	0.000196	-0.000131	-0.000087	-0.000074	-0.000052	-0.000130	-0.000072
	0.000065	0.000197	0.000190	0.000159	-0.000033	0.000510	0.000206	0.000185	0.000060	0.000530
Feb-10	0.000072	0.000167	0.000221	0.000148	-0.000052	0.000585	0.000103	0.000090	-0.000069	0.000479
	0.000063	0.000243	0.000285	0.000191	-0.000079	0.000673	0.000272	0.000184	0.000017	0.000623
	-0.000003	0.000182	0.000259	0.000151	-0.000137	0.000236	0.000016	0.000111	-0.000102	0.000287
	0.000014	0.000207	0.000272	0.000185	-0.000144	-0.000077	-0.000072	-0.000048	-0.000131	-0.000058
	0.000065	0.000196	0.000194	0.000161	-0.000032	0.000500	0.000195	0.000172	0.000047	0.000518
Mar-10	0.000073	0.000168	0.000224	0.000149	-0.000053	0.000580	0.000098	0.000086	-0.000075	0.000476
	0.000062	0.000243	0.000285	0.000190	-0.000085	0.000655	0.000258	0.000170	0.000004	0.000615
	0.000000	0.000184	0.000264	0.000154	-0.000136	0.000233	0.000014	0.000109	-0.000104	0.000289
	0.000010	0.000205	0.000269	0.000181	-0.000155	-0.000077	-0.000073	-0.000050	-0.000132	-0.000057
	0.000068	0.000197	0.000196	0.000164	-0.000028	0.000504	0.000195	0.000173	0.000047	0.000522

Apr-10	0.000076	0.000169	0.000229	0.000150	-0.000054	0.000585	0.000106	0.000096	-0.000067	0.000483
	0.000061	0.000242	0.000288	0.000190	-0.000087	0.000661	0.000265	0.000180	0.000010	0.000624
	0.000003	0.000185	0.000269	0.000156	-0.000136	0.000233	0.000011	0.000107	-0.000107	0.000290
	0.000009	0.000203	0.000276	0.000181	-0.000156	-0.000081	-0.000074	-0.000051	-0.000133	-0.000062
	0.000066	0.000194	0.000198	0.000162	-0.000031	0.000509	0.000201	0.000181	0.000051	0.000529
May-10	0.000078	0.000171	0.000232	0.000151	-0.000052	0.000576	0.000100	0.000092	-0.000071	0.000475
	0.000060	0.000240	0.000286	0.000187	-0.000088	0.000650	0.000259	0.000173	0.000003	0.000613
	0.000005	0.000187	0.000272	0.000156	-0.000134	0.000230	0.000011	0.000107	-0.000106	0.000285
	0.000008	0.000201	0.000274	0.000178	-0.000159	-0.000092	-0.000083	-0.000062	-0.000144	-0.000072
	0.000068	0.000196	0.000198	0.000163	-0.000029	0.000503	0.000197	0.000178	0.000048	0.000522
Jun-10	0.000072	0.000173	0.000236	0.000153	-0.000063	0.000585	0.000116	0.000106	-0.000068	0.000487
	0.000049	0.000237	0.000284	0.000183	-0.000107	0.000676	0.000274	0.000185	0.000001	0.000620
	-0.000001	0.000188	0.000275	0.000156	-0.000147	0.000235	0.000023	0.000119	-0.000101	0.000289
	0.000000	0.000202	0.000278	0.000179	-0.000175	-0.000092	-0.000092	-0.000074	-0.000164	-0.000067
	0.000065	0.000198	0.000203	0.000165	-0.000038	0.000524	0.000216	0.000193	0.000052	0.000537
Jul-10	0.000073	0.000170	0.000238	0.000154	-0.000065	0.000593	0.000127	0.000120	-0.000057	0.000497
	0.000051	0.000240	0.000289	0.000188	-0.000107	0.000674	0.000278	0.000193	0.000007	0.000623
	0.000005	0.000191	0.000280	0.000161	-0.000146	0.000242	0.000032	0.000129	-0.000093	0.000307
	0.000006	0.000210	0.000284	0.000188	-0.000172	-0.000107	-0.000103	-0.000081	-0.000172	-0.000071
	0.000070	0.000200	0.000206	0.000168	-0.000037	0.000537	0.000230	0.000210	0.000064	0.000553
Aug-10	0.000074	0.000168	0.000245	0.000152	-0.000068	0.000594	0.000129	0.000121	-0.000055	0.000500
	0.000055	0.000241	0.000297	0.000189	-0.000107	0.000675	0.000280	0.000192	0.000007	0.000622
	0.000006	0.000190	0.000284	0.000159	-0.000149	0.000247	0.000034	0.000129	-0.000091	0.000309
	0.000011	0.000212	0.000292	0.000189	-0.000172	-0.000098	-0.000098	-0.000077	-0.000167	-0.000062
	0.000074	0.000202	0.000212	0.000169	-0.000037	0.000544	0.000235	0.000213	0.000068	0.000559
Sep-10	0.000069	0.000167	0.000243	0.000151	-0.000073	0.000593	0.000130	0.000121	-0.000055	0.000498
	0.000053	0.000243	0.000297	0.000191	-0.000109	0.000669	0.000277	0.000184	0.000000	0.000616
	-0.000001	0.000186	0.000279	0.000158	-0.000153	0.000237	0.000028	0.000119	-0.000100	0.000303
	0.000003	0.000208	0.000288	0.000186	-0.000180	-0.000094	-0.000093	-0.000072	-0.000164	-0.000059
	0.000067	0.000199	0.000209	0.000167	-0.000043	0.000535	0.000231	0.000205	0.000061	0.000552
Oct-10	0.000070	0.000168	0.000246	0.000156	-0.000070	0.000597	0.000138	0.000131	-0.000050	0.000505
	0.000056	0.000246	0.000303	0.000198	-0.000103	0.000677	0.000288	0.000196	0.000008	0.000627

	0.000005	0.000193	0.000286	0.000165	-0.000148	0.000237	0.000028	0.000121	-0.000100	0.000308
	0.000007	0.000212	0.000294	0.000194	-0.000174	-0.000103	-0.000101	-0.000083	-0.000174	-0.000067
	0.000069	0.000203	0.000211	0.000169	-0.000042	0.000552	0.000242	0.000221	0.000072	0.000567
Nov-10	0.000069	0.000165	0.000244	0.000153	-0.000070	0.000587	0.000131	0.000120	-0.000058	0.000496
	0.000054	0.000243	0.000300	0.000195	-0.000105	0.000673	0.000287	0.000195	0.000008	0.000620
	0.000003	0.000192	0.000284	0.000164	-0.000148	0.000232	0.000025	0.000116	-0.000103	0.000301
	0.000009	0.000212	0.000296	0.000196	-0.000170	-0.000095	-0.000098	-0.000076	-0.000168	-0.000063
	0.000067	0.000199	0.000209	0.000167	-0.000043	0.000549	0.000240	0.000220	0.000072	0.000562
Dec-10	0.000068	0.000167	0.000245	0.000156	-0.000071	0.000582	0.000124	0.000113	-0.000068	0.000492
	0.000052	0.000244	0.000300	0.000198	-0.000106	0.000668	0.000282	0.000189	0.000003	0.000613
	0.000005	0.000194	0.000286	0.000167	-0.000147	0.000222	0.000013	0.000105	-0.000118	0.000292
	0.000005	0.000210	0.000294	0.000195	-0.000173	-0.000107	-0.000113	-0.000092	-0.000187	-0.000077
	0.000078	0.000211	0.000219	0.000179	-0.000034	0.000541	0.000233	0.000211	0.000062	0.000554
Jan-11	0.000074	0.000173	0.000250	0.000162	-0.000064	0.000583	0.000125	0.000114	-0.000067	0.000495
	0.000052	0.000245	0.000300	0.000197	-0.000107	0.000674	0.000287	0.000192	0.000006	0.000622
	0.000012	0.000201	0.000293	0.000173	-0.000140	0.000235	0.000021	0.000115	-0.000109	0.000309
	0.000003	0.000210	0.000291	0.000194	-0.000176	-0.000124	-0.000127	-0.000116	-0.000205	-0.000089
	0.000078	0.000208	0.000220	0.000177	-0.000033	0.000546	0.000235	0.000211	0.000064	0.000558
Feb-11	0.000078	0.000177	0.000253	0.000166	-0.000061	0.000579	0.000121	0.000113	-0.000070	0.000492
	0.000058	0.000250	0.000304	0.000202	-0.000102	0.000687	0.000301	0.000203	0.000020	0.000630
	0.000017	0.000204	0.000296	0.000179	-0.000135	0.000226	0.000008	0.000107	-0.000121	0.000301
	0.000013	0.000220	0.000299	0.000205	-0.000166	-0.000128	-0.000130	-0.000120	-0.000207	-0.000092
	0.000083	0.000212	0.000224	0.000181	-0.000029	0.000540	0.000229	0.000209	0.000059	0.000554
Mar-11	0.000078	0.000179	0.000254	0.000166	-0.000061	0.000574	0.000116	0.000110	-0.000075	0.000488
	0.000061	0.000256	0.000308	0.000206	-0.000099	0.000684	0.000299	0.000201	0.000017	0.000625
	0.000019	0.000209	0.000299	0.000181	-0.000132	0.000230	0.000012	0.000113	-0.000117	0.000309
	0.000008	0.000216	0.000295	0.000200	-0.000171	-0.000109	-0.000113	-0.000102	-0.000189	-0.000072
	0.000080	0.000211	0.000222	0.000178	-0.000031	0.000538	0.000228	0.000206	0.000057	0.000550
Apr-11	0.000079	0.000179	0.000254	0.000167	-0.000058	0.000586	0.000133	0.000124	-0.000061	0.000492
	0.000064	0.000259	0.000312	0.000211	-0.000093	0.000693	0.000314	0.000211	0.000027	0.000629
	0.000022	0.000214	0.000302	0.000188	-0.000126	0.000238	0.000026	0.000124	-0.000109	0.000311
	0.000013	0.000221	0.000301	0.000206	-0.000163	-0.000093	-0.000092	-0.000085	-0.000171	-0.000057

	0.000076	0.000207	0.000220	0.000174	-0.000036	0.000552	0.000245	0.000221	0.000070	0.000559
May-11	0.000097	0.000195	0.000272	0.000185	-0.000040	0.000608	0.000155	0.000142	-0.000038	0.000511
	0.000080	0.000274	0.000327	0.000227	-0.000077	0.000690	0.000311	0.000212	0.000025	0.000627
	0.000040	0.000232	0.000320	0.000205	-0.000108	0.000271	0.000056	0.000148	-0.000077	0.000338
	0.000046	0.000252	0.000333	0.000240	-0.000130	-0.000047	-0.000048	-0.000050	-0.000126	-0.000017
	0.000074	0.000203	0.000217	0.000171	-0.000035	0.000573	0.000266	0.000239	0.000091	0.000581
Jun-11	0.000099	0.000199	0.000274	0.000188	-0.000036	0.000617	0.000167	0.000149	-0.000029	0.000523
	0.000083	0.000279	0.000330	0.000232	-0.000072	0.000674	0.000293	0.000193	0.000007	0.000611
	0.000050	0.000244	0.000329	0.000218	-0.000098	0.000271	0.000059	0.000148	-0.000075	0.000340
	0.000048	0.000254	0.000334	0.000244	-0.000126	-0.000029	-0.000025	-0.000032	-0.000107	0.000004
	0.000075	0.000203	0.000218	0.000172	-0.000033	0.000576	0.000268	0.000240	0.000092	0.000583
Jul-11	0.000090	0.000191	0.000264	0.000178	-0.000047	0.000614	0.000167	0.000149	-0.000030	0.000524
	0.000080	0.000278	0.000327	0.000230	-0.000076	0.000675	0.000300	0.000197	0.000011	0.000616
	0.000039	0.000235	0.000319	0.000208	-0.000110	0.000266	0.000056	0.000146	-0.000078	0.000338
	0.000051	0.000260	0.000339	0.000250	-0.000121	-0.000058	-0.000049	-0.000057	-0.000131	-0.000023
	0.000077	0.000205	0.000219	0.000173	-0.000032	0.000558	0.000256	0.000226	0.000078	0.000569
Aug-11	0.000049	0.000151	0.000223	0.000141	-0.000089	0.000575	0.000130	0.000111	-0.000068	0.000486
	0.000038	0.000236	0.000284	0.000192	-0.000118	0.000653	0.000280	0.000177	-0.000008	0.000596
	0.000008	0.000203	0.000287	0.000177	-0.000141	0.000254	0.000045	0.000133	-0.000090	0.000326
	0.000000	0.000209	0.000287	0.000203	-0.000174	-0.000023	-0.000015	-0.000024	-0.000098	0.000012
	0.000044	0.000172	0.000186	0.000142	-0.000065	0.000521	0.000221	0.000192	0.000044	0.000533
Sep-11	0.000068	0.000171	0.000247	0.000164	-0.000070	0.000573	0.000139	0.000111	-0.000069	0.000486
	0.000046	0.000245	0.000299	0.000204	-0.000106	0.000669	0.000300	0.000180	-0.000013	0.000622
	0.000014	0.000208	0.000297	0.000186	-0.000129	0.000260	0.000052	0.000136	-0.000091	0.000336
	0.000009	0.000220	0.000306	0.000216	-0.000163	0.000064	0.000078	0.000059	-0.000010	0.000096
	0.000052	0.000179	0.000196	0.000149	-0.000050	0.000524	0.000228	0.000191	0.000041	0.000536
Oct-11	0.000074	0.000180	0.000258	0.000173	-0.000060	0.000628	0.000186	0.000156	-0.000037	0.000545
	0.000051	0.000255	0.000310	0.000213	-0.000099	0.000714	0.000328	0.000208	-0.000005	0.000674
	0.000027	0.000226	0.000315	0.000203	-0.000115	0.000313	0.000096	0.000180	-0.000054	0.000394
	0.000025	0.000245	0.000327	0.000239	-0.000142	0.000076	0.000091	0.000069	0.000002	0.000104
	0.000058	0.000187	0.000205	0.000157	-0.000043	0.000554	0.000251	0.000215	0.000053	0.000570

Nov-11	0.000077	0.000184	0.000263	0.000180	-0.000056	0.000664	0.000238	0.000188	-0.000005	0.000578
	0.000066	0.000272	0.000328	0.000232	-0.000081	0.000737	0.000364	0.000229	0.000016	0.000695
	0.000041	0.000243	0.000333	0.000222	-0.000101	0.000353	0.000146	0.000217	-0.000016	0.000427
	0.000033	0.000255	0.000339	0.000253	-0.000134	0.000091	0.000107	0.000079	0.000008	0.000123
	0.000049	0.000180	0.000198	0.000151	-0.000052	0.000579	0.000283	0.000236	0.000075	0.000594
Dec-11	0.000058	0.000172	0.000252	0.000169	-0.000069	0.000650	0.000220	0.000173	-0.000027	0.000568
	0.000050	0.000262	0.000319	0.000225	-0.000090	0.000742	0.000366	0.000231	0.000011	0.000703
	0.000009	0.000213	0.000299	0.000197	-0.000130	0.000353	0.000141	0.000217	-0.000025	0.000439
	0.000028	0.000257	0.000344	0.000261	-0.000128	0.000044	0.000064	0.000040	-0.000034	0.000083
	0.000050	0.000184	0.000206	0.000161	-0.000038	0.000564	0.000265	0.000217	0.000049	0.000581

Table A.19 Portfolio weights of group 1 derived by optimal utility method (moving average) where country 1 is Thailand, 2 is US, 3 is UK, 4 is Canada, 5 is Germany, and 6 is Japan from April 2008 to December 2011

Period	p1	p2	p3	p4	p5	p6
Apr-08	0.5	-0.5	0.5	0.5	0.5	-0.5
May-08	0.5	-0.5	0.5	0.5	0.5	-0.5
Jun-08	0.5	-0.5	0.5	0.5	0.5	-0.5
Jul-08	0.5	-0.5	0.5	0.5	0.5	-0.5
Aug-08	0.5	-0.5	0.5	0.5	0.5	-0.5
Sep-08	0.5	-0.5	0.077637	0.5	0.5	-0.07764
Oct-08	0.5	-0.5	-0.5	0.5	0.5	0.5
Nov-08	0.164871	-0.5	-0.05071	0.5	0.5	0.38584
Dec-08	0.160425	-0.5	-0.16043	0.5	0.5	0.5
Jan-09	0.5	-0.5	-0.5	0.5	0.5	0.5
Feb-09	0.5	-0.5	-0.5	0.5	0.5	0.5
Mar-09	0.196299	-0.1963	-0.5	0.5	0.5	0.5
Apr-09	0.375256	0.5	-0.5	0.5	0.5	-0.37526
May-09	0.5	-0.5	-0.5	0.5	0.5	0.5
Jun-09	0.5	-0.5	-0.5	0.5	0.5	0.5
Jul-09	0.5	-0.5	-0.5	0.5	0.5	0.5
Aug-09	0.5	-0.5	-0.5	0.5	0.5	0.5
Sep-09	0.5	-0.4312	-0.5	0.5	0.5	0.431204
Oct-09	0.5	0.429643	-0.42964	0.5	0.5	-0.5
Nov-09	0.5	0.351452	-0.35145	0.5	0.5	-0.5
Dec-09	0.5	-0.31441	0.314412	0.5	0.5	-0.5
Jan-10	0.5	0.305003	-0.305	0.5	0.5	-0.5
Feb-10	0.5	0.5	-0.5	0.5	0.5	-0.5
Mar-10	0.5	0.5	-0.5	0.5	0.5	-0.5
Apr-10	0.5	0.5	-0.5	0.5	0.5	-0.5
May-10	0.5	0.5	-0.5	0.5	0.5	-0.5
Jun-10	0.5	0.5	-0.5	0.5	0.5	-0.5
Jul-10	0.5	0.5	-0.5	0.5	0.5	-0.5
Aug-10	0.5	0.5	-0.5	0.5	0.5	-0.5
Sep-10	0.5	0.5	-0.5	0.5	0.5	-0.5
Oct-10	0.5	0.5	-0.5	0.5	0.5	-0.5

Nov-10	0.5	0.5	-0.5	0.5	0.5	-0.5
Dec-10	0.5	0.5	-0.5	0.5	0.5	-0.5
Jan-11	0.5	0.5	-0.5	0.5	0.5	-0.5
Feb-11	0.5	0.5	-0.5	0.5	0.5	-0.5
Mar-11	0.5	0.5	-0.5	0.5	0.5	-0.5
Apr-11	0.5	0.5	-0.5	0.5	0.5	-0.5
May-11	0.5	0.5	-0.5	0.5	0.5	-0.5
Jun-11	0.5	0.5	-0.5	0.5	0.5	-0.5
Jul-11	0.5	0.5	-0.5	0.5	0.5	-0.5
Aug-11	0.5	0.5	-0.5	0.5	0.5	-0.5
Sep-11	0.5	0.040299	-0.5	0.5	0.5	-0.0403
Oct-11	0.5	0.5	-0.5	0.5	0.5	-0.5
Nov-11	0.5	0.5	-0.5	0.5	0.46161	-0.46161
Dec-11	0.5	0.5	-0.5	0.5	0.088875	-0.08887

Table A.20 Portfolio weights of group 1 derived by optimal utility method (regression) where country 1 is Thailand, 2 is US, 3 is UK, 4 is Canada, 5 is Germany, and 6 is Japan from April 2008 to December 2011

Period	p1	p2	p3	p4	p5	p6
Apr-08	-0.5	0.5	0.5	0.5	-0.5	0.5
May-08	-0.5	0.5	0.5	0.5	-0.5	0.5
Jun-08	0.5	-0.5	0.5	0.5	-0.5	0.5
Jul-08	-0.5	0.5	-0.5	0.5	0.5	0.5
Aug-08	-0.5	0.5	-0.5	0.5	0.5	0.5
Sep-08	0.499999	0.5	-0.5	0.5	-0.5	0.500001
Oct-08	0.5	-0.5	0.5	0.5	-0.5	0.5
Nov-08	0.5	0.5	0.5	0.5	-0.5	-0.5
Dec-08	-0.5	0.5	0.5	0.5	-0.5	0.5
Jan-09	-0.5	-0.5	0.5	0.5	0.5	0.5
Feb-09	0.5	-0.5	0.5	0.5	-0.5	0.5
Mar-09	-0.5	0.5	-0.5	0.5	0.5	0.5
Apr-09	-0.5	0.5	0.5	0.5	0.5	-0.5
May-09	-0.5	0.5	0.5	0.5	0.5	-0.5
Jun-09	0.5	0.5	-0.5	0.5	0.5	-0.5
Jul-09	0.5	0.5	-0.5	0.5	0.5	-0.5
Aug-09	0.5	0.5	-0.5	-0.5	0.5	0.5
Sep-09	0.5	0.5	-0.5	0.5	-0.5	0.5
Oct-09	0.5	0.5	0.5	-0.5	-0.5	0.5
Nov-09	0.5	0.5	0.5	-0.09851	-0.5	0.098513
Dec-09	0.5	0.5	0.5	-0.5	0.5	-0.5
Jan-10	0.5	-0.5	0.5	-0.5	0.5	0.5
Feb-10	0.5	0.5	0.5	-0.5	-0.5	0.5
Mar-10	-0.5	0.5	0.5	-0.5	0.5	0.5
Apr-10	0.5	-0.5	0.5	-0.5	0.5	0.5
May-10	0.5	-0.5	0.5	-0.5	0.5	0.5
Jun-10	0.5	-0.5	0.5	-0.5	0.5	0.5
Jul-10	0.5	-0.5	0.5	0.5	0.5	-0.5
Aug-10	0.5	-0.5	0.5	0.5	-0.5	0.5
Sep-10	-0.5	0.499999	0.5	0.5	-0.5	0.5
Oct-10	-0.5	-0.5	0.5	0.5	0.5	0.5

Nov-10	0.5	0.5	0.5	0.5	-0.5	-0.5
Dec-10	0.5	0.5	0.5	0.5	-0.5	-0.5
Jan-11	0.5	-0.5	-0.5	0.5	0.5	0.5
Feb-11	-0.5	-0.5	0.5	0.5	0.5	0.5
Mar-11	-0.5	0.5	0.5	0.5	-0.5	0.5
Apr-11	0.5	0.5	-0.31899	-0.5	0.318987	0.5
May-11	0.5	0.5	-0.5	-0.5	0.5	0.5
Jun-11	0.5	-0.5	0.5	-0.5	0.5	0.5
Jul-11	-0.5	-0.5	0.5	0.5	0.5	0.5
Aug-11	0.5	-0.5	0.5	0.5	-0.5	0.5
Sep-11	0.5	-0.5	0.5	0.5	-0.5	0.5
Oct-11	-0.5	0.5	-0.5	0.5	0.5	0.5
Nov-11	0.5	0.5	-0.5	0.5	-0.5	0.5
Dec-11	0.5	0.5	-0.5	0.5	-0.5	0.5

Table A.21 Portfolio weights of group 2 derived by optimal utility method (moving average) where country 1 is Thailand, 2 is Brazil, 3 is Russia, 4 is India, 5 is China, and 6 is South Africa from April 2008 to December 2011

Period	p1	p2	p3	p4	p5	p6
Apr-08	-0.5	0.5	0.5	0.5	0.5	-0.5
May-08	-0.5	0.5	0.5	0.5	0.5	-0.5
Jun-08	-0.5	0.5	0.5	0.5	0.159077	-0.15908
Jul-08	-0.5	0.5	0.5	0.5	0.5	-0.5
Aug-08	-0.5	0.5	0.5	0.5	0.5	-0.5
Sep-08	-0.5	0.5	0.5	0.5	0.5	-0.5
Oct-08	-0.5	0.5	0.5	0.5	0.5	-0.5
Nov-08	-0.5	0.5	0.5	0.5	0.5	-0.5
Dec-08	-0.5	0.5	0.5	0.5	0.5	-0.5
Jan-09	-0.5	0.5	0.5	0.5	0.5	-0.5
Feb-09	-0.5	0.5	0.369532	0.5	0.5	-0.36953
Mar-09	-0.5	0.5	0.31849	0.5	0.5	-0.31849
Apr-09	-0.5	0.5	0.5	0.5	0.5	-0.5
May-09	-0.5	0.5	0.5	0.5	0.5	-0.5
Jun-09	-0.5	0.5	0.5	0.5	0.5	-0.5
Jul-09	-0.5	0.5	0.5	0.5	0.5	-0.5
Aug-09	-0.5	0.5	0.475959	0.5	0.5	-0.47596
Sep-09	-0.5	0.5	0.207694	0.5	0.5	-0.20769
Oct-09	-0.25187	0.5	0.251868	0.5	0.5	-0.5
Nov-09	-0.5	0.5	0.425484	0.5	0.5	-0.42548
Dec-09	-0.40422	0.5	0.197085	0.5	0.5	-0.29286
Jan-10	-0.227	0.5	0.227004	0.5	0.5	-0.5
Feb-10	-0.26598	0.5	0.265985	0.5	0.5	-0.5
Mar-10	0.198032	0.5	-0.21315	0.5	0.5	-0.48488
Apr-10	0.212682	0.5	-0.21268	0.5	0.5	-0.5
May-10	0.235433	0.5	-0.38885	0.5	0.5	-0.34658
Jun-10	0.415602	0.5	-0.4156	0.5	0.5	-0.5
Jul-10	0.5	0.5	-0.5	0.5	0.5	-0.5
Aug-10	0.5	0.5	-0.5	0.5	0.5	-0.5
Sep-10	0.5	0.5	-0.5	0.5	0.5	-0.5
Oct-10	0.5	0.5	-0.5	0.5	0.5	-0.5

Nov-10	0.5	0.5	-0.5	0.384794	0.5	-0.38479
Dec-10	0.5	0.5	-0.5	0.5	0.266221	-0.26622
Jan-11	0.5	0.5	-0.5	0.338684	0.182397	-0.02108
Feb-11	0.5	0.5	-0.5	0.5	0.239403	-0.2394
Mar-11	0.5	0.5	-0.5	0.5	0.102019	-0.10202
Apr-11	0.5	0.5	-0.5	0.5	-0.35206	0.352059
May-11	0.5	0.5	-0.5	0.5	-0.5	0.5
Jun-11	0.5	0.5	-0.36124	0.5	-0.27103	0.132271
Jul-11	0.5	0.5	-0.5	0.5	-0.5	0.5
Aug-11	0.5	0.5	-0.45154	0.451543	-0.5	0.5
Sep-11	0.5	0.5	-0.28422	0.284219	-0.5	0.5
Oct-11	0.5	0.5	-0.5	0.5	-0.5	0.5
Nov-11	0.5	0.5	-0.29069	0.009452	-0.21876	0.5
Dec-11	0.5	0.5	0.052854	-0.25228	-0.30058	0.5

Table A.22 Portfolio weights of group 2 derived by optimal utility method (regression) where country 1 is Thailand, 2 is Brazil, 3 is Russia, 4 is India, 5 is China, and 6 is South Africa from April 2008 to December 2011

Period	p1	p2	p3	p4	p5	p6
Apr-08	0.5	0.5	0.5	-0.5	-0.5	0.5
May-08	0.5	0.5	0.5	0.5	-0.5	-0.5
Jun-08	0.5	0.5	0.5	-0.5	-0.5	0.5
Jul-08	-0.5	0.5	0.5	0.5	0.412557	-0.41256
Aug-08	-0.5	-0.5	0.5	0.5	0.5	0.5
Sep-08	0.5	-0.5	-0.5	0.5	0.5	0.5
Oct-08	0.5	-0.5	0.5	-0.5	0.5	0.5
Nov-08	0.5	-0.5	-0.5	0.5	0.5	0.5
Dec-08	0.5	-0.5	-0.5	0.5	0.5	0.5
Jan-09	-0.5	0.5	-0.5	0.5	0.5	0.5
Feb-09	-0.5	0.5	-0.5	0.5	0.5	0.5
Mar-09	-0.5	0.5	0.5	0.5	0.5	-0.5
Apr-09	-0.5	0.146566	0.5	0.5	0.5	-0.14657
May-09	-0.5	0.5	0.5	0.5	0.5	-0.5
Jun-09	-0.5	-0.5	0.5	0.5	0.5	0.5
Jul-09	0.5	-0.5	-0.5	0.5	0.5	0.5
Aug-09	-0.5	-0.5	0.5	0.5	0.5	0.5
Sep-09	0.5	-0.5	0.5	0.5	-0.5	0.5
Oct-09	0.5	-0.5	0.5	0.5	-0.5	0.5
Nov-09	0.5	0.5	0.5	-0.5	-0.5	0.5
Dec-09	0.5	-0.5	0.5	0.5	-0.5	0.5
Jan-10	0.5	0.5	0.5	-0.5	-0.5	0.5
Feb-10	0.5	0.5	0.5	-0.5	-0.5	0.5
Mar-10	0.5	0.5	-0.32284	-0.5	0.322837	0.5
Apr-10	0.5	0.5	0.5	-0.5	-0.5	0.5
May-10	0.5	0.5	0.5	-0.5	-0.5	0.5
Jun-10	0.5	0.5	0.5	-0.5	-0.5	0.5
Jul-10	0.5	0.5	0.5	-0.5	-0.5	0.5
Aug-10	0.5	0.5	0.5	-0.5	-0.5	0.5
Sep-10	0.5	0.5	0.5	-0.5	-0.5	0.5
Oct-10	0.5	-0.5	0.5	0.5	-0.5	0.5

Nov-10	0.5	0.5	0.5	-0.5	-0.5	0.5
Dec-10	0.5	0.5	0.5	-0.5	-0.5	0.5
Jan-11	0.5	-0.5	0.5	0.5	-0.5	0.5
Feb-11	-0.5	0.5	0.5	0.5	-0.5	0.5
Mar-11	0.181144	0.259476	0.5	0.059381	-0.5	0.5
Apr-11	0.5	-0.5	0.5	0.5	-0.5	0.5
May-11	0.5	0.5	-0.5	-0.5	0.5	0.5
Jun-11	0.5	0.5	-0.5	-0.5	0.499999	0.5
Jul-11	0.5	-0.5	0.5	-0.5	0.5	0.5
Aug-11	0.5	-0.5	0.5	-0.5	0.5	0.5
Sep-11	0.5	0.5	-0.5	-0.5	0.5	0.5
Oct-11	-0.5	0.5	-0.5	0.5	0.5	0.5
Nov-11	0.5	0.215352	0.5	-0.5	-0.21535	0.5
Dec-11	0.5	0.5	-0.5	-0.5	0.5	0.5

Table A.23 Universal hedging ratios calculated by using expected returns estimated by moving average method and regression method from April 2008 to December 2011

Period	h (moving average)	h (regression)
Apr-08	0.696603	1
May-08	0.722003	0
Jun-08	0.582236	1
Jul-08	0.564813	1
Aug-08	0.540616	1
Sep-08	0.043732	1
Oct-08	1	1
Nov-08	1	1
Dec-08	1	0.60768
Jan-09	1	1
Feb-09	1	1
Mar-09	1	0.881839
Apr-09	1	0.940972
May-09	1	0.939154
Jun-09	1	0.917924
Jul-09	0	0.93675
Aug-09	1	0.910466
Sep-09	0	0.831692
Oct-09	0	1
Nov-09	0	0.540565
Dec-09	0	1
Jan-10	1	1
Feb-10	1	1
Mar-10	1	1
Apr-10	1	1
May-10	1	1
Jun-10	1	1
Jul-10	1	1
Aug-10	1	1
Sep-10	1	1
Oct-10	1	1
Nov-10	1	1

Dec-10	1	0.475995
Jan-11	1	1
Feb-11	1	1
Mar-11	1	1
Apr-11	1	1
May-11	1	1
Jun-11	1	1
Jul-11	1	1
Aug-11	1	1
Sep-11	1	1
Oct-11	1	1
Nov-11	1	1
Dec-11	1	1

Table A.24 Optimal utility hedging ratios of group 1 calculated by using expected returns estimated by moving average method and regression method where country 2 is US, 3 is UK, 4 is Canada, 5 is Germany, and 6 is Japan from April 2008 to December 2011

Period	Moving average					Regression				
	h2	h3	h4	h5	h6	h2	h3	h4	h5	h6
Apr-08	0	0	0	0	1	0	1	1	1	1
May-08	0	0	0	0	1	0	1	1	1	1
Jun-08	0	0	0	0	1	0	1	1	1	1
Jul-08	0	0	0	0	1	0	1	1	1	1
Aug-08	0	1	0	0	1	0	1	1	1	1
Sep-08	0	1	1	0	1	0	1	1	0	1
Oct-08	0	1	1	0	1	0	1	1	0	1
Nov-08	0	1	1	1	1	0	1	1	0	1
Dec-08	0	1	1	0	1	0	1	1	0	1
Jan-09	0	1	1	0	1	0	1	1	0	1
Feb-09	0	1	1	0	1	0	1	1	1	1
Mar-09	0	1	1	0	1	0	0	1	1	1
Apr-09	0	1	1	0	1	0	0	1	1	1
May-09	0	1	1	0	1	0	0	0	1	1
Jun-09	0	1	1	0	1	0	0	0	1	1
Jul-09	0	1	1	0	1	0	0	0	1	1
Aug-09	0	1	1	0	1	0	0	0	1	1
Sep-09	0	1	1	0	1	0	0	0	1	1
Oct-09	0	1	1	0	1	0	0	0	1	1
Nov-09	0	1	1	0	1	0	0	0	1	1
Dec-09	1	1	1	0	1	0	0	0	1	0
Jan-10	0	1	1	0	1	0	0	0	1	1
Feb-10	0	1	0	0	1	0	0	0	1	0
Mar-10	1	1	0	0	1	0	0	0	1	0
Apr-10	1	1	0	1	0	0	0	0	1	0
May-10	1	1	0	1	0	0	0	0	1	0
Jun-10	0	1	0	1	0	1	0	0	1	0
Jul-10	1	1	0	1	0	0	0	0	1	0
Aug-10	1	1	0	1	0	0	0	1	1	1

Sep-10	1	1	0	1	0	0	0	1	1	1
Oct-10	1	1	0	1	0	0	0	1	1	1
Nov-10	1	1	0	1	0	0	0	1	1	1
Dec-10	1	1	0	1	0	0	0	1	1	1
Jan-11	1	1	0	1	0	0	0	1	1	1
Feb-11	1	1	0	1	0	0	0	1	1	1
Mar-11	1	1	0	1	0	0	0	1	1	1
Apr-11	1	1	0	1	0	0	1	1	0	1
May-11	1	1	0	1	0	0	1	1	1	1
Jun-11	1	1	0	1	0	0	1	1	1	1
Jul-11	1	1	0	1	0	0	1	1	1	1
Aug-11	1	1	0	1	0	0	1	0	1	1
Sep-11	1	1	0	1	0	0	1	1	1	1
Oct-11	1	1	0	1	0	0	1	0	1	1
Nov-11	1	1	0	1	0	0	1	0	1	1
Dec-11	1	1	0	1	0	0	1	0	1	1

Table A.25 Optimal utility hedging ratios of group 2 calculated by using expected returns estimated by moving average method and regression method where country 2 is Brazil, 3 is Russia, 4 is India, 5 is China, and 6 is South Africa from April 2008 to December 2011

Period	Moving average					Regression				
	h2	h3	h4	h5	h6	h2	h3	h4	h5	h6
Apr-08	0	0	0	1	1	1	1	0	0	0
May-08	0	0	0	1	1	1	1	0	0	1
Jun-08	0	0	0	1	1	1	1	0	0	1
Jul-08	0	0	0	1	1	1	1	0	0	1
Aug-08	0	0	0	1	1	0	1	0	0	1
Sep-08	0	1	0	1	1	0	1	0	0	1
Oct-08	0	1	0	1	1	0	1	0	0	1
Nov-08	0	1	0	1	1	0	1	0	0	1
Dec-08	0	1	0	1	1	0	0	1	1	1
Jan-09	0	1	0	1	1	0	0	1	1	1
Feb-09	0	0	0	1	1	0	0	1	1	1
Mar-09	0	0	0	1	1	0	0	1	1	1
Apr-09	0	0	1	1	1	1	0	1	1	1
May-09	0	0	1	1	1	1	0	1	1	1
Jun-09	0	0	1	1	1	1	0	1	1	1
Jul-09	0	0	1	1	1	1	0	1	1	1
Aug-09	0	0	1	1	1	1	0	1	1	1
Sep-09	0	0	1	1	1	1	0	1	1	1
Oct-09	0	0	1	1	1	1	0	1	1	0
Nov-09	0	0	1	1	1	1	0	1	1	0
Dec-09	0	0	1	1	1	1	0	1	1	0
Jan-10	0	0	1	1	1	1	1	0	0	0
Feb-10	0	0	1	1	1	1	1	0	0	0
Mar-10	0	0	1	1	1	1	1	0	0	1
Apr-10	0	0	1	1	1	0	1	0	0	1
May-10	0	0	1	1	1	0	1	0	0	1
Jun-10	0	0	1	1	1	0	1	0	0	1
Jul-10	0	0	1	1	1	0	1	0	0	1
Aug-10	0	0	1	1	1	0	1	0	0	1

Sep-10	0	0	1	1	1	0	1	0	0	0
Oct-10	0	0	1	1	1	0	1	0	0	0
Nov-10	0	0	1	1	1	0	1	0	0	0
Dec-10	0	0	1	1	1	0	1	0	0	0
Jan-11	0	0	1	1	1	0	1	0	0	0
Feb-11	0	0	1	1	1	0	1	0	0	0
Mar-11	0	0	1	1	1	0	1	0	0	0
Apr-11	0	0	1	1	1	0	1	1	0	0
May-11	0	0	1	1	1	0	1	1	1	0
Jun-11	0	0	1	1	1	1	1	1	1	0
Jul-11	0	0	1	1	1	1	0	1	1	0
Aug-11	0	0	1	1	1	1	0	1	1	0
Sep-11	0	0	1	1	1	0	0	1	1	0
Oct-11	0	0	1	1	1	0	1	1	1	0
Nov-11	0	0	1	1	1	0	1	1	1	0
Dec-11	0	0	1	1	1	0	1	1	0	0

Table A.26 Forward premium hedging ratios of group 1 (where country 2 is US, 3 is UK, 4 is Canada, 5 is Germany, and 6 is Japan) and group 2 (where country 2 is Brazil, 3 is Russia, 4 is India, 5 is China, and 6 is South Africa) from April 2008 to December 2011

Period	Group 1					Goup 2				
	h2	h3	h4	h5	h6	h2	h3	h4	h5	h6
Apr-08	0	1	1	1	0	1	1	1	1	1
May-08	0	1	1	1	0	1	1	1	1	1
Jun-08	0	1	1	1	0	1	1	1	1	1
Jul-08	0	1	0	1	0	1	1	1	1	1
Aug-08	0	1	0	1	0	1	1	1	1	1
Sep-08	0	1	0	0	0	1	1	1	1	1
Oct-08	0	1	0	0	0	1	1	1	1	1
Nov-08	0	0	0	0	0	1	1	1	0	1
Dec-08	0	0	0	0	0	1	1	1	1	1
Jan-09	0	0	0	1	0	1	1	1	1	1
Feb-09	0	0	0	1	0	1	1	1	1	1
Mar-09	0	0	0	1	0	1	1	1	1	1
Apr-09	0	0	0	1	0	1	1	1	1	1
May-09	0	0	0	1	0	1	1	1	1	1
Jun-09	0	0	0	1	0	1	1	1	1	1
Jul-09	0	0	0	1	0	1	1	1	1	1
Aug-09	0	0	0	1	0	1	1	1	1	1
Sep-09	0	0	0	1	0	1	1	1	1	1
Oct-09	0	0	0	1	0	1	1	1	1	1
Nov-09	0	0	0	1	0	1	1	1	1	1
Dec-09	0	0	0	1	0	1	1	1	1	1
Jan-10	0	0	0	1	0	1	1	1	1	1
Feb-10	0	0	0	1	0	1	1	1	1	1
Mar-10	0	0	0	1	0	1	1	1	1	1
Apr-10	0	0	0	1	0	1	1	1	1	1
May-10	0	0	0	1	0	1	1	1	1	1
Jun-10	0	0	0	1	0	1	1	1	1	1
Jul-10	0	0	0	1	0	1	1	1	1	1
Aug-10	0	0	0	1	0	1	1	1	1	1

Sep-10	0	0	0	1	0	1	1	1	1	1
Oct-10	0	0	0	1	0	1	1	1	1	1
Nov-10	0	0	0	1	0	1	1	1	1	1
Dec-10	0	0	0	0	0	1	1	1	1	1
Jan-11	0	0	0	0	0	1	1	1	1	1
Feb-11	0	0	0	0	0	1	1	1	1	1
Mar-11	0	0	0	0	0	1	1	1	1	1
Apr-11	0	0	0	0	0	1	1	1	1	1
May-11	0	0	0	0	0	1	1	1	1	1
Jun-11	0	0	0	0	0	1	1	1	1	1
Jul-11	0	0	0	0	0	1	1	1	1	1
Aug-11	0	0	0	0	0	1	1	1	0	1
Sep-11	0	0	0	0	0	1	1	1	0	1
Oct-11	0	0	0	0	0	1	1	1	0	1
Nov-11	0	0	0	0	0	1	1	1	1	1
Dec-11	0	0	0	0	0	1	1	1	1	1

Table A.27 Technical analysis (moving average) hedging ratios of group 1 (where country 2 is US, 3 is UK, 4 is Canada, 5 is Germany, and 6 is Japan) and group 2 (where country 2 is Brazil, 3 is Russia, 4 is India, 5 is China, and 6 is South Africa) from April 2008 to December 2011

Period	Group 1					Group 2				
	h2	h3	h4	h5	h6	h2	h3	h4	h5	h6
Apr-08	1	1	0	0	1	0	1	1	1	1
May-08	1	1	1	0	0	0	1	1	1	1
Jun-08	1	1	0	0	0	0	0	1	0	1
Jul-08	1	1	0	0	0	0	0	1	0	1
Aug-08	1	1	0	0	0	0	0	1	0	1
Sep-08	0	0	0	0	0	0	0	1	0	1
Oct-08	0	0	0	0	0	0	0	1	0	1
Nov-08	0	1	0	0	0	0	0	1	0	1
Dec-08	0	1	0	0	0	0	0	1	0	1
Jan-09	0	1	1	0	0	1	0	1	0	1
Feb-09	0	1	1	1	0	1	1	1	0	1
Mar-09	0	1	1	1	0	1	1	1	0	1
Apr-09	0	1	1	1	0	1	1	1	0	1
May-09	0	1	1	1	0	1	1	1	0	1
Jun-09	0	1	1	1	0	1	1	1	0	1
Jul-09	0	1	1	1	0	1	1	1	0	1
Aug-09	0	1	1	1	0	1	1	1	0	0
Sep-09	0	1	1	1	0	1	1	1	0	0
Oct-09	0	1	0	0	0	0	1	1	0	0
Nov-09	1	1	0	0	0	0	1	1	0	0
Dec-09	1	1	0	0	0	0	1	1	1	0
Jan-10	1	1	0	0	0	0	1	1	1	0
Feb-10	1	1	0	0	0	0	1	1	1	0
Mar-10	1	1	0	0	0	0	1	1	1	0
Apr-10	1	1	0	1	0	0	1	0	1	0
May-10	1	1	0	1	1	0	1	0	1	0
Jun-10	1	1	0	1	1	0	1	0	1	0
Jul-10	1	1	0	1	1	0	1	0	1	0
Aug-10	1	1	0	1	1	0	1	1	1	0

Sep-10	1	1	0	1	1	0	1	1	1	0
Oct-10	1	1	0	1	1	0	1	1	1	0
Nov-10	1	1	1	1	1	0	1	1	1	0
Dec-10	1	1	1	1	1	0	1	1	1	1
Jan-11	1	1	1	1	1	0	1	1	1	0
Feb-11	1	1	1	1	1	0	1	1	1	0
Mar-11	1	1	1	1	1	0	1	1	1	1
Apr-11	1	1	1	1	1	0	1	1	1	1
May-11	1	1	1	1	1	0	0	1	1	0
Jun-11	1	1	0	1	0	0	0	1	1	0
Jul-11	1	1	0	0	0	0	0	0	1	0
Aug-11	1	1	0	0	0	0	0	0	1	0
Sep-11	1	0	0	0	0	0	0	0	1	0
Oct-11	1	0	0	0	0	0	0	0	1	0
Nov-11	1	0	1	0	0	0	0	1	0	1
Dec-11	1	0	1	0	0	0	1	1	1	0

Table A.28 Technical analysis (MACD) hedging ratios of group 1 (where country 2 is US, 3 is UK, 4 is Canada, 5 is Germany, and 6 is Japan) and group 2 (where country 2 is Brazil, 3 is Russia, 4 is India, 5 is China, and 6 is South Africa) from April 2008 to December 2011

Period	Group 1					Group 2				
	h2	h3	h4	h5	h6	h2	h3	h4	h5	h6
Apr-08	0	0	0	0	0	0	0	0	0	0
May-08	0	0	0	0	0	0	0	0	0	0
Jun-08	0	0	0	0	0	0	0	0	0	0
Jul-08	0	0	0	0	0	0	0	0	0	0
Aug-08	0	0	0	0	0	0	0	0	0	0
Sep-08	0	0	0	0	0	0	0	0	0	0
Oct-08	0	0	0	0	0	1	0	1	0	0
Nov-08	0	1	1	0	0	1	0	1	0	0
Dec-08	0	1	1	0	0	1	1	1	0	1
Jan-09	0	1	1	1	0	1	1	1	0	1
Feb-09	0	1	1	1	0	1	1	1	0	1
Mar-09	0	1	1	1	0	1	1	1	0	0
Apr-09	0	1	1	1	0	1	1	1	0	0
May-09	0	1	1	1	0	1	1	1	0	0
Jun-09	0	1	0	0	0	1	1	0	0	0
Jul-09	0	0	0	0	0	1	1	0	0	0
Aug-09	0	0	0	0	0	0	1	0	0	0
Sep-09	0	0	0	0	0	0	1	0	1	0
Oct-09	0	0	0	0	0	0	1	0	1	0
Nov-09	1	0	0	0	0	0	0	0	1	0
Dec-09	1	0	0	0	0	0	0	0	1	0
Jan-10	1	0	0	0	1	0	0	0	1	0
Feb-10	1	0	0	1	1	0	0	0	1	0
Mar-10	1	0	0	1	1	0	0	0	1	0
Apr-10	1	1	0	1	1	0	0	0	1	0
May-10	1	1	0	1	1	0	0	0	1	0
Jun-10	1	1	0	1	1	1	0	0	1	0
Jul-10	1	1	0	1	1	1	0	0	1	0
Aug-10	1	1	0	1	1	1	0	0	1	0

Sep-10	1	1	1	1	1
Oct-10	1	1	1	1	1
Nov-10	1	0	1	1	1
Dec-10	1	0	1	1	1
Jan-11	1	0	1	1	1
Feb-11	1	0	1	1	1
Mar-11	1	0	0	0	1
Apr-11	1	0	0	0	1
May-11	1	0	0	0	1
Jun-11	1	0	0	0	1
Jul-11	1	0	0	0	0
Aug-11	1	0	0	0	0
Sep-11	0	0	0	0	0
Oct-11	0	0	1	0	0
Nov-11	0	0	1	0	0
Dec-11	0	0	1	0	0

1	1	1	1	0
1	1	1	1	0
1	1	1	1	0
1	1	1	1	0
1	1	1	1	0
1	0	1	1	0
1	0	0	1	0
0	0	0	1	0
0	0	0	1	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
1	0	1	0	1
1	0	1	0	1
1	0	1	0	1
1	0	1	0	1

Figure A.1 Movements in currency pair Thai Bath/ Euro from April 2008 to December 2011

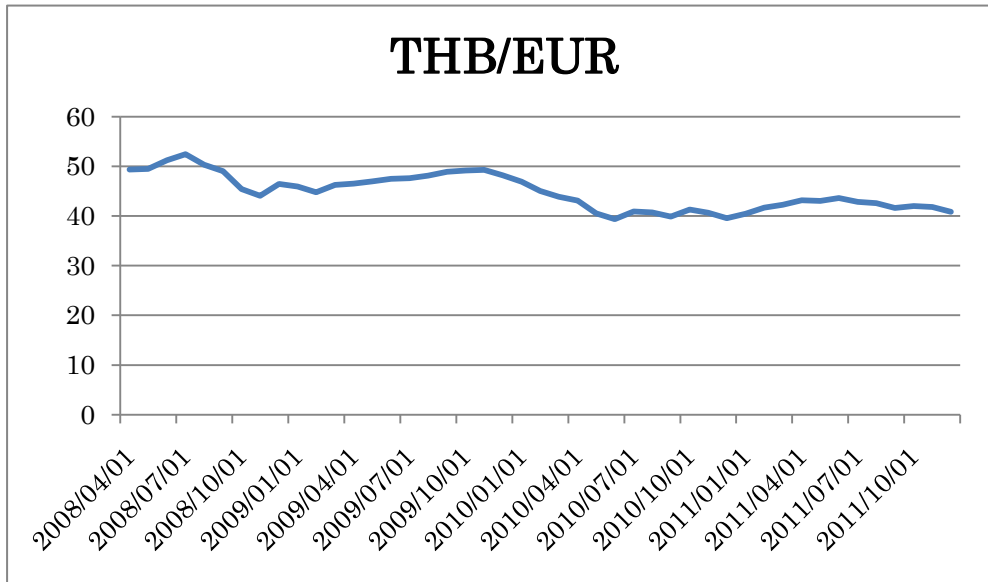


Figure A.2 Movements in currency pair Thai Bath/ Brazilian Real from April 2008 to December 2011

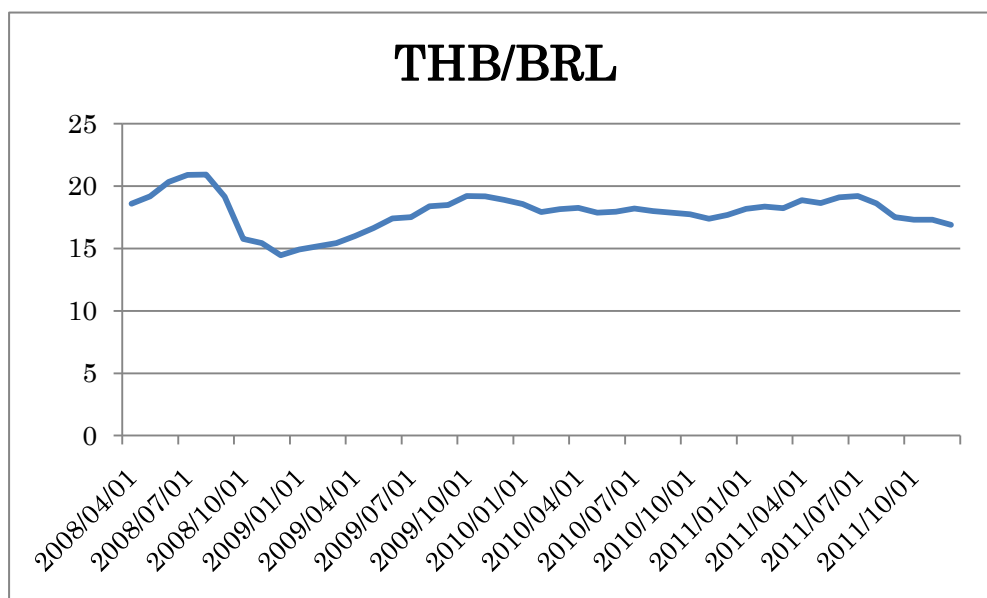


Figure A.3 Movements in currency pair Thai Bath/ British Pound from April 2008 to December 2011

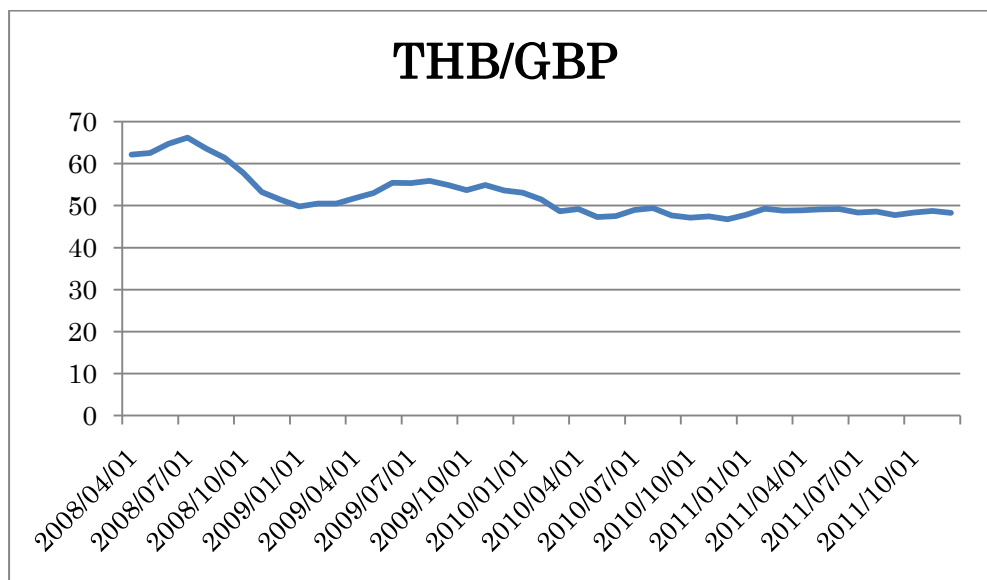


Figure A.4 Movements in currency pair Thai Bath/ Canadian Dollar from April 2008 to December 2011

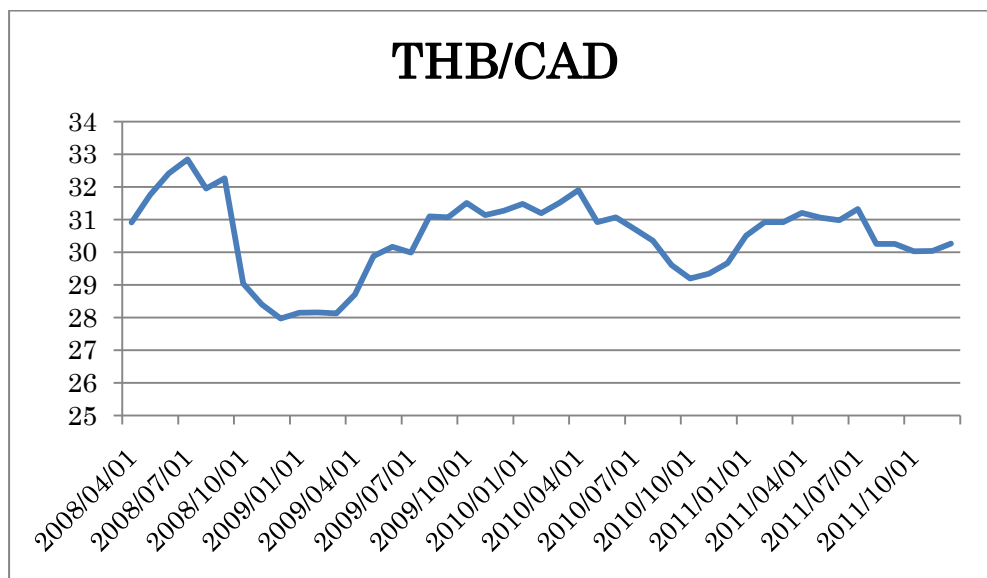


Figure A.5 Movements in currency pair Thai Bath/ Chinese Yuan from April 2008 to December 2011

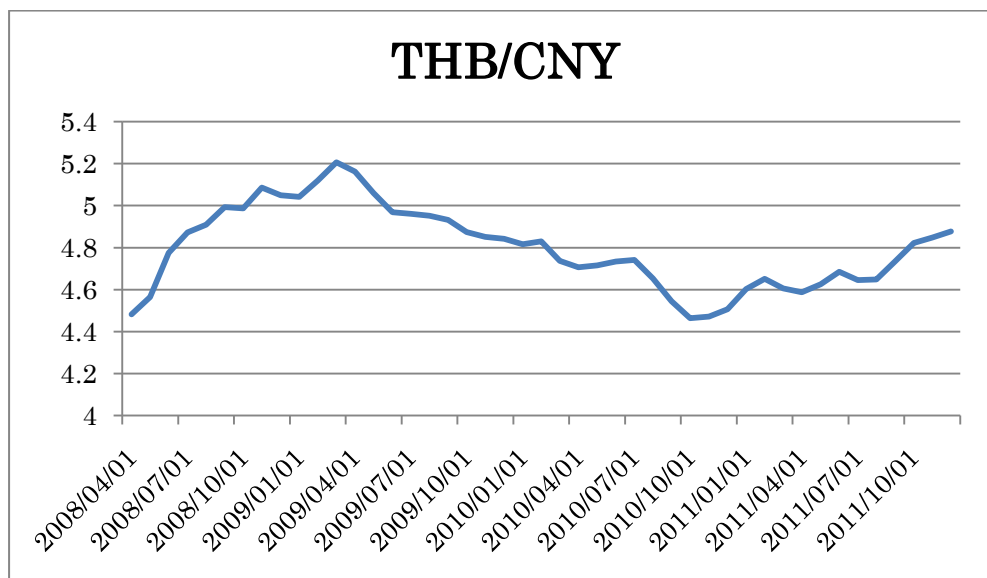


Figure A.6 Movements in currency pair Thai Bath/ Indian Rupee from April 2008 to December 2011

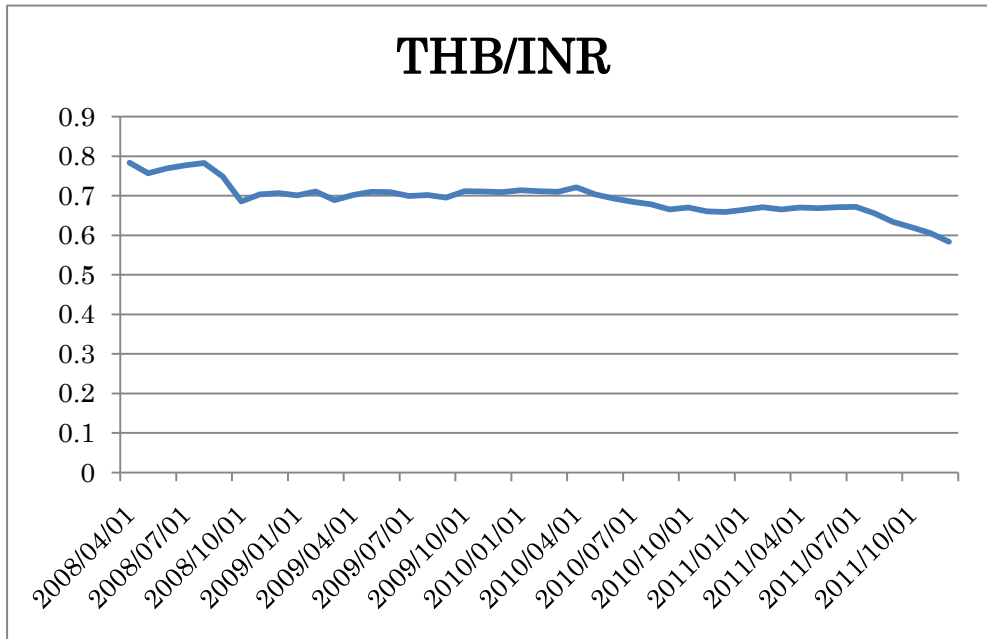


Figure A.7 Movements in currency pair Thai Bath/ Japanese Yen from April 2008 to December 2011

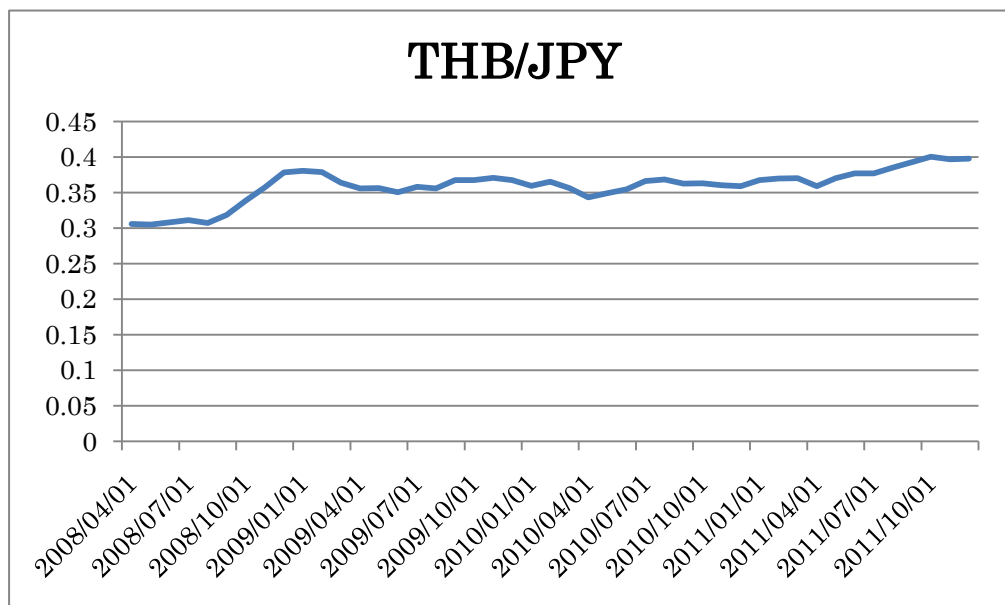


Figure A.8 Movements in currency pair Thai Bath/ Russian Rouble from April 2008 to December 2011

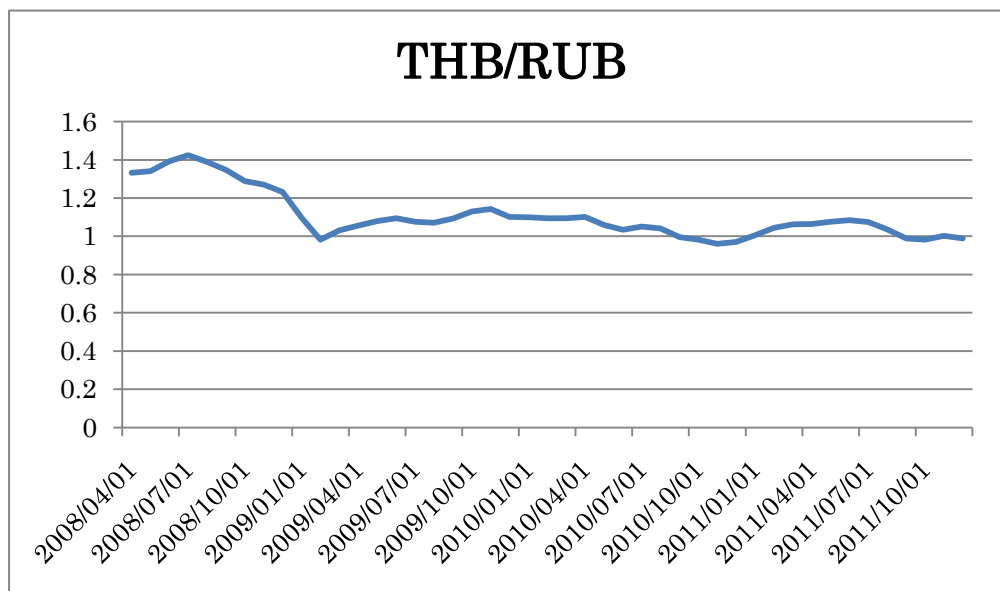


Figure A.9 Movements in currency pair Thai Bath/ South African Rand from April 2008 to December 2011

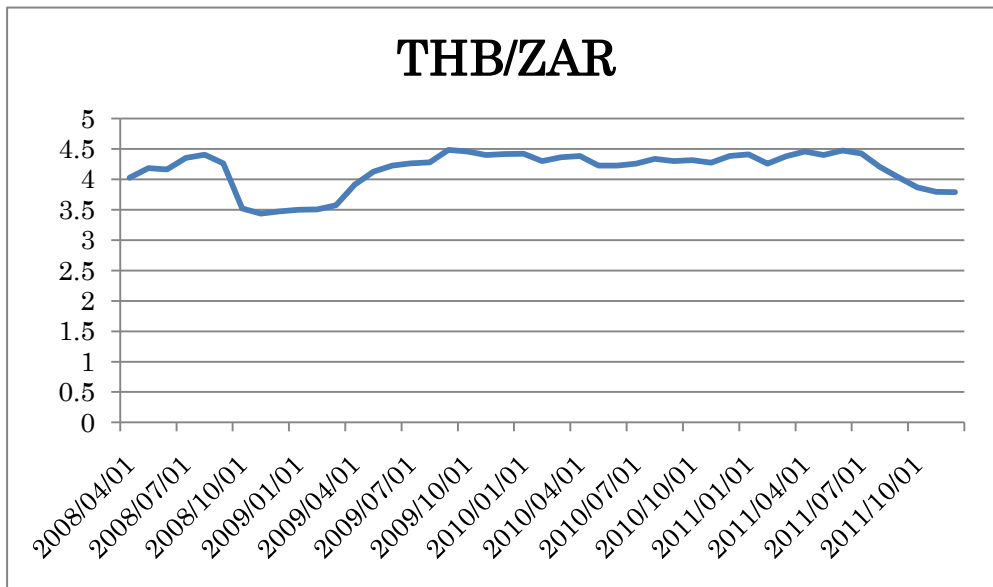
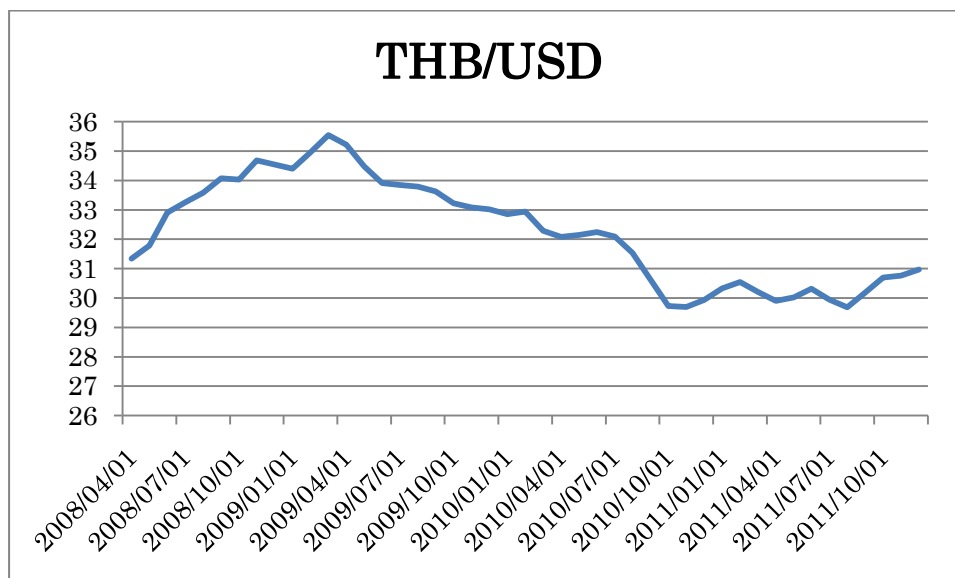


Figure A.10 Movements in currency pair Thai Bath/ US Dollar from April 2008 to December 2011



BIOGRAPHY

Mr. Prompong Limpapanasit was born on February 18th 1986 in Mahasarakham province in the northeast of Thailand. He received Bachelor Degree in Economics with major in Business and Managerial Economics from Faculty of Economics Chulalongkorn University in 2008. After managing his family business for two years he continued his study by attending Master of Arts Program in International Economics and Finance at Faculty of Economics Chulalongkorn University in 2010.