Exchange Rate Volatility and its Impact on Trade Performance in Australia: Empirical Evidence from Aggregate, Sectoral and Bilateral Trade Data Levels

by

Jinmei YANG
Bachelor of Laws (Hons)
Huazhong University of Science & Technology, China
Master of Economics
University of New England, Australia

A thesis submitted for the Degree of
Doctor of Philosophy
of the University of New England

UNE Business School
Faculty of the Professions
University of New England
Armidale NSW 2351
Australia

August 2012
Abstract

As an important macro variable, the exchange rate has a significant influence on the whole economy. This study focuses on the impact of exchange rate volatility on trade performance in Australia given the evidence from the Autoregressive Distributed Lag (ARDL) bounds testing approach at aggregate, sectoral and bilateral trade data levels.

Despite the considerable amount of research that has been undertaken to analyse the impact of exchange rate volatility on trade performance, studies of the impact of exchange rate volatility on trade performance have reported many conflicting results since the results are significantly influenced both by the authors’ modelling strategies, for example, the choices of sampling period, model specification, measurements of exchange rate volatility and countries considered, and by the contexts of their investigations. Some studies demonstrate that there are negative relationships between exchange rate volatility and trade performance whereas other studies show positive relationships. Some empirical literature suggests that exchange rate volatilities may have both positive and negative impacts on trade flows, while other studies show that there is no significant relationship between exchange rate volatility and trade flows.

This study intends to explore new and previously unused quarterly data ranging from 1983 to 2007 and apply the ARDL bounds testing approach to estimate the effects of exchange rate volatility on Australia’s trade performance. This study makes a contribution to current research in various ways. First, this study develops two sets of nominal and real exchange rate volatility, applying the most commonly used measurements generated from moving average standard deviation (MSD) and the GARCH models for each nominal and real exchange rate. Secondly, it is based on a substantially longer period of quarterly data than previous studies. In addition, this study empirically investigates the impact of exchange rate volatility on the export and import flows of Australia from aggregate, sectoral and bilateral trade data levels, which can deal with the aggregation bias and deepen the analysis step by step and ensure the results are more reliable and robust.
The empirical results from this study suggest that the impact of exchange rate volatility on trade differs among the three different trade data levels, and can have either positive or negative impacts on trade flows. For aggregate, sectoral and bilateral levels, volatility has a statistically significant positive impact on trade flows in 2, 1 and 9 equations respectively, and it has statistically significant negative impact on trade flows in 0, 8 and 4 equations respectively. This indicates that exchange rate volatility has statistically significant negative impact on trade flows in more cases at sectoral trade data level, and it has statistically significant positive impact on trade flows in more cases at aggregate and bilateral trade data levels.

Our results also indicate that Australia’s exports are more sensitive than imports to exchange rate volatility since there are more export equations than import equations (15 vs 9) in which exchange rate volatility has a statistically significant impact on trade flows. Empirical results show that exchange rate volatility has a significant positive impact on the export sector Resources and an insignificant positive impact on the export sector Rural Goods. For the export sector Manufactures, exchange rate volatility has a significant negative impact. For all three import sectors, exchange rate volatility has an insignificant impact with a positive sign on Capital imports and negative signs on Consumption and Intermediate imports.

Moreover, the empirical results show that there is little overall difference between the results produced with GARCH-type volatility measures and those with MSD-type volatility measures. As well, there is little difference between the results produced with the volatility measures derived from the real exchange rate and the nominal exchange rate. In addition, GDP generally has a positive impact on trade flows at all three trade data levels, whereas Relative Price can have positive, negative or even no impact on trade flows. All in all, the findings from this study suggest that policymakers should pay more attention to the relative exchange rate policy and trade issues.
Acknowledgements

I willingly acknowledge my debt and express my sincere appreciation to the many people who have helped me to complete this thesis.

First, I wish to acknowledge my great indebtedness to my Principal Supervisor, Professor Mahinda Siriwardana. His lectures on international trade inspired me to explore this topic. As my Principal Supervisor, he gave me constant aid, his patience and encouragement, and his understanding of my personal and family issues throughout the whole period of my PhD candidature. Without his strong support and supervision, this thesis would never have been completed.

I would like to express my deepest gratitude to my co-supervisor, Dr Nam Hoang. Dr Hoang helped me not only in the academic research field, but also encouraged me to recover from the sadness of the loss of my mother—his friendship is unforgettable. Thanks to Professor Brian Dollery, who helped me to settle down in the early stage of my thesis.

I thank the Australian Federal Government for offering me the competitive and prestigious Australian Postgraduate Awards (APA) scholarship. Also I thank the University of New England for providing me with the Keith & Dorothy Mackay Postgraduate Travelling Scholarship and the UNE & Wuxi Collaborative Research Grant during my PhD candidature. Without these scholarships, this thesis would not have taken the shape in the first place. Special thanks are due to my School secretaries: Sharon Styles and Kylie Flack. Thanks are due also to Higher Degree Research staff at the University of New England. They all helped me administratively when I suffered heavily from the loss of my mother half way through my research.

I am also grateful to the following organisations for their assistance with my huge data collection: International Monetary Fund (IMF), United Nations Statistics Division, World
Trade Organisation (WTO), Federal Reserve Bank, Australian Bureau of Statistics (ABS) and Reserve Bank of Australia (RBA).

Special thanks to Master Richard Junhong Lu, the President of Australia Oriental Radio in Sydney.

Finally, I thank my husband, Dr Canran Liu, my only son, Huayan Liu, and my brother, Mr Guojin Yang. Special thanks to my sisters, nieces and friends.
Table of Contents

Declaration ........................................................................................................................................... ii
Abstract ................................................................................................................................................ iii
Acknowledgements ............................................................................................................................. v
Table of Contents .................................................................................................................................. vii
List of Tables .......................................................................................................................................... xii
List of Figures ......................................................................................................................................... xiv
List of Abbreviations ............................................................................................................................ xvii
List of Appendices ................................................................................................................................ xix

Chapter 1: Introduction .......................................................................................................................... 1
1.1 Research Background ...................................................................................................................... 1
1.2 Research Problem ........................................................................................................................... 8
1.3 Objectives of the Thesis .................................................................................................................. 13
1.4 Outline of the Thesis ...................................................................................................................... 14

Chapter 2: Australian Exchange Rate Policy and Trade Direction .................................................... 15
2.1 Introduction ...................................................................................................................................... 15
2.2 Australian Exchange Rate Policy .................................................................................................. 16
   2.2.1 Australian exchange rate policy before 1983 ........................................................................... 16
       2.2.1.1 The peg to the British Pound (1931-1971) ..................................................................... 18
       2.2.1.2 The peg to the US Dollar (1971-1974) ........................................................................ 20
       2.2.1.3 The peg to an effective exchange rate (1974-1976) ..................................................... 25
       2.2.1.4 The crawling peg regime (1976-1983) ........................................................................ 28
   2.2.2 The floating exchange rate (1983-present) .......................................................................... 33
2.3 Statistical Analysis of Australia’s Merchandise Trade ..................................................................... 41
   2.3.1 Trends in exports ................................................................................................................... 42
   2.3.2 Trends in imports .................................................................................................................... 44
   2.3.3 Australia’s trade direction ....................................................................................................... 45
2.4 Concluding Remarks .......................................................... 47

Chapter 3: Trade Theory about Exchange Rate Volatility’s Impact on Trade ...... 48
3.1 Introduction ........................................................................ 48
3.2 Standard Trade Theory Related to Exchange Rate ........................ 48
3.3 Marshall-Lerner Condition .................................................. 50
3.4 The J-curve Effect .............................................................. 52
3.5 Exchange Rate Pass-Through Effect ..................................... 55
3.6 Concluding Remarks .......................................................... 58

Chapter 4: Review of Empirical Studies of Exchange Rate Volatility’s Impact on Trade ................................................................ 59
4.1 Introduction ........................................................................ 59
4.2 Measures of Exchange Rate Volatility .................................... 59
4.3 Various Model Specifications .............................................. 65
    4.3.1 Basic models ............................................................. 65
    4.3.2 Gravity models ......................................................... 67
    4.3.3 Other variants of models ............................................. 68
4.4 Estimation and Analysis Methods ......................................... 70
    4.4.1 Ordinary least squares (OLS) and related methods .......... 70
    4.4.2 Instrumental variable (IV) estimation .......................... 72
    4.4.3 Seemingly unrelated regression (SUR) ......................... 74
    4.4.4 Stationarity and cointegration tests .............................. 74
    4.4.5 Error correction model (ECM) .................................... 75
    4.4.6 Vector autoregression (VAR) ....................................... 76
    4.4.7 Multivariate-GARCH-M ........................................... 76
    4.4.8 Poisson pseudo-maximum likelihood-IV (PPML-IV) ........ 78
    4.4.9 Models with poisson lag structure ............................... 79
    4.4.10 Leamer’s extreme bound analysis (EBA) ..................... 80
    4.4.11 ARDL bounds testing approach ................................. 81
    4.4.12 Methods using panel data ......................................... 82
4.4.13 Other models and methods .......................................................... 84
4.5 Empirical Studies According to Three Data Levels.......................... 86
  4.5.1 Empirical studies with aggregate data ........................................ 86
  4.5.2 Empirical studies with bilateral data ........................................... 89
  4.5.3 Empirical studies with sectoral data ........................................... 97
4.6 Concluding Remarks ........................................................................ 102

Chapter 5: Model, Variables and Data Specifications .............................. 120
  5.1 Introduction ........................................................................................ 120
  5.2 Unit Root and the Methods of Unit Root Test .................................... 120
  5.3 Model, Variables and Data at Aggregate Trade Level ....................... 126
    5.3.1 Standard export and import demand equations ............................ 126
    5.3.2 ARDL bounds testing approach ................................................... 127
    5.3.3 Derivation of variables and data description .............................. 130
  5.4 Model, Variables and Data at Sectoral Trade Level ......................... 131
    5.4.1 Model at sectoral trade data level .............................................. 131
    5.4.2 Derivation of variables and data description .............................. 133
  5.5 Model, Variables and Data at Bilateral Trade Level .......................... 134
    5.5.1 Model at bilateral trade data level ............................................. 135
    5.5.2 Derivation of variables ............................................................. 137
    5.5.3 Data description ....................................................................... 138
  5.6 Exchange Rate Volatility Measures .................................................. 140
    5.6.1 MSD measure ........................................................................... 140
    5.6.2 GARCH measure ..................................................................... 140
  5.7 Concluding Remarks ........................................................................ 141

Chapter 6: Empirical Results at the Aggregate Trade Data Level .............. 142
  6.1 Introduction ....................................................................................... 142
  6.2 Unit Root Test Results ...................................................................... 142
  6.3 Estimation Results for Export Equation .......................................... 144
    6.3.1 Bounds test for cointegration ...................................................... 144
9.5 Limitations of the Thesis and Avenues for Further Research ........................................ 214
9.6 Concluding Remarks ........................................................................................................ 215

Appendices .............................................................................................................................. 216
References .............................................................................................................................. 234
List of Tables

1.1 The collapse of the Bretton Woods system ................................................................. 2
1.2 Treatment of disequilibria by pegging countries under the Bretton Woods regime ................................................................. 3
1.3 Volatility of changes in exchange rates: standard errors of percentage changes (in %/annum) ........................................................................................................... 5
1.4 The shift to floating rates ........................................................................................................... 8
2.1 US and UK reserves and external monetary liabilities (US$billion) .................. 19
2.2 Evolution of official US liabilities and world reserves (US$billion) .............. 21
2.3 Exchange rate realignments resulting from the Smithsonian Agreement .... 22
2.4 New issues of international bonds, 1973-1978 (US$million) .................. 24
2.5 Evolution of the currency composition of Eurodeposits in European Banks (%) .. 25
2.6 Stock of foreign liabilities and assets (per cent of GDP).............................. 40
2.7 Australia’s merchandise exports by commodities (three-yearly intervals), 1996-2005 (AU$million) ................................................................. 42
2.8 Australia’s top exported commodities in 2007 .............................................. 43
2.9 Australia’s merchandise imports by commodities (three-yearly intervals), 1996-2005 (AU$million) ................................................................. 44
2.10 Australia’s top imported commodities in 2007 .............................................. 45
2.11 Australia’s trade direction after 1980 (percentage of total) .......................... 46
4.1 Various volatility measures ......................................................................................... 105
4.2 Empirical studies of the effects of exchange rate volatility at aggregate level .... 110
4.3 Empirical studies of the effects of exchange rate volatility at bilateral level ...... 113
4.4 Empirical studies of the effects of exchange rate volatility at sectoral level ...... 117
6.1 Results of various unit root tests .............................................................................. 143
6.2 The ECM-ARDL results for the export equations with the four volatility measures ........................................................................................................... 146
6.3 Long-run multipliers for the two export equations with GARCH-derived volatilities ........................................................................................................... 147
6.4 The ECM results for the export equation with $CV_N$ and $CV_R$ as volatility measures ................................................................. 148
6.5 The short-run relationship among the four variables of the export equations with $MSD_N$ and $MSD_R$ as volatility measures .................................................. 149
6.6 The ECM-ARDL results for the import equations with the four volatility measures ............................................................................... 154
6.7 The ECM results for the import equations with $MSD_N$ and $MSD_R$ as volatility measures ................................................................. 155
6.8 The short-run relationship among the four variables of the import equations with the four volatility measures................................................................. 156
7.1 Results of various unit root tests ................................................................. 162
7.2 Bounds test for the Manufactures sector .................................................. 165
7.3 Error correction representation for the selected model for the Manufactures sector ............................................................................... 166
7.4 Bounds test for the Resources sector .......................................................... 170
7.5 Error correction representation for the selected model for the Resources sector 171
7.6 Bounds test for the Rural Goods sector .................................................. 171
7.7 Error correction representation for the selected model for the Rural Goods sector ............................................................................... 175
7.8 Long-run multipliers for export equations of three sectors (Manufactures, Resources and Rural Goods) .................................................. 179
7.9 Bounds test for the Capital sector ............................................................. 180
7.10 Error correction representation for the selected model for the Capital sector ............................................................................... 181
7.11 Bounds test for the Consumption sector .................................................. 185
7.12 Error correction representation for the selected model for the Consumption sector ............................................................................... 186
7.13 Bounds test for the Intermediate Goods sector ............................................. 191
7.14 Error correction representation for the selected model for the Intermediate Goods sector ................................................................. 192
7.15 Long-run multipliers for the import equations for the three sectors (Capital, Consumption and Intermediate Goods) .................................................. 195
8.1 Results of various unit root tests ................................................................. 198
8.2 The results of cointegration test for the analysis at bilateral trade data level...... 203
8.3 Long-run coefficients estimated from the UECMs for the analysis at bilateral trade data level .................................................................204

List of Figures

1.1 Australian trade and foreign exchange turnover .................................................................6
1.2 Australian foreign exchange turnover (daily average) ......................................................7
1.3 Foreign exchange turnover by instrument (average daily turnover, major markets, April and October) ..............................................................7
2.1 Movement of Australian dollar, 1950-2009, monthly data .............................................17
2.2 Australia’s terms of trade, December 1983=100, 1959-2007, quarterly data .............23
2.3 Australia’s current account deficit, 1970-2006, quarterly data .......................................26
2.4 Australian effective exchange rates, June 1970-December 2006, quarterly data, June 1970=100 .................................................................27
2.5 Australian real TWI and consumer price index (CPI), March 1995=100, June 1970 to December 2006 .................................................................27
2.6 Australian external position, 1970-2007 ........................................................................29
2.7 Ratios of net international investment to GDP, 1970-2007 ..............................................31
2.8 Direction of the Australia dollar, 1983-2007, quarterly data .........................................34
2.9 Australian foreign exchange market, 1990-2007, monthly data ..................................36
2.10 Australian dollar volatility (moving standard deviation of the first difference of the logarithm of bilateral exchange rate), monthly data ........................................38
2.11 Exchange rate volatility (moving standard deviation of the first difference of REER), quarterly data ..................................................................39
2.12 Total trade in goods and services in Australia, 1985-2007 ...........................................41
2.13 Australia’s top export partners in 2007 .....................................................................43
2.14 Australia’s top import partners in 2007 .....................................................................45
3.1 Market effects of foreign exchange rate change ...........................................49
3.2 Import market response to changes in the foreign exchange rate when foreign supply is not infinitely elastic .................................................................50
3.3 Export and import markets under 20 per cent depreciation of home currency......51
3.4 The J-curve effect ..........................................................................................53
6.1 Recursive estimates in the stability test for the UECMs corresponding to the export equations ..............................................................................................150
6.2 Recursive estimates in the stability test for ECM corresponding to the export equations .................................................................................................151
6.3 Recursive estimates in the stability test for the first difference models corresponding to the export equations .................................................................151
6.4 Recursive estimates in the stability test for the UECMs corresponding to the import equations..............................................................................................157
6.5 Recursive estimates in the stability test for the ECMs corresponding to the import equations..............................................................................................158
6.6 Recursive estimates in the stability test for the first difference models (i.e. short-run models) corresponding to the import equations ......................159
7.1 Plot of CUSUM and CUSUMQ for coefficient stability for the UECM model for the Manufactures sector. The four rows are for $CV_N$, $CV_R$, $MSD_N$ and $MSD_R$ as the volatility measures respectively ................167
7.2 Plot of CUSUM and CUSUMQ for coefficient stability for the RECM model for the Manufactures (MAN) sector. The four rows are for GAR_N, GAR_R, MSD_N and MAS_R as the volatility measures respectively .............168
7.3 Plot of CUSUM and CUSUMQ for coefficient stability for the UECM model for the Resources sector. The four rows are for $CV_N$, $CV_R$, $MSD_N$ and $MSD_R$ as the volatility measure respectively ......................172
7.4 Plot of CUSUM and CUSUMQ for coefficient stability for the RECM model for the Resources sector. The four rows are for $CV_N$, $CV_R$, $MSD_N$ and $MSD_R$ as the volatility measure respectively ......................173
7.5 Plot of CUSUM and CUSUMQ for coefficient stability for the UECM model for the Rural Goods sector. The four rows are for $CV_N$, $CV_R$, $MSD_N$ and $MSD_R$ as the volatility measure respectively ......................177
7.6 Plot of CUSUM and CUSUMQ for coefficient stability for the RECM model for the Rural Goods sector. The four rows are for $CV_N$, $CV_R$, $MSD_N$ and $MSD_R$ as the volatility measure respectively ......................178
7.7 Plot of CUSUM and CUSUMQ for coefficient stability for the UECM model for the Capital sector. The four rows are for $CV_N$, $CV_R$, $MSD_N$ and $MSD_R$ as the volatility measure respectively .................. 182

7.8 Plot of Cusum and Cusumq for coefficients stability for the RECM model for the Capital sector. The four rows are for $CV_N$, $CV_R$, $MSD_N$ and $MSD_R$ as the volatility measure respectively .................. 183

7.9 Plot of CUSUM and CUSUMQ for coefficient stability for the UECM model for the Consumption sector. The four rows are for $CV_N$, $CV_R$, $MSD_N$ and $MSD_R$ as the volatility measure respectively .................. 187

7.10 Plot of CUSUM and CUSUMQ for coefficient stability for the RECM model for the Consumption sector. The four rows are for $CV_N$, $CV_R$, $MSD_N$ and $MSD_R$ as the volatility measure respectively .................. 188

7.11 Plot of CUSUM and CUSUMQ for coefficient stability for the UECM model for the Intermediate Goods sector. The four rows are for $CV_N$, $CV_R$, $MSD_N$ and $MSD_R$ as the volatility measure respectively .................. 193

7.12 Plot of Cusum and Cusumq for coefficients stability for the RECM model for the Intermediate Goods sector. The four rows are for $CV_N$, $CV_R$, $MSD_N$ and $MSD_R$ as the volatility measure respectively ........ 194
List of Abbreviations

ABS  Australia Bureau of Statistics
ADF  Augmented Dicky Fuller tests
AIC  Akaike Information Criterion
AR   Autoregressive
ARCH Autoregressive Conditional Heteroskedasticity
ARDL Autoregressive Distributed Lag
ARMA Autoregressive Moving Average
ASEAN Association of South East Asian Nations
BLUE Best Linear Unbiased Estimator
CPI  Consumer Price Index
CUSUM Cumulative sum of recursive residuals
CUSUMQ CUSUM of squares
DCC  Dynamic Conditional Correlation
DFGLS Dickey-Fuller Test with GLS detrending
DOLS Dynamic Ordinary Least Squares
EBA  Extreme Bound Analysis
ECM  Error Correction Model
EMU  European Monetary Union
ERS  Elliot, Rothenberg and Stock point optimal test
ESTAR Exponential Smooth Transition Autoregressive Model
FGLS Feasible Generalized Least Squares
FMOLS Fully Modified Ordinary Least Squares
FTA  Free Trade Agreement
GARCH Generalized Autoregressive Conditional Heteroskedasticity
GDP  Gross Domestic Product
GLS  Generalized Least Squares
GMM  Generalized Method of Moments
G2SLS Generalized two Stage Least Squares
IMF  International Monetary Fund
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPS</td>
<td>Im, Pesaran and Shin test</td>
</tr>
<tr>
<td>IV</td>
<td>Instrumental Variable</td>
</tr>
<tr>
<td>KPSS</td>
<td>Kwiatkowski, Phillips, Schmidt and Shin test</td>
</tr>
<tr>
<td>LLC</td>
<td>Levin, Lin and Chu test</td>
</tr>
<tr>
<td>LM</td>
<td>Lagrange Multiplier</td>
</tr>
<tr>
<td>MSD</td>
<td>Moving Standard Deviation</td>
</tr>
<tr>
<td>NEER</td>
<td>Nominal Effective Exchange Rate</td>
</tr>
<tr>
<td>NER</td>
<td>Nominal Exchange Rate</td>
</tr>
<tr>
<td>NP</td>
<td>Ng and Perron (NP) tests</td>
</tr>
<tr>
<td>OECD</td>
<td>Organization for Economic Co-operation and Development</td>
</tr>
<tr>
<td>OLS</td>
<td>Ordinary Least Squares</td>
</tr>
<tr>
<td>PP</td>
<td>Phillips-Perron test</td>
</tr>
<tr>
<td>PPML-IV</td>
<td>Poisson pseudo-maximum likelihood-Instrumental Variabe</td>
</tr>
<tr>
<td>RBA</td>
<td>Reserve Bank of Australia</td>
</tr>
<tr>
<td>RC</td>
<td>Random Coefficient</td>
</tr>
<tr>
<td>RECM</td>
<td>Restricted Error Correction Model</td>
</tr>
<tr>
<td>REER</td>
<td>Real Effective Exchange Rate</td>
</tr>
<tr>
<td>RER</td>
<td>Real Exchange Rate</td>
</tr>
<tr>
<td>SBIC</td>
<td>Schwarz’s Bayesian Information Criteria</td>
</tr>
<tr>
<td>SDR</td>
<td>Special Drawing Rights</td>
</tr>
<tr>
<td>SIC</td>
<td>Schwarz Information Criterion</td>
</tr>
<tr>
<td>SUR</td>
<td>Seemingly Unrelated Regression</td>
</tr>
<tr>
<td>TOT</td>
<td>Terms of Trade</td>
</tr>
<tr>
<td>TWI</td>
<td>Trade Weighted Index</td>
</tr>
<tr>
<td>UECM</td>
<td>Unrestricted Error Correction Model</td>
</tr>
<tr>
<td>UK</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>US</td>
<td>United States</td>
</tr>
<tr>
<td>VAR</td>
<td>Vector Autoregression</td>
</tr>
<tr>
<td>VDR</td>
<td>Variable Deposit Requirements</td>
</tr>
<tr>
<td>VECM</td>
<td>Vector Error Correction Model</td>
</tr>
<tr>
<td>WLS</td>
<td>Weighted Least Squares</td>
</tr>
</tbody>
</table>
List of Appendices

Tables for Chapter 8

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>TA8.1</td>
<td>Estimated UECM for export to China with $CV$ as volatility measure</td>
<td>217</td>
</tr>
<tr>
<td>TA8.2</td>
<td>Estimated UECM for export to China with $MSD$ as volatility measure</td>
<td>217</td>
</tr>
<tr>
<td>TA8.3</td>
<td>Estimated UECM for import from China with $CV$ as volatility measure</td>
<td>218</td>
</tr>
<tr>
<td>TA8.4</td>
<td>Estimated UECM for import from China with $MSD$ as volatility measure</td>
<td>218</td>
</tr>
<tr>
<td>TA8.5</td>
<td>Estimated UECM for export to Japan with $CV$ as volatility measure</td>
<td>219</td>
</tr>
<tr>
<td>TA8.6</td>
<td>Estimated UECM for export to Japan with $MSD$ as volatility measure</td>
<td>219</td>
</tr>
<tr>
<td>TA8.7</td>
<td>Estimated UECM for import from Japan with $CV$ as volatility measure</td>
<td>220</td>
</tr>
<tr>
<td>TA8.8</td>
<td>Estimated UECM for import from Japan with $MSD$ as volatility measure</td>
<td>220</td>
</tr>
<tr>
<td>TA8.9</td>
<td>Estimated UECM for export to New Zealand with $CV$ as volatility measure</td>
<td>221</td>
</tr>
<tr>
<td>TA8.10</td>
<td>Estimated UECM for export to New Zealand with $MSD$ as volatility measure</td>
<td>221</td>
</tr>
<tr>
<td>TA8.11</td>
<td>Estimated UECM for import from New Zealand with $CV$ as volatility measure</td>
<td>222</td>
</tr>
<tr>
<td>TA8.12</td>
<td>Estimated UECM for import from New Zealand with $MSD$ as volatility measure</td>
<td>222</td>
</tr>
<tr>
<td>TA8.13</td>
<td>Estimated UECM for export to South Korea with $CV$ as volatility measure</td>
<td>223</td>
</tr>
<tr>
<td>TA8.14</td>
<td>Estimated UECM for export to South Korea with $MSD$ as volatility measure</td>
<td>223</td>
</tr>
<tr>
<td>TA8.15</td>
<td>Estimated UECM for import from Singapore with $CV$ as volatility measure</td>
<td>224</td>
</tr>
<tr>
<td>TA8.16</td>
<td>Estimated UECM for import from Singapore with $MSD$ as volatility measure</td>
<td>224</td>
</tr>
<tr>
<td>TA8.17</td>
<td>Estimated UECM for export to US with $CV$ as volatility measure</td>
<td>225</td>
</tr>
<tr>
<td>TA8.18</td>
<td>Estimated UECM for export to US with $MSD$ as volatility measure</td>
<td>225</td>
</tr>
<tr>
<td>TA8.19</td>
<td>Estimated UECM for import from UK with $CV$ as volatility measure</td>
<td>226</td>
</tr>
<tr>
<td>TA8.20</td>
<td>Estimated UECM for import from UK with $MSD$ as volatility measure</td>
<td>226</td>
</tr>
</tbody>
</table>
Figures for Chapter 8

FA8.1 Stability test for the estimated UECM for the export to China with CV as volatility measure ................................................................. 227
FA8.2 Stability test for the estimated UECM for the export to China with MSD as volatility measure ................................................................. 227
FA8.3 Stability test for the estimated UECM for the import from China with CV as volatility measure ................................................................. 227
FA8.4 Stability test for the estimated UECM for the import from China with MSD as volatility measure ................................................................. 228
FA8.5 Stability test for the estimated UECM for the export to Japan with CV as volatility measure ................................................................. 228
FA8.6 Stability test for the estimated UECM for the export to Japan with MSD as volatility measure ................................................................. 228
FA8.7 Stability test for the estimated UECM for the import from Japan with CV as volatility measure ................................................................. 229
FA8.8 Stability test for the estimated UECM for the import from Japan with MSD as volatility measure ................................................................. 229
FA8.9 Stability test for the estimated UECM for the export to New Zealand with CV as volatility measure ................................................................. 229
FA8.10 Stability test for the estimated UECM for the export to New Zealand with MSD as volatility measure ................................................................. 230
FA8.11 Stability test for the estimated UECM for the import from New Zealand with CV as volatility measure ................................................................. 230
FA8.12 Stability test for the estimated UECM for the import from China with MSD as volatility measure ................................................................. 230
FA8.13 Stability test for the estimated UECM for the export to South Korea with CV as volatility measure ................................................................. 231
FA8.14 Stability test for the estimated UECM for the export to South Korea with MSD as volatility measure ................................................................. 231
FA8.15 Stability test for the estimated UECM for the import from Singapore with CV as volatility measure ................................................................. 231
FA8.16 Stability test for the estimated UECM for the import from Singapore with MSD as volatility measure ................................................................. 232
FA8.17 Stability test for the estimated UECM for the import from UK with CV as volatility measure ................................................................. 232
FA8.18  Stability test for the estimated UECM for the export to US with $CV$ as volatility measure .................................................................232

FA8.19  Stability test for the estimated UECM for the export to US with $MSD$ as volatility measure .................................................................233

FA8.20  Stability test for the estimated UECM for the import from US with $MSD$ as volatility measure .................................................................233