In the last few decades, exchange rate economics has seen a number of developments, with substantial contributions to both the theory and empirics of exchange rate determination. Important developments in econometrics and the increasing availability of high-quality data have also been responsible for stimulating the large amount of empirical work on exchange rates in this period. Nonetheless, while our understanding of exchange rates has significantly improved, a number of challenges and open questions remain in the exchange rate debate, enhanced by events including the launch of the euro and the large number of recent currency crises. This volume provides a selective coverage of the literature on exchange rates, focusing on developments from within the last fifteen years. Clear explanations of theories are offered, alongside an appraisal of the literature and suggestions for further research and analysis.

MARK P. TAYLOR is Professor of Macroeconomics, Department of Economics, Warwick University and Research Fellow, Centre for Economic Policy Research, London. He was a Senior Economist at the International Monetary Fund, Washington D.C. for five years and an Economist at the Bank of England, and began his career as a foreign exchange dealer in the City of London. He has previously held teaching and research positions at the University of Oxford, the University of Liverpool, New York University, City University Business School, the University of Dundee and the University of Newcastle. He is the author of several books and over one hundred articles in leading journals including *Journal of Economic Literature, Journal of Political Economy, Journal of International Economics, International Economic Review, Review of Economics and Statistics, Journal of Development Economics, Journal of Money, Credit and Banking, Journal of International Money and Finance, European Economic Review, Economic Journal, Economica* and many others. Professor Taylor has consulted for a number of organisations, including the International Monetary Fund, the World Bank, the Bank of England, the European Central Bank and J.P. Morgan Fleming Asset Management.
The Economics of Exchange Rates

Lucio Sarno

and

Mark P. Taylor

with a foreword by

Jeffrey A. Frankel
To my parents
L.S.

To my mother and the memory of my father
M.P.T.
Contents

Foreword by Jeffrey A. Frankel  ix
Preface xi

1 Introduction  1

2 Foreign exchange market efficiency  5

Appendix A. Mean of a log-normally distributed variable  35
Appendix B. Siegel’s paradox  36
Appendix C. Generalised method-of-moments estimators  38
Appendix D. Cointegration and the Granger representation theorem  42

3 Purchasing power parity and the real exchange rate  51

4 Exchange rate determination: theories and evidence  97

5 New open-economy macroeconomics  144

6 Currency unions, pegged exchange rates and target zone models  170

Appendix A. The method of simulated moments  201

7 Official intervention in the foreign exchange market  208

8 Models of currency crisis and speculative attack  245

9 Foreign exchange market microstructure  264

Author index  307
Subject index  313
Foreword

Research is supposed to proceed according to what is called the scientific method. Hypotheses are proposed, tested, and enthroned if consistent with the evidence. The accretion of knowledge is supposed to be cumulative over time, discarding what is at odds with evidence and retaining what works. The ability to answer questions about the real world is supposed to be the ultimate motivation.

Unfortunately, economics does not always work that way. Intellectual fads and the effort to demonstrate mathematical prowess sometimes dominate the research agenda. Everyone becomes more specialised, and few seek to synthesise. Some even forget that the ultimate goal is to design models consistent with the real world and that, for example, the derivation of behaviour from principles of optimisation should be considered only a tool to that end.

After the rational expectations revolution of the 1970s, the study of exchange rates turned nihilistic in the 1980s. It was discovered that a decade or two of experience with floating currencies had not provided enough data to verify some of the systematic patterns of movement in real or nominal exchange rates that the theories of the time had predicted. Statistical tests failed to reject the hypothesis that the nominal exchange rate followed a random walk, or that the real exchange rate followed a random walk. This meant, embarrassingly, we had nothing to say that would help predict changes in such variables. But these demonstrations of the state of our ignorance were misleadingly labelled as evidence in favour of theories, versions of the random walk ‘theory’. More elaborate models were then designed, based on optimising behaviour, so as to have no testable implications, and thereby to correspond superficially to the empirical findings of no statistical significance. Never mind that the random walk proposition was in fact a proclamation of lack of knowledge rather than a proclamation of knowledge. Never mind that there was in any case excellent reason to believe that the failures to reject were due to low power – insufficient data – rather than the truth of the null hypothesis. (Never mind that the hypothesis of a random walk in the nominal exchange rate was inconsistent with the hypothesis of a random walk in the real exchange rate, given sustained inflation differentials. One can write about them in separate papers.)

The state of affairs improved a lot in the 1990s. Big data sets, based on long time series or panel studies, now allowed higher levels of statistical confidence, including rejections of
random walks at long horizons. Geography reappeared in international economics after a strangely long absence. The old question of exchange rate regimes was reinvigorated with theories of dynamically inconsistent monetary policy, credibility and target zone dynamics. New areas of research focused on specific real world questions, such as the study of pricing to market in exports, of monetary unions, of speculative attacks and of microstructure in the foreign exchange market. The ‘new open-economy macroeconomics’ managed to accomplish the craved derivations from micro-foundations of optimisation in dynamic general equilibrium without at the same time sacrificing the realism of imperfect integration, imperfect competition or imperfect adjustment, and without sacrificing the ability to address important questions regarding the effects of monetary policy.

What, then, is the current state of knowledge regarding exchange rate economics? Who can synthesise it all and present it clearly? For years, Mark Taylor has been pursuing the research of international money and finance in the way science is supposed to be done. The work is patient and careful. The accumulation of understanding is cumulative. Old theories are discarded when shown to be inconsistent with the evidence, and retained if supported by the evidence. New theories are incorporated when they too pass the hurdles. Occam’s razor is wielded. It all has to fit together. Above all, the enterprise is empirical, in the best sense of the word: the motivation is to explain the world. More recently, Lucio Sarno has been seen as a promising new researcher in the field.

Sarno and Taylor’s book is a tour de force. The exposition is comprehensive, covering contributions from all corners of the field, and covering the range from the seminal models of the 1970s to the latest discoveries on the theoretical and econometric frontiers of the 2000s. There is no excess verbiage or mathematics. Everything is there to serve a purpose. This is the current state of knowledge.

Jeffrey A. Frankel
Harvard University
The economics of exchange rates is an area within international finance which has generated and continues to generate strong excitement and interest among students, academics, policy-makers and practitioners. The last fifteen years or so in particular have seen a great flurry of activity in exchange rate economics, with important contributions to exchange rate theory, empirics and policy. Much of this activity has been so revolutionary as to induce a significant change in the profession’s way of thinking about the area. In this book – part monograph, part advanced textbook – we seek to provide an overview of the exchange rate literature, focusing largely but not exclusively on work produced within the last fifteen years or so, expositing, criticising and interpreting those areas which, in our view, are representative of the most influential contributions made by the profession in this context. Our overall aim is to assess where we stand in the continuing learning and discovery process as exchange rate economists. In doing so, we hope to provide a framework which will be useful to the economics and financial community as a whole for thinking about exchange rate issues.

The monograph is intended to be wide-ranging and we have attempted to make chapters easy to follow and largely self-contained.

The primary target for the book is students taking advanced courses in international economics or international finance at about the level of a second-year US doctoral programme in economics or finance, although students at other levels, including master’s degree students and advanced undergraduates, should also find the book accessible. The book should also prove useful to our professional colleagues, including researchers in international finance in universities and elsewhere, and specialists in other areas requiring an up-to-date overview of exchange rate economics. Last, but by no means least, we very much hope that the book will be of interest and use to financial market practitioners.

The intellectual history behind this monograph is long and tortuous. At one level it began while Mark Taylor, freshly graduated from Oxford in philosophy and economics, was working as a junior foreign exchange dealer in the City of London whilst simultaneously pursuing graduate studies part-time at London University in the early 1980s. At another level, it began while he was a senior economist at the International Monetary Fund (IMF) during the first half of the 1990s, in that his survey article on exchange rate economics, largely prepared at the IMF and published in the *Journal of Economic Literature* in 1995, initially
prompted Cambridge University Press to commission the book. Returning to academia, Taylor subsequently recruited one of his most promising graduate students at the time, Lucio Sarno, as a co-author, in order to ease the burden. Given, however, the large amount of material that we intended to cover, the high productivity of the area, and our other research commitments, it took us several further years to complete the book. One advantage of this long gestation period is that we have had the opportunity to test much of it in advanced graduate courses at Warwick, Oxford and Columbia, and to get valuable feedback from colleagues while we have held visiting positions at institutions such as the IMF, the World Bank and the Federal Reserve Bank of St Louis.

More generally, in preparing the book, we have become indebted to a large number of individuals. In particular, we are grateful for helpful conversations through the years of gestation, as well as for often very detailed comments on various draft chapters, to the following people: Michael Artis, Andrew Atkeson, Leonardo Bartolini, Tam Bayoumi, Giuseppe Bertola, Stanley Black, William Branson, Guillermo Calvo, Yin-Wong Cheung, Menzie Chinn, Richard Clarida, Giuseppe De Arcangelis, Michael Dooley, Rudiger Dornbusch, Hali Edison, Martin Evans, Robert Flood, Jeffrey Frankel, Kenneth Froot, Peter Garber, Charles Goodhart, Gene Grossman, Philipp Hartmann, Robert Hodrick, Peter Isard, Peter Kenen, Richard Lyons, Nelson Mark, Bennett McCallum, Paul Masson, Michael Melvin, Marcus Miller, Ashoka Mody, Maurice Obstfeld, Paul O’Connell, Lawrence Officer, David Papell, David Peel, William Poole, Kenneth Rogoff, Andrew Rose, Nouriel Roubini, Alan Stockman, Lars Svensson, Alan Taylor, Daniel Thornton, Sushil Wadhwani, Myles Wallace, Axel Weber and John Williamson.

Naturally, we are solely responsible for any errors that may still remain on these pages. We must also offer our thanks, as well as our public apology, to Ashwin Rattan and Chris Harrison, our editors at Cambridge University Press. They patiently worked with us through the extensive preparation of the manuscript and quietly tolerated our failure to meet countless deadlines. The phrase ‘the manuscript will be with you by the end of the month’ will be as familiar to Ashwin and Chris as ‘the cheque is in the mail’.

Finally, albeit most importantly, we owe our deepest thanks to our families and friends for providing essential moral support throughout this project.

The publisher has used its best endeavours to ensure that the URLs for external websites referred to in this book are correct and active at the time of going to press. However, the publisher has no responsibility for the websites and can make no guarantee that a site will remain live or that the content is or will remain appropriate.