

Exchange Rates, Interest Rates and Commodity Prices

Edited by
Meher Manzur

Exchange Rates, Interest Rates and Commodity Prices

Edited by

Meher Manzur

*School of Economics and Finance
Curtin University of Technology
Perth, Australia*

Edward Elgar

Cheltenham, UK • Northampton, MA, USA

© Meher Manzur 2002

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical or photocopying, recording, or otherwise without the prior permission of the publisher.

Published by
Edward Elgar Publishing Limited
Glensanda House
Montpellier Parade
Cheltenham
Glos GL50 1UA
UK

Edward Elgar Publishing, Inc.
136 West Street
Suite 202
Northampton
Massachusetts 01060
USA

A catalogue record for this book
is available from the British Library

Library of Congress Cataloguing in Publication Data

Exchange rates, interest rates, and commodity prices / edited by Meher Manzur.
p. cm.

Includes bibliographical references and index.

1. Foreign exchange rates.
2. Interest rates.
3. Primary commodities—Prices.
4. International finance. I. Manzur, Meher, 1953—

HG3851 .E938 2003
332'.042—dc21

2002034711

ISBN 1 84064 843 0

Printed and bound in Great Britain by MPG Books Ltd, Bodmin, Cornwall

Preface

The volatility of nominal and real exchange rates has been the major highlight of events since the switch to floating by major currencies in the early 1970s. Interestingly, large fluctuations in exchange rates are observed to have been in concert with those of interest rates, and prices for agricultural, energy and mineral commodities. Whilst exchange rates are fundamentally linked with interest rates (through interest parity conditions), the system is still quite noisy with substantial independent variations in nominal and real interest rates across countries. More intriguing is the alleged link between exchange rates and commodity prices. It is true that exchange rates and commodity prices are both asset prices that respond to news instantaneously, but can something stronger be said about causation? Is exchange rate volatility responsible for the wide swings in commodity prices, or vice versa? These questions themselves concern the broader problems of exchange rate determination and price formation in open economies, which are among the fundamental issues occupying the frontiers of international finance.

The purpose of this volume is to provide a set of selected self-contained studies analysing a number of interrelated questions about interactions of exchange rates, interest rates and commodity prices. While there remains much that is little understood, the conclusions concerning the validity of the theory of purchasing power parity are becoming more and more reliable; the expectations hypothesis of the term structure continues to perform poorly; interest rates are yet to equalise in real terms across countries; and there is evidence of important linkages between commodity prices and exchange rates, and vice versa. Consistent with the main findings, efforts have been made, as and when appropriate, to draw attention to what action and decisions businesses and governments can take to modify adverse effects and to capitalise on opportunities in the future.

M.M.

Acknowledgements

I wish to express my gratitude to the authors for their contributions to this volume. I extend my gratitude to Elsevier Science Ltd for granting permission to reprint material from *Journal of International Money and Finance*, Vol. 18, 1999, pp. 225–249, L.L. Ong et al ‘The world interest rate....’; Vol. 19, 1998, pp. 407–439, L.A. Sjaastad: ‘On exchange rates....’; Vol. 15, 1996, pp. 879–897, L.A. Sjaastad et al: ‘The price of gold....’, and to Taylor and Francis Ltd (www.tandf.co.uk) for permission to reproduce material from *Applied Economics* Vol. 31, 1999, pp. 1383–1391, M. Manzur et al ‘Measuring international competitiveness....’.

I am indebted to Kenneth Clements, not only for his useful contribution to this volume, but also for his constructive help and continuous encouragement through out the course of this work. Paula Haslehurst has done a professional job in preparing the manuscript, with Melvin Poa providing excellent research assistance. Thanks are also due to Subramaniam Anathram for his useful help during the final stage of this work. I am also thankful to Edward Elgar and his colleagues, Francine O’Sullivan, Alex Minton and Caroline McLin, all from Edward Elgar Publishing for their exhaustive efforts in the development of the manuscript. The text has also benefited from the comments of an anonymous reviewer. Financial assistance from the Curtin Business School is gratefully acknowledged.

M.M.

Contributors

Kenneth W. Clements is Professor of Economics and Director of the Economic Research Centre at The University of Western Australia.

John Freebairn is Professor and Head of the Department of Economics at the University of Melbourne.

H.Y. Izan is Professorial Fellow at the Graduate School of Management, The University of Western Australia.

Yihui Lan is working on her PhD thesis, 'The Big Mac Approach to Economics', at the University of Western Australia.

Meher Manzur is Senior Lecturer in Finance and Banking at the Curtin University of Technology.

Li Lian Ong is Asian Regional Economist (based in Hong Kong) at Macquarie Bank in Sydney.

Fabio Scacciavillani is Economist at the European Central Bank.

Larry A. Sjaastad is Professor of Economics at The University of Chicago and Adjunct Professor at The University of Western Australia.

Contents

<i>Figures</i>	<i>vi</i>
<i>Tables</i>	<i>viii</i>
<i>Preface</i>	<i>xi</i>
<i>Acknowledgements</i>	<i>xii</i>
<i>Contributors</i>	<i>xiii</i>
1. Exchange Rates, Interest Rates and Commodity Prices: An Introduction <i>Meher Manzur</i>	1
2. The Explosion of Purchasing Power Parity <i>Yihui Lan</i>	9
3. On Exchange Rates, Nominal and Real <i>Larry A. Sjaastad</i>	39
4. Purchasing Power Parity and International Competitiveness <i>Meher Manzur</i>	79
5. The World Real Interest Rate <i>Li Lian Ong, Kenneth W. Clements and H.Y. Izan</i>	97
6. Term Structure of Interest Rates: Experience from the G7 Countries <i>Meher Manzur</i>	126
7. Notes on Exchange Rates and Commodity Prices <i>Kenneth W. Clements and Meher Manzur</i>	145
8. The Price of Gold and the Exchange Rate <i>Larry A. Sjaastad and Fabio Scacciavillani</i>	157
9. Is the \$A a Commodity Currency? <i>John Freebairn</i>	180
<i>Index</i>	208

Figures

2.1	The growth of economic research	12
2.2A	Exchange rates and relative prices: absolute PPP	15
2.2B	Exchange rates and relative prices: relative PPP	15
2.2C	Exchange rates and relative prices: stochastic deviations from relative PPP	16
2.3	The quantity theory of money	17
2.4	Traded and non-traded goods prices	18
2.5	Exchange rates, money and prices	19
2.6	Productivity and exchange rates	20
2.7	The time path of a mean reversion process	24
2.8	Estimates of PPP half-lives	26
3.1	Swiss franc exchange rates 1973–1991 (nominal, PPP real and true real versions)	55
3.2	Prices of Swiss traded goods vs. price levels	56
4.1	Real exchange rates: basket vs PPP method, 1973(1)–1996(1), Singapore	83
4.2	Real exchange rates: basket vs PPP method, 1973(1)–1996(1), Malaysia	83
4.3	Real exchange rates: basket vs PPP method, 1973(1)–1996(1), Japan	83
4.4	Real exchange rates: basket vs PPP method, 1973(1)–1996(1), Thailand	84
4.5	Real exchange rates: basket vs PPP method, 1973(1)–1996(1), Korea	84
5.1	Gagon and Unferh's estimates of the world interest rate model: annual data, 1978–1993	110
7.1	Internal and external prices	147
7.2	Equi-value contours	151
7.3	Internal and external relative prices	152
7.4	World-market clearing	153
7.5	Overall equilibrium	154
7.6	The small-country case	154

7.7	The large-country case	155
8.1	Simulated response of US dollar price of gold to a 10 per cent depreciation of the dollar against: the yen, the DM, both	171
9.1	Estimates of the sectoral composition of exports 1913–1914 to 1981–1982	186
9.2	Terms of trade index (ratio of the implicit price deflator for exports and the implicit price deflator for imports; index base 1975 = 100)	190
9.3	Commodity price index 1960–1986 (1980 = 100)	192
9.4	Terms of trade index (left scale) and effective real exchange rate index, RCT (right scale) (1974 = 100)	198
9.5	Australia's terms of trade and international competitiveness	200
9.6	World commodity price fluctuations and Australian export commodity sector	202
9.7	World commodity price fluctuations and Australian import competing sector	203
9.8	World commodity price fluctuations and non-traded sector	204

Tables

1.1	Real exchange rates: G7 (log changes x 100)	3
1.2	Changes in commodity prices and real interest rates	4
2.1	Big Mac Index search results	13
2.2	Estimates of PPP half-lives	25
2.3	Recent empirical evidence on PPP	28
3.1	Augmented Dickey–Fuller unit-root tests on basic data: 1974:01–1991:04	48
3.2	Swiss franc/US dollar exchange rate: 1974:02–1991:04	50
3.3	Swiss franc/mini-ECU exchange rate: 1974:02–1991:04	52
3.4	Correlations and unit-root tests, franc/dollar exchange rates: 1973:01–1991:04	57
3.5	Orthogonality tests of Swiss true real exchange rate: 1974:01– 1991:04; NLSYSTEM–GMM estimates of equation (3.8)	60
3.6	Tests of ‘unit-sum’ restriction: Switzerland, 1974:02–1991:04; NLSYSTEM–GMM estimates of equation (3.7’) on import and export prices	61
3.7	Orthogonality tests of Swiss PPP real exchange rate: 1974:02– 1991:04; NLSYSTEM–GMM estimates of equation (3.9’)	63
3.8	Estimated cointegrating vectors for Swiss exchange rates: 1974:02–1991:04	65
3.9	Orthogonality tests: Swiss true real exchange rates, 1973:02– 1991:04	66
3.10	Percent measurement error in the Swiss PPP real exchange rate, 1973:02–1991:04	66
3.11	Endogeneity tests on y_{it} ; Switzerland, 1974:01–1991:04	73
4.1	DF–ADF unit root: Singapore, Malaysia, Japan, Thailand and Korea, 1973(1)–1996(4)	86
4.2	Sims unit root tests: Singapore, Malaysia, Japan, Thailand and Korea, 1973(1)–1996(4)	88
4.3	Engle and Granger cointegration tests: Singapore, Malaysia, Japan, Thailand and Korea, 1973(1)–1996(4)	89

4.4	Johansen cointegration tests: exports and basket real exchange rates, 1973(1)–1996(4)	90
4.5	Johansen cointegration tests: exports and PPP real exchange rates, 1973(1)–1996(4)	91
4.6	Granger causality test: exports, PPP and basket real exchange rates, 1973(1)–1996(4)	92
5.1	Estimate of the world interest rate model: annual data, 1978–1993	109
5.2	Estimates of the world interest rate model for seven OECD countries: annual data, 1978–1993	113
5.3	Estimates of the weighted world interest rate model: annual data, 1978–1993	114
5.4	Estimates of the world interest rate model for seven OECD countries: annual data deflated by WPI, 1978–1993	116
5.5	Estimates of the true real interest rate with relative price changes for seven OECD countries: annual data, 1978–1993	119
6.1	Correlation matrix of bond yield measures: G7 countries, 1975(3)–1998(4)	132
6.2	Summary statistics of bond yield measures: G7 countries, 1975(3)–1998(4)	133
6.3	IPS panel tests for unit roots: G7 countries, 1975(3)–1998(4)	134
6.4	Autocorrelations of excess holding returns: G7 countries, 1975(3)–1998(4)	135
6.5	Regression of excess holding return on the yield spread: G7 countries, 1975(3)–1998(4)	135
6.6	Regression of the change in one period ahead short rate on the yield spread: G7 countries, 1975(3)–1998(4)	136
6.7	Regression of volatility of interest rates on the yield spread: G7 countries, 1975(3)–1998(4)	139
6.8	Regression of actual market covariability on the yield spread: G7 countries, 1975(3)–1998(4)	140
6.9	Regression of nominal exchange rate volatility on the yield spread: G7 countries, 1975(3)–1998(4)	142
8.1	Augmented Dickey–Fuller unit root tests on residuals of cointegration equations: gold prices and exchange rates, 1982(07)–1990(12)	164
8.2	Stationarity and market efficiency tests on forecast error data 1982(2)–1990(4)	165
8.3	OLS estimate of equation (8.4): gold, 1983(01)–1990(12) (Hansen–Hodrick standard errors)	167

8.4	OLS estimate of equation (8.4) with inflation variables: gold, 1983(01)–1990(12) (Hansen–Hodrick standard errors)	169
8.5	OLS estimate of equation (8.4') with inflation variables and nine lags on dependent variable: gold, 1983(01)–1990(12) (Hansen–Hodrick standard errors)	170
8.6	The stability of the gold market and real exchange rates	173
8.7	Stationarity tests on gold price and exchange rate data	177
9.1	Changes in the composition of commodities in Australia's exports of goods, 1950–1951 to 1988–1989 (percentage share of total exports)	187
9.2	Measures of trend movements and the volatility of real prices for selected commodities over the period 1950–1988	191
9.3	Correlation matrix for real commodity prices, 1952–1988	193

1. Exchange Rates, Interest Rates and Commodity Prices: An Introduction

Meher Manzur

Why is purchasing power parity (PPP) always and everywhere controversial? Despite overwhelming evidence that sterilised central bank interventions are impotent, why do major industrialised countries (such as the G8) continue to look for accords to stem exchange rate volatility? In a world of increasing globalisation, why are interest rate movements so poorly correlated across countries? Why are the currencies of the resource-based economies depreciating when the commodity prices are holding up? Has the link between exchange rates and commodity prices collapsed? These are among the fundamental questions confronting contemporary research and policy-making in international finance. These questions themselves concern the more fundamental problems of exchange rate determination and price formation in open economies, and the degree of monetary independence and its implications for macroeconomic policy.

This book contributes to an understanding of the key issues relating to the intriguing questions of the link between the exchange rate instability and domestic inflation; the real exchange rate and interest rate manifestations; and the covariability of exchange rates and commodity prices. The book is made up of nine self-contained chapters with a common theme – the behaviour of asset prices and interest rates in international markets. The approach is broadly empirical and applies econometric and modelling techniques to a wide range of recent data for a cross-section of countries.

The purpose of this chapter is to set the stage for the subsequent chapters to follow. We start in the next section with a skeletal review of how the three key variables under focus – exchange rates, interest rates and commodity prices – hold together historically. This descriptive analysis will be followed by an overview of the other chapters of this book.

1.0 HISTORICAL PERSPECTIVES

Exchange rates and interest rates are fundamentally linked by the interest parity condition. The *uncovered version* of this condition stipulates that the interest differential (that is, domestic interest rate minus foreign interest rate) coincides with the expected depreciation of the domestic currency. Since the expected future spot exchange rate is not observable, the uncovered version is modified by replacing the expected future spot rate by the forward exchange rate to obtain the *covered version*, implying that the interest differential is equal to the forward discount or premium.¹ The link between exchange rates and commodity prices derives from PPP. Under PPP, commodity prices are *arbitraged internationally* so that they are the same in all locations when expressed in terms of a common currency.²

In what follows, we provide a brief description of the broad features of major exchange rates in the 1990s, and compare these features with those of the 1960s. Also included is a brief analysis of whether these features are manifested in real interest rates and commodity prices. The purpose here is to describe the features rather than analyse them.

We use quarterly exchange rates for the Group of Seven (G7) countries for 1991(1)–1998(4) to capture the most recent experience with the current floating rate system, and 1961(1)–1968(4), the ‘matured’ part of the Bretton Woods period of adjustable par values. All data are from *International Financial Statistics* published by the International Monetary Fund. Since the two periods have substantially different implications with respect to the behaviour of nominal exchange rates and monetary policy, we focus on real rather than nominal exchange rates.

Real exchange rates are defined as nominal rates adjusted for inflation. Since prices for individual countries, when expressed in a common currency, are subject to the variability of exchange rates, bilateral real exchange rates based on individual country price levels may be infected with measurement errors. The use of one reference country, such as the USA, gives rise to asymmetries. Following Sjaastad (1990), we resolve these problems by using ‘multilateral’ real exchange rates which involve defining all prices and exchange rates on an appropriately weighted ‘basket’ of currencies rather than a single currency. In our context, the basket comprises the G7 currencies; and the average export shares of these countries are used as weights. Alternative weighting schemes were tested and gave the same results.³

Table 1.1 gives the mean and standard deviation of the real exchange rate

changes for the 1990s and 1960s. As can be seen, the means are more or less comparable for the two periods, but the standard deviations in the 1990s are considerably larger – on average more than five times larger. This indicates that real exchange rates have been much more volatile in the 1990s compared with the 1960s, that is, the variability of real exchange rates is increased when the nominal exchange rate is floating. This is consistent with Mussa (1987).

Note that greater variability of real exchange rates in a floating rate regime is ‘inherent’ in the adjustment mechanism. By definition, the exchange rate is the relative price of two national monies (assets), and like other asset prices, is determined in a forward-looking manner in which expectations concerning the future course of events play a key role. Consequently, exchange rates are very sensitive to the receipt of new information. On the other hand, aggregate price levels, which reflect the prices of goods and services, adjust only slowly, and do not jump as new information becomes available. The ‘stickiness’ of aggregate price levels does not necessarily represent market imperfections, rather it reflects the costs of price adjustment as a result of nominal contracts of finite length (see Frenkel, 1981). This characterisation of exchange rates *vis-à-vis* national price levels is embodied in the ‘asset market’ theory of exchange rates (see Mussa, 1982).

We now turn to the properties of other prices such as commodity prices and real interest rates. For commodity prices, we use the monthly series of world commodity prices contained in *International Financial Statistics* published by the International Monetary Fund.

Table 1.1 Real exchange rates: G7 (log changes x 100)

Statistic	UK	France	Germany	Japan	Canada	Italy	USA
1960s							
Mean	0.35	-0.21	0.08	-0.70	0.30	-0.29	0.13
Std deviation	2.48	0.66	0.74	1.05	1.00	0.78	0.46
1990s							
Mean	0.25	0.07	0.20	-0.08	0.37	0.16	0.24
Std deviation	6.81	6.93	7.21	7.84	3.12	6.45	3.41

To eliminate seasonal effects, we use twelve-month rates of change rather than monthly changes. For real interest rates, we use the ninety-day US treasury bill rates corrected for US inflation over the following twelve months. As a check, we also defined the real interest rate as the ninety-day

US treasury bill rate adjusted for quarterly inflation in the USA; moreover, we repeated the exercise using the yield on US long-term government bonds and the results (not included here) were very similar. The data on the US treasury bill rates, the yield on long-term bonds and the CPI are all from OECD MEI Database, VAR Econometrics.

The statistics for the twelve-month rates of change of commodity price index and the level of real interest rates are given in Table 1.2. As can be seen, the mean changes for the two series are more or less comparable, but standard deviations of both of them are about five times more variable in the 1990s than in the 1960s. This result is quite similar to the increased volatility of exchange rates, discussed previously. Note that as changes in exchange rates and commodity prices are dimensionally consistent, they are comparable with *levels* of real interest rates.

Table 1.2 Changes in commodity prices and real interest rates

	Commodity prices		Real interest rates	
	1960s	1990s	1960s	1990s
Mean	-1.30	-1.02	-0.02	-0.04
Standard deviation	5.88	19.89	0.32	1.61

To summarise, we observe that exchange rates have been markedly volatile since the switch to floating by the major currencies. Interestingly, we also observe that the additional variability of exchange rates tends to echo those of commodity prices and interest rates. This raises a number of important questions such as why these prices are so volatile, whether there is any systematic link among their variances, business and policy implications of this increased volatility, and so on. Proper resolution of these questions involves a thorough re-examination of the fundamental issues in exchange rate economics. In the eight chapters to follow, we provide new insights to these issues.

2.0 A PREVIEW OF OTHER CHAPTERS

PPP has, historically, occupied the centre stage of research in international finance. In Chapter 2, Yihui Lan provides an up-to-date survey of the contemporary literature on PPP. It covers the literature that has appeared up until July 2000, with the major focus on the research from the last decade.

This chapter has several attractive features. First, it employs an analytical approach to quantify the research into and interest in PPP, as compared to other major topics in international finance. Second, it provides a stylised geometric analysis of the PPP theory. Third, the study uses scientific measures (for example, the half-life measure) to deal with issues related to deviations from the parity and the speed of adjustment. Finally, it provides a succinct analysis of the recent empirical evidence on PPP.

Chapter 3 focuses on the crucial area of exchange rate dynamics. In this chapter, Larry Sjaastad provides an empirical test of the proposition that floating exchange rates can insulate small, open economies from external inflation. For this purpose, an Australian 'commodity currency' model is developed first, which is then extended to deal with real exchange rates as well. An attractive feature of this study is that the nominal version of the model is rich enough to admit tests of various hypotheses, including PPP, monetary independence, interest rate parity, terms-of-trade neutrality and foreign exchange market efficiency. The author uses Swiss data for the post-Bretton Woods period to test the nominal and real versions of the exchange rate model. The results indicate, among others, that the model tracks the Swiss franc nominal exchange rate *vis-à-vis* the dollar and the major European currencies very well, but Swiss PPP real exchange rates are found to be heavily contaminated with measurement error. According to the author, as that error explains the large co-movements in nominal and PPP real exchange rates, those co-movements are largely irrelevant to the PPP debate.

Chapter 4 deals with an important application of PPP. In this chapter, Meher Manzur investigates the relative usefulness of PPP in the measurement of international competitiveness. For this purpose, a new, alternative measure of real exchange rates is first constructed as an indicator of international competitiveness. This new measure, called the 'basket approach', involves defining all prices and exchange rates on an appropriately weighted basket of currencies rather than a single currency. Using data for Japan, Korea, Thailand, Malaysia and Singapore, real exchange rates are calculated based on both PPP and the basket approach. To check for the relative performance of the two measures, cointegration tests are employed. The results indicate that the new measure tends to outperform PPP in tracking the export growth for the sample countries. Moreover, the PPP-based real exchange rates tend to understate the measures of competitiveness for these countries. This result has important implications in terms of the levels of these countries' exchange rates as well as the well-known Balassa hypothesis.

Chapter 5 deals with a particular version of interest rate parity, namely, the equalisation of the real interest rates across countries. A key feature of this