

Currencies, Commodities and Consumption

Currency values, prices, consumption and incomes are at the heart of the economic performance of all countries. In order to make a meaningful comparison between one economy and another, economists routinely make use of purchasing power parity (PPP) exchange rates, but while PPP rates are widely used and well understood, they take a lot of effort to produce and suffer from publication delays. *Currencies, Commodities and Consumption* analyses the strengths and weaknesses of two alternatives to PPP. First, the so-called Big Mac Index, which uses hamburger prices as a standard of measurement, and second, a less well-known technique which infers incomes across countries based on the proportion of consumption devoted to food. Kenneth W. Clements uses international macroeconomics, microeconomic theory and econometrics to provide researchers and policy makers with insights into alternatives to PPP rates and make sense of the ongoing instability of exchange rates and commodity prices.

KENNETH W. CLEMENTS has been at The University of Western Australia since 1981 as Winthrop Professor of Economics and since 2008 BHP Billiton Research Fellow at the UWA Business School. In 2009, his book (coauthored with X. Zhao) *Economics and Marijuana* was published by Cambridge University Press. He is a Fellow of the Academy of Social Sciences in Australia and in 2009 received from the Australian Learning and Teaching Council a Citation for Outstanding Contributions to Student Learning.



Currencies, Commodities and Consumption

KENNETH W. CLEMENTS
Business School, The University of Western Australia





CAMBRIDGEUNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

One Liberty Plaza, 20th Floor, New York, NY 10006, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

314-321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi - 110025, India

79 Anson Road, #06-04/06, Singapore 079906

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org

Information on this title: www.cambridge.org/9781107014763

© Kenneth W. Clements 2013

This publication is in copyright. Subject to statutory exception and to the provisions of relevant collective licensing agreements, no reproduction of any part may take place without the written permission of Cambridge University Press.

First published 2013

First paperback edition 2015

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

Library of Congress Cataloging in Publication data

Clements, Kenneth W., 1950-

Currencies, commodities and consumption / Kenneth W. Clements,

Business School, The University of Western Australia.

pages cm

Includes bibliographical references and indexes.

ISBN 978-1-107-01476-3

1. Consumer price indexes. 2. Cost and standard of living. 3. Purchasing power parity. 4. Foreign exchange. I. Title.

HB225.C54 2012

339.3-dc23 2012033995

ISBN 978-1-107-01476-3 Hardback

ISBN 978-1-316-60111-2 Paperback

Cambridge University Press has no responsibility for the persistence or accuracy of URLs for external or third-party internet websites referred to in this publication, and does not guarantee that any content on such websites is, or will remain, accurate or appropriate.



Contents

Li	st of figures	page vi
Li	st of tables	ix
Al	bout the author and contributors	xiii
Αc	cknowledgements	XV
1	Introduction	1
	Part I Exchange rates and prices	11
2	Purchasing power parity and the Big Mac Index	13
3	Commodity currencies and currency commodities	126
	Part II Commodity prices	189
4	Three facts about marijuana prices	191
5	Patterns in world metal prices	226
	Part III International patterns of incomes, prices and consumption	255
6	Disparities in incomes and prices internationally	257
7	Affluence and food: a simple way to infer incomes	320
In	dex	378

V



Figures

2.1	Exchange rates and prices, 19/3–200/	page 14
2.2	The growth of economic research	17
2.3	The geometry of PPP	20
2.4	Example of Big Mac table	29
2.5	The volatility of exchange rates and prices, 1994–2008	33
2.6	Big Mac real exchange rates for twenty-four countries, 1994–2008	35
2.7	The geography of money: over/undervaluation of	33
2.7	currencies, 1994–2008 averages	41
2.8	The value of the US dollar, 1994–2008	42
2.9	Scatter plots of exchange rates and prices, twenty-four countries, 1994–2008	46
2.10	Blow-up of scatter plots of exchange rates and prices,	
	twenty-four countries, 1994–2008	48
2.11	Variances of exchange-rate changes	49
2.12	Total volatility and the horizon	51
2.13	Scatter plots of future real exchange rates against currer	ıt
	deviations from parity, twenty-four countries, 1994-20	08 53
2.14	Predictive value of deviations from parity: chi-square	
	value against horizon	55
2.15	Time paths of estimated and implied parameters	58
2.16	The quality of three sets of exchange-rate forecasts	60
2.17	Implications of mispricing	69
3.1	The world gold market	132
3.2	Share of supply in excess supply elasticity	134
3.3	Country size, exchange rate and commodity price	135
3.4	Working of the commodity market	136
3.5	Market power, commodity price and exchange rate	137
3.6	Impact of appreciation on commodity prices	138
3.7	The shift coefficient	139

vi



List o	f figures	V11
3.8	The reciprocal commodity-currency relationship	143
3.9	Relative prices, import tariffs and the terms of trade	145
	Impact of a commodity boom	149
	More on a commodity boom	151
	The unstable case	152
3.13	Interactions between market power and commodity	
	currency: the four possibilities	154
3.14	Impact of a currency fad and a commodity boom	156
3.15	Real percentage demeaned currency and	
	commodity-price returns	161
4.1	Marijuana and housing prices	200
4.2	Relative price changes for marijuana and other	
	commodities	204
4.3	Relationship between unexpected arrests and	
	infringement notices	209
5.1	Price and volume indexes and dispersion for metals,	
	1950–2010, changes	232
5.2	Summary of price and volume indexes and dispersion	
	for metals, 1950–2010	233
5.3	Value, price and volume indexes for metals, 1950–2010	235
5.4	Differences in average metal values, 1950–2010	240
5.5	Prices and volumes of sixteen metals, 1950–2010	243
	Metal prices and volumes, 1950–2010	248
5A.2	Histogram of logarithmic changes in prices and volumes	2.52
5 4 2	for sixteen metals, 1950–2010	252
3A.3	Histogram of logarithmic changes in price and volume	2.52
<i>(</i> 1	indexes, 1950–2010	252
6.1	Relative prices in rich and poor countries	270
6.2 6.3	Relative prices and incomes for 132 countries in 2005	271279
6.4	Price dispersion and income (1)	284
6.5	Price dispersion and income (2) DEI and income	
		286 307
	Relative prices and incomes for rich versus poor countries Two versions of dispersion and income relation	313
	Weighted relative prices and incomes in 132 countries	313
υ Λ. 3	in 2005	314
7.1	Ratio of changes in the food budget share to changes	317
/ • I	in income	332



viii		List of figures
7.2	Scatter plot of food budget share against income	333
7.3	Actual and predicted income	347
7.4	Further cross-country income comparisons	348
7.5	Matrix of histograms of simulated income difference	ces
	for six country groups	352
7.6	Probability of income differences	353
7A.1	Further scatter plot of food budget share against	
	income for 138 countries	365
7A.2	Food prices and incomes	373
7A.3	Probability of income differences as a function of	
	distance between countries	374



Tables

2.1	Implied PPP exchange rates for twenty-four	
	countries, 1994–2008	page 30
2.2	Nominal exchange rates for twenty-four countries,	
	1994–2008	32
2.3	Real exchange rates for twenty-four countries,	
	1994–2008	34
2.4	Contingency tables test of serial independence of	
	mispricing, one-year horizon	38
2.5	Test of serial independence over various horizons	39
2.6	Runs tests for absolute parity	40
2.7	Mean real exchange rates	43
2.8	Predictive regressions, real exchange rates, twenty-fou	r
	countries, 1994–2008	56
2.9	More predictive regressions, twenty-four countries,	
	1994–2008	62
2.10	Seemingly unrelated regressions under full adjustment	,
	twenty-four countries, 1994–2008	66
2.11	Predictive regressions for real exchange rates with tim	e
	dummies, twenty-four countries, 1994–2008	73
2.12	The 'burgernomics' literature	77
2A.1	Implied PPP exchange rates, 1996–2008	81
2A.2	Nominal exchange rates, 1986–2008	85
2A.3	Real exchange rates, 1986–2008	89
2A.4	Predictive regressions with time dummies, changes	
	in nominal exchange rates, twenty-four countries,	
	1994–2008	97
2A.5	Predictive regressions with time dummies, inflation	
	differentials, twenty-four countries, 1994–2008	100
2A.6	Seemingly unrelated regressions under full	
	adjustment with time dummies, twenty-four countries	,
	1994–2008	103

ix



x List of tables

2A.7	More predictive regressions, twenty countries	
	(Argentina, Brazil, Poland, Russia omitted),	
	1994–2008	106
2A.8	Seemingly unrelated regressions under full adjustment,	
	twenty countries (Argentina, Brazil, Poland, Russia	
	omitted), 1994–2008	109
2A.9	Predictive regressions with time dummies, changes in	
	nominal exchange rates, twenty countries (Argentina,	
	Brazil, Poland, Russia omitted), 1994–2008	111
2A.10	Predictive regressions with time dummies, inflation	
	differentials, twenty countries, (Argentina, Brazil,	111
21.11	Poland, Russia omitted), 1994–2008	114
2A.11	Seemingly unrelated regressions under full adjustment	
	with time dummies, twenty countries, (Argentina,	117
2 4 1 2	Brazil, Poland, Russia omitted), 1994–2008	11/
ZA.12	Summary of presentation of results, high-inflation countries included and excluded	121
2 1		121
3.1	Descriptive statistics for currency and commodity returns	163
3.2	Correlation, variance and covariance for currency and	103
3,2	commodity returns	164
3.3	Correlograms of currency and commodity returns	165
3.4	Lag selection criteria for a VAR of currency and	103
J . T	commodity returns	166
3.5	Bivariate Granger causality between currency and	100
J . J	commodity returns	167
3.6	Volatility decomposition of currency and commodity	107
3.0	returns	174
3.7	Parameter estimates for currency and commodity	1, .
J.7	returns	175
3.8	Likelihood-ratio tests of spillover factors	176
3.9	Volatility decomposition of currency and	170
0.,	commodity-price returns over time	178
3A.1	Data sources and codes	183
4.1	Marijuana prices: leaf	194
4.2	Marijuana prices: heads	195
4.3	Marijuana prices in Australia	196
. • •		



List of	List of tables	
4.4	Estimated regional effects for marijuana prices,	
	income and house prices	198
4.5	Marijuana, consumer and alcohol price indexes	203
4.6	Infringement notices for minor cannabis offences	206
4.7	Arrests and prosecutions for marijuana offences	207
4.8	Estimates for the penalty model	208
4.9	Demand elasticities for alcoholic beverages	213
4.10	Income elasticities and budget shares	214
4.11	Quantity consumed, price, expenditure and budget	
	share for alcoholic beverages and marijuana	215
4.12	Own- and cross-price elasticity for alcoholic beverages	
	and marijuana	217
4.13	Log changes in quantity consumed and price for	
	alcoholic beverages and marijuana	219
4.14	Counterfactual log changes in quantity consumed for	
	alcoholic beverages and marijuana	220
5.1	Summary of logarithmic changes in prices and volumes	
	for sixteen metals, 1950–2010	228
5.2	Value shares for sixteen metals, 1950–2010	230
5.3	Summary of price and volume indexes and volatilities	
	for metals, 1950–2010	234
5.4	Comparison of average metal values, 1950–2010	239
5.5	Summary of average values, prices and volume	
	comparisons, 1950–2010	241
5.6	Price flexibility for metals, 1950–2010	244
5. 7	Price flexibility for metals and metal-specific intercepts,	
	1950–2010	246
6.1	Incomes and dispersion of prices in 132 countries	
	in 2005	264
6.2	Relative prices and incomes in 132 countries in 2005	268
6.3	Income elasticities of prices and demand	276
6.4	Implied price dispersion and income	278
6.5	Commodity decomposition of minimum-variance	
	income	283
6.6	Dispersion-equivalent income: illustrative calculations	288
6A.1	Budget shares in 132 countries in 2005	291
6A.2	Relative prices in 132 countries in 2005	298
6A.3	Implied price dispersion and income with and without	
	outliers	306



xii	List o	f tables
6A.4	Relative prices and incomes for rich and poor countries	
	separately in 2005	310
6A.5	Wald tests of equality of coefficients across country	
	groups	311
6A.6	Implied price dispersion and income for rich and poor	
	countries seperately	312
7.1	Real incomes and food budget shares in 132 countries,	
	2005	326
7.2	Matrix of food and income changes for six country	
	groups	330
7.3	The Florida model: estimates and simulation results	335
7.4	A cross-country income comparison	340
7 . 5	Illustrative comparison of food shares and incomes,	
	Nigeria and Indonesia	355
7A.1	National accounts data for twenty selected countries	357
7A.2	International Comparison Program data	363
7A.3	Prices of twelve commodities in 132 countries	366
7A.4	Ratios of the standard deviation of residuals for	
	poor to rich countries	372



About the author and contributors

The Author

Kenneth W. Clements has been at The University of Western Australia since 1981 as Winthrop Professor of Economics and since 2008 as BHP Billiton Research Fellow at the UWA Business School. His research has been supported by a series of grants from the Australian Research Council, and he has published recently in journals such as the *American Journal of Agricultural Economics*, *Journal of Business*, *Journal of International Money and Finance* and *International Statistical Review*. In 2009, his book (coauthored with X. Zhao), *Economics and Marijuana*, was published by Cambridge University Press. He is a Fellow of the Academy of Social Sciences in Australia and in 2009 received from the Australian Learning and Teaching Council a Citation for Outstanding Contributions to Student Learning.

Contributors

DONGLING CHEN has a PhD from The University of Western Australia and is an economist with the Shanghai Municipal Authority.

MEI-HSIU CHEN has a PhD from The University of Western Australia and is a Lecturer in Accounting and Finance at University of Western Australia.

RENÉE FRY has a PhD from the Australian National University and is Associate Professor in Economics at Australian National University.

GRACE GAO has a PhD from The University of Western Australia and is a Research Associate in Economics at University of Western Australia.

YIHUI LAN has a PhD from The University of Western Australia and is Associate Professor in Finance at University of Western Australia.

xiii



xiv

About the author and contributors

SHI PEI SEAH has a master's degree in Financial Mathematics from The University of Western Australia and is a consultant with PricewaterhouseCoopers.

THOMAS SIMPSON has a Bachelor of Commerce with honours degree from The University of Western Australia and was a Research Assistant in Economics at University of Western Australia.



Acknowledgements

In carrying out the research reported in this book, I would like to acknowledge the substantial assistance received from a number of sources over an extended period of time. First, there are those individuals with whom I have collaborated directly: Dongling Chen, Mei-Hsiu Chen, Renée Fry, Grace Gao, Yihui Lan, Shi Pei Seah and Thomas Simpson, whose names are listed at the commencement of the relevant chapters as contributors.

The contributors and I have received helpful comments, criticism and encouragements from Kym Anderson, Garry Barrett, Mardi Dungey, Mark Hazell, Judy Hensen, Zhang Hongtao, Carol Howard, Aimee Kaye, Geoffrey Kingston, Emily Laing, Liang Li, Bill Malcolm, Bob Marks, Bob McColl, Ganesh Viswanath Natraj, Chris O'Donnell, Matt Polasek, Ye Qiang, Ranjan Ray, David Sapsford, Jeffrey Sheen, Jiawei Si, Larry Sjaastad, MoonJoong Tcha, George Verikios, Don Weatherburn, David Wesney and Xueyan Zhao. I benefitted from the excellent research assistance of Andrew Ainsworth, Renae Bothe, Mei-Hsiu Chen, Joan Coffey, Grace Gao, Mei Han, Ze Min Hu, Callum Jones, Aya Kelly, Yihui Lan, Vitaly Pershin, Shi Pei Seah, Jiawei Si, Tom Simpson, Eleni Stephanou, Stepháne Verani, Patricia Wang, Robin Wong and Clare Yu. I am very grateful to Jiawei Si (again) for his excellent work with the production of this book. I also acknowledge the helpful comments received from anonymous readers, as well as encouragement and guidance from Chris Harrison, Publishing Director (Social Sciences), Cambridge University Press. In additional, Josephine Lane, Assistant Editor, Economics and Management Cambridge University Press, and International Science Editing provided valuable assistance in the production of the book.



xvi

Acknowledgements

I have presented earlier versions of some of this research at the Economic Measurement Group Workshops, Centre for Applied Economic Research, The University of New South Wales in 2008 and 2011, the 2006 conference on 'The Economics of Commodity Prices and Exchange Rates' held at The University of Western Australia, the 2006 Conference of Economists, Curtin University, the UWA Business School Forum on 'The GFC Mark II', September 2011, and seminars at Monash University and UWA. I have benefitted from these opportunities to trial ideas and the feedback received from participants, but needless to say, I have not been able to incorporate all of the many comments and suggestions received.

A shorter version of Chapter 2 of this book appeared as K. W. Clements, Y. Lan and S. P. Seah, 'The Big Mac Index Two Decades On: An Evaluation of Burgernomics', International Journal of Finance and Economics 17: 31-60, 2012. A shorter version of Chapter 3 appeared as K. W. Clements and R. Fry, 'Commodity Currencies and Currency Commodities', Resources Policy 33: 55-73, 2008. Chapter 4 appeared as K. W. Clements, 'Three Facts about Marijuana Prices', Australian Journal of Agricultural and Resource Economics 48: 271-300, 2004 (and that paper formed the basis for part of K. W. Clements, 'The Pricing of Marijuana', chapter 3 in K. W. Clements and X. Zhao, Economics and Marijuana: Consumption, Pricing and Legalisation, Cambridge University Press, 2009). A shorter version of Chapter 7 appeared as K. W. Clements and D. Chen, 'Affluence and Food: A Simple Way to Infer Incomes', American Journal of Agricultural Economics 92: 909-26, 2010. I acknowledge the willingness of these journals to permit the use of that material in this book and thank the referees and editors for constructive comments and suggestions on earlier versions. The front cover pictures are copyrighted by iStockphoto and are used with permission.

This research was supported in part by grants and other forms of assistance I received from the Australian Research Council, ACIL Tasman, AngloGold Ashanti, BHP Billiton, WA Department of Industry and Resources and the Business School, The University of Western Australia. The views expressed herein are not necessarily those of the supporting bodies.



Acknowledgements

xvii

Finally, I want to express my appreciation for the productive research environment provided by the Business School of The University of Western Australia. Staff, students and the Deanery of the School have all helped to make this research possible.

Kenneth W. Clements