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Chapter 1

Introduction

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I have divided the papers in this volume into four categories: overviews, real exchange rates and purchasing power parity (PPP), uncovered interest rate parity, financial integration and real interest rate equality and money and other economic variables and the international transmission of disturbances. The last is made up of two studies of the demand for money, four studies of international transmission, one study of the Great Inflation and the disinflation that followed and one study of the monetary model of exchange rates.

In what follows, I briefly review the papers and in the process of doing so try to give a taste for the development of my thinking as my research proceeded.

1. Chapters Overview

The common theme of Chapters 2 and 3, which make up this section of the book is long-run equilibrium. The focus on long-run equilibrium and the placement of these two chapters at the start of this volume are purposeful. We know more both theoretically and empirically about the long run than the short run. The quantity theory of money and the PPP condition, which are investigated in these two chapters are examples being traceable to the writings of the sixteenth-century Spanish scholastics and the subjects of much refinement thereafter. The equilibrium conditions in our models, moreover, provide a necessary anchor for investigations of shorter run behavior.

If we are completely agnostic with regard to equilibrium conditions, reaching a meaningful judgment with regard to dynamics becomes extremely difficult if not well-nigh impossible. These two chapters, therefore, set the stage for the papers in the rest of the book.

In Chapter 2, "Equilibrium Relationships between Money and Other Economic Variables," the principal question I addressed is whether the neutrality proposition associated with the quantity theory of money holds when changes in steady-state values of monetary growth, inflation and real growth are compared and whether this proposition extends to the relations linking interest rates and nominal exchange rates to money growth and inflation. The data I used were for 20 OECD countries over the period 1956–1980. I averaged these data to derive measures of steady-state growth rates of the money supply, price levels, real income, interest rates, and exchange rates for the periods prior to and during the Great Inflation. I then went on to examine the relationships linking between-period changes in these averages. In the main, the data were completely consistent with the predictions of the quantity-theory model. Classical neutrality held as did long-run PPP and a long-run monetary approach to the exchange rate. There was also evidence of a Fisher effect, albeit one that was less than complete.

In Chapter 3, "International Financial Relations under the Current Float: Evidence from Panel Data," the question my co-author Yusif Simaan and I addressed is how the major international financial relations fare over the long run. We examined five such relations: PPP and the Fisher equation once again, uncovered interest parity (UIP) and the equity-return analogs of both the Fisher equation and UIP. In the main, the results were consistent with theoretical expectations. Over the long run, PPP, UIP and the (bond-market) Fisher effect prove to be very good first approximations. The equity-return relations, though somewhat less so, were nevertheless much better behaved than past studies would have lead one to expect. Average rates of equity returns within countries kept pace with inflation in almost all instances; across countries, they were positively correlated with average rates of inflation. This proved particularly so when we extended the data period to include earlier decades.

2. Real Exchange Rates and Purchasing Power Parity

The 14 chapters dealing with real-exchange-rate behavior and PPP in this section of the book were written between 1980 and 2008. The actual work on the first of these, "A Comparison of Price Movements across Countries and States," written with Arthur Gandolfi, was, however, largely completed by the mid-1970s.[1]

During this long period, thinking in much of the profession on the subject of real exchange rates and PPP went full circle. Throughout the 1960s, PPP was viewed as a useful long-run proposition.[2] But shortly after the move to floating exchange rates in the early 1970s that changed. A variant of the monetary approach to exchange rates and the balance of payments that posited equilibrium as holding over exceedingly short time periods achieved widespread prominence. The papers in Frenkel and Johnson (1976) are examples. Excessive PPP optimism of that sort, however, did not last long at all. A scant decade later, very nearly the opposite conclusion had gained ascendancy in much of the profession. The role of PPP, as a rule-of-thumb predictive model and even as a long-run equilibrium condition, was increasingly questioned — PPP was seen to have "collapsed" (Frenkel, 1981).[3] Sometime in the mid-1990s as evidence supporting PPP increasingly accumulated, sentiment shifted again, this time back in the direction of the *status quo ante*, where it has remained.

[1]This paper was never previously published. The basic results were reported in an article that Gandolfi and I wrote for what was then called the First National City Bank *Monthly Economic Letter* in August 1974, "World Prices: An Open and Closed Case." I presented an early version of the paper at a conference at the U.S. Department of the Treasury in winter 1975 and at a faculty seminar Queens College CUNY in spring 1975.

[2]See, in particular, Friedman and Schwartz (1963, pp. 678–679) and Gailliot (1970).

[3]One reason sentiment changed so radically was the unexpected greater variability of the nominal exchange rates than their fundamental determinants after fixed rates broke down. A second was the finding by a number of researchers that real exchange rates under the float could be characterized statistically as random walks. Roll (1979), Frenkel (1981), Adler and Lehman (1983) and Darby (1983) were all prominent examples.

The papers in this section of the book were, I believe, a major part of this latter process.[4]

I had never bought the short-run argument and I rather quickly became skeptical of the argument that PPP had all of a sudden become useless. Both were at variance with my day-to-day observations as a business economist and also with the empirical evidence that I had begun to accumulate.

One bit of evidence came from the international transmission project. Michael Darby and I summarizing the results of that project described the worldwide inflation process as one of "lagged adjustment to lagged adjustment" (Darby and Lothian, 1983, p. 510). The inflation of that time, our evidence showed, was a monetary phenomenon. Equilibrium in monetary matters, however, was long run and PPP was a key, but again in the long run.

Chapter 4, "A Comparison of Price Movements across Countries and States," written with Arthur E. Gandolfi provided a second and more directly pertinent body of evidence. Gandolfi and I used annual data to compare price movements in the 48 continental US and the District of Columbia over the period 1930 through 1954 with exchange-rate adjusted price movements in 36 countries over the period 1953–1966 and in a subset of 10 industrial countries over the period 1953–1971. We used the states as our touchstone for judging openness — the extent to which prices quickly got equalized and PPP held.

When we wrote the initial draft of this paper in mid-1970s, it was the first of its kind. Not until 20 years later did another study of the same sort using intranational data appear (Engel and Rogers, 1996). Since then, studies of real exchange rate behavior using such data have proliferated (see, for example, Chen and Devereux, 2003 and the references cited therein).

Our comparisons of the 36 countries and the states yielded unambiguous results. We found that the 36 countries were much less open

[4]Earlier papers pointing to long-run real exchange rate stability include Davutyan and Pippenger (1985), Frankel (1986) and Edison (1987).

vis-à-vis one another than were the states of the Union. For the subset of 10 industrial countries, the results were less clear cut. We could reject the hypothesis of openness but somewhat less often and with less confidence.

Our assumption that states because of their openness were a useful benchmark was borne out by the data. In absolute terms, the degree of variation in yearly rates of inflation across states was exceedingly small — less than 1.5% per annum in almost all instances. Looking at the other side of the coin, we also found support for the hypothesis of *eventual* equalization of prices in both international samples. For the 10 countries, it took roughly three years before the variation of prices, or alternatively the extent of adjustment of prices, across those countries began to match the yearly variations, or extent of adjustment, of prices across the states. For the 36 countries, equality with the yearly cross-state results took the entire period of 14 years.

The final bit of evidence supporting long-run PPP came from the paper reprinted here as Chapter 2 — "Equilibrium Relationships between Money and Other Economic Variables" that I have already described.

The question of how to reconcile this evidence with the seemingly aberrant behavior of exchange rates following the move to floating exchange rates, therefore, naturally arose. The paper that appears here as Chapter 5, "The Behavior of Real Exchange Rates," published in the *International Journal of Forecasting* in 1987 was a first step toward answering this question. The first part of the paper was purely descriptive. In it, I examined the movements in measures of real dollar and real DM exchange rates for 11 major countries over the period 1957 through 1985. To take account of differences in price levels among countries, I adjusted the price indexes by the Kravis *et al.* (1978) estimates of equilibrium price levels in 1970. The end result, therefore was two sets of indexes of deviations from absolute PPP, one relative to the dollar, the other relative to the DM.

With respect to real dollar exchange rates, there was one important finding: most such exchange rates were dominated by two substantial movements, a protracted sharp decline in the early

1970s and an equally protracted sharp rise in the early 1980s. For most countries individually and for all countries on average these two swings were largely offsetting. In that limited sense, PPP did approximately hold during the sample period. Real DM exchange rates showed much less temporal variation and on average hovered much more closely about their equilibrium levels.

My conclusions were that the problem at the time was mostly a US dollar problem and that the two changes in the US monetary regime that took place in the period I studied were the most likely causes of the corresponding swings in dollar real exchange rates. Given the persistent nature of those swings, I concluded further that much more than the decade and a half's worth of data then available would be needed to discriminate among alternative explanations of this behavior.

One solution, therefore was to use much longer span of time-series data. An alternative was to return to the cross-country panel data of the sort that I used in the "Equilibrium Relationships between Money and Other Economic Variables." A second alternative was to reexamine the data for the floating-rate period using more powerful statistical techniques than the simple time-series methods used in previous studies. Over the next two decades, I wrote a series of papers of all three sorts, several on my own and a number of with co-authors.

Chapter 6, "A Century Plus of Japanese Exchange-Rate Behavior," published in *Japan and the World Economy* in 1990 was the first of my studies using long-term time series. In the paper, I examined annual data for France, Japan, the UK and the US over the period 1874–1986. The hypothesis that exchange-rate-adjusted price levels in these countries were co-integrated was generally found consistent with the data. Unit-root tests applied to the various real exchange rates much more often than not rejected the hypothesis of non-stationarity in terms of unit roots, or in the case of the yen non-trend-stationarity. Analysis of earlier periods of floating yen rates, particularly in the later decades of the nineteenth century — pointed to an important link between monetary conditions and real exchange rate variability.

In Chapter 7, "The Response of Real Exchange Rates to Permanent and Transitory Shocks," Martin Evans and I studied the time-series properties of the real exchange rates of Germany, Italy, Japan and the UK relative to the US dollar over the period 1975–1989. To mitigate the small-sample problems that plague conventional tests of real-exchange-rate stability, we developed an empirical model using the joint behavior of inflation and real exchange rates to back out the role played by the different shocks affecting real exchange rates. The model allowed us to uncover the sources of the fluctuations in real exchange rates with greater precision than would have been possible from studying real exchange rates alone.

We found that over the floating-rate period as a whole transitory shocks had a relatively small but statistically significant influence on real exchange rates. Real dollar exchange rates did not, therefore, simply evolve in response to permanent shocks. Instead, there were instances — varying with the currency and the time period — in which temporary shocks appeared to have made a substantial contribution to their evolution.

These variations in the relative contributions of the permanent and temporary components also provided important clues about the underlying sources of the shocks to real exchange rates. Differences in temporary components paralleled observed differences in the conduct of monetary policy, both over time and across countries. We found further that the contribution of the permanent component was heavily concentrated in one important and lengthy episode, the substantial dollar appreciation, and then roughly offsetting the depreciation of the 1980s. Because these two swings were characteristic of all four real exchange rates, they appeared to have been US related.

At roughly the same time that Evans and I were working on our paper, Mark Taylor and I began work on real-exchange-rate behavior constructing long historical time series data for France, the UK and the US. For US–UK the data spanned the full two centuries 1791–1990 and for France a somewhat shorter period. We used these data in "Real Exchange Rate Behavior: The Recent Float from the Perspective of the Past Two Centuries," that was published in the

Journal of Political Economy (*JPE*) in 1996 and which is reprinted here as Chapter 8 and in two derivative studies that are reprinted here as Chapters 10 and 12.

In "Real Exchange Rate Behavior: The Recent Float from the Perspective of the Past Two Centuries," Taylor and I reported strong evidence of mean-reversion of both franc–sterling and dollar–sterling real exchange rates. Perhaps more important, we showed that, contra the received wisdom of the time, the floating-rate experience was not any different from the standpoint of long-run behavior than the 180-year period that preceded it. The simple, stationary autoregressive models that we estimated on pre-float data easily outperformed non-stationary real exchange rate models in dynamic forecasting exercises during the period of the float. These equations, moreover, explained 60%–80% of the in-sample variation in real exchange rates.

In Chapter 10, "Real Exchange Rate Behavior," originally published in the *Journal of International Money and Finance* in 1997, we reported the results of a series of random simulations based on artificial data that we had generated that had the same sample moments as the data used in our *JPE* paper. We then generated the empirical power functions of standard unit-root tests applied to those data for samples of 20 years (roughly the length of the recent float at the time we wrote) and of 50 years (roughly the length of the post-WWII period then) as well as for samples of 100 and 200 years. The standard tests for mean reversion proved to have extremely poor power characteristics in the two smaller samples and, for data with sample moments similar to those of the sterling-dollar real exchange rate series, the rejection frequency did not improve very much even with a sample corresponding to 100 years. We concluded that the difficulty in detecting mean reversion in real exchange rates for the recent floating rate period very likely was due to the lack of statistical power of the standard tests.

Chapter 12 "Purchasing Power Parity over Two Centuries: Strengthening the Case for Real Exchange Rate Stability Reply to Cuddington and Liang," which appeared in the *Journal of International Money and Finance* in 2000, replied to a critical comment in that journal on our *JPE* article by John T. Cuddington and Hong

Liang who argued that PPP should be rejected because of the existence of a time trend in the dollar-sterling real exchange rate. We showed, however, that including such a trend in the autoregressive representation actually strengthened the case for mean reversion of the real exchange rate. Its economic importance was slight, but its inclusion resulted in a much faster-estimated speed of mean reversion — 20% per annum vs. 11% per annum according to our original estimate. That, in turn, translated into an estimated half-life of shocks to the real exchange rate of about three years, half the estimated half-life for dollar-sterling without allowance for a time trend.

Chapter 9, "Multi-Country Evidence on the Behavior of Purchasing Power Parity under the Current Float," provided a direct complement to the long-term time-series studies. It was originally published in The *Journal of International Money and Finance* in 1997. In the paper, I used panel data for the US and 22 other OECD countries to examine the PPP relation during the floating-rate period alone. The stylized facts of that period considered most inimical to PPP were the high volatility of real exchange rates and the strong positive correlation between real and nominal exchange rates observed in month-to-month, quarter-to-quarter and even year-to-year data. The results in this paper, however, showed that the two diminished greatly as the frequency of the data was reduced and that the correlation between real and nominal exchange rates almost entirely disappeared. Panel-data tests, moreover, showed that real exchange rates were better characterized as mean-reverting rather than as unit-root processes. While these findings stood in contrast to prevailing beliefs about exchange-rate behavior during this period, they were fully consistent with the results obtained with the time-series data.[5]

Chapter 11 "Some New Stylized Facts of Exchange Rate Behavior," originally published in the *Journal of International Money and Finance* in 1998, used another decade's worth of data to follow up on the investigation of floating-rate behavior reported in Chapter 5.

[5]Frankel and Rose (1996) using similar data provided important corroborative evidence.

It showed much more conclusively than did the earlier investigation that the problems associated with the float were not generic to the system but rather specific, being largely confined to the sub-period extending from the mid-1970s to the early 1980s and to one currency — the US dollar.

In Chapter 13, "Real Exchange-Rate Behavior under Fixed and Floating Exchange Rate Regimes," originally published in the *Manchester School*, Cornelia McCarthy and I used data for Ireland, Germany, the UK and the US to examine the stability of real exchange rates across regimes and over time (Lothian and McCarthy, 2002). We focused on Ireland because, given the diversity of its exchange-rate arrangements — currency union with the UK, followed by a close link to the other EU countries under the Exchange Rate Mechanism and then membership in the Euro, it provided a nice set of natural experiments. We found substantial evidence in favor of PPP and that the regime, other than Ireland's currency union with the UK, did not matter.

In Chapter 14, "Real Exchange Rates over the Last Two Centuries: How Important is the Harrod-Balassa-Samuelson Effect?" published in the *Economic Journal* in 2008, Mark Taylor and I used a modified version of the long time series we had used in our *JPE* paper to investigate the influences of three additional factors on real-exchange rate behavior. The first, whence the title of this chapter, was the effect of real variables on the long-run equilibrium levels of real exchange rates and, in particular, the influence of relative productivity differentials — the Harrod-Balassa-Samuelson effect. A second was the possibility of nonlinear adjustment of real exchange rates to their long-run equilibria. A third was differences in volatility of real exchange rate across nominal exchange rate regimes. We proxied the levels of productivity by real GDP per capita, which allowed us to examine the HBS effect using a long-span of data over which productivity differentials might be expected to be important even between major economies. We found a statistically significant HBS effect for dollar-sterling (but not for franc-sterling) that captured its long-run trend. We also found evidence of nonlinear reversion towards

long-run equilibrium and of downward shifts in volatility during fixed nominal exchange rate regimes.

3. Uncovered Interest Rate Parity

A particularly puzzling aspect of exchange-rate behavior since the advent of floating exchange rates has been the tendency for countries with high-interest rates to see their currencies appreciate rather than depreciate as the theory of UIP would suggest. This UIP puzzle, known in its other guise as "the forward premium puzzle," is now so well documented that it has taken on the aura of a stylized fact and as a result spawned a whole literature attempting to account for its existence (see Engel, 1996 and Chinn, 2006 for surveys of this literature). Like earlier studies, this second generation of studies focused almost exclusively on short-run behavior during the period of floating exchange rates that began in the early 1970s.

Chapter 15, "Uncovered Interest Rate Parity over the Past Two Centuries, written with Liuren Wu and published in the *Journal of International Money and Finance* in 2011, broke that mold. Wu and I studied the validity of UIP by constructing time series spanning two centuries. The estimated slope coefficients in regressions of exchange-rate growth on interest differentials were positive over the whole sample period and only become negative when the sample was dominated by the period of 1980s. We found further that large interest-rate differentials had significantly stronger forecasting powers for currency movements than small interest-rate differentials. When we regressed domestic currency returns of foreign bonds against returns on domestic bonds as an alternative test of UIP, we could not reject the null hypotheses of zero intercept and unit slope in most cases. These results were consistent with a world, in which expectations formation was highly imperfect and characterized on the one hand by slow adjustment of expectations to actual regime changes and on the other by anticipations for extended periods of regime changes or other big events that never materialized. A historical account of expected and realized regime changes added credence to this explanation and illustrated how uncovered interest-rate parity

holds over the very long haul, but nevertheless could be deviated from for extended periods due to either failures of expectations to adjust quickly enough to regime and other broad-based policy changes or to anticipations over extended periods of large events that in the end never actually materialized.

The point of departure for Chapter 16, "I Discovered the Peso Problem: Irving Fisher and the UIP Puzzle," written with Rachel A. J. Pownall and Kees C. Koedijk and published in the *Journal of International Money and Finance* in 2013 was Irving Fisher's seminal work on UIP straddling the turn of the last century (Fisher, 1896, 1907). Fisher was the first economist to posit the UIP relation, the first to investigate it empirically, and the first to offer a peso-problem type explanation for important episodes in which it was violated. Pownall, Koedijk and I begin with a review of Fisher's theoretical and empirical work and then go on to reexamine his data using modern econometric techniques. The results we obtained were very similar to those obtained in studies of the current floating-rate period — estimates of slope coefficients in both sets of Fisher's data that were not significantly different from zero and that in one instance was negative rather than positive.

Fisher himself was well aware of the departures from UIP in his data and pointed to the existence of episodic phenomena and in particular "unforeseen monetary changes" (Fisher, 1907, p. 279) as a reason why UIP might be violated. If the episodes in which such phenomena operated were lengthy, as they were in Fisher's two data sets, then long spans of data would be needed to provide sufficient degrees of freedom to uncover the true relationships. Over such long periods expectational errors would have a greater chance of averaging out. The same would be true for time-varying risk *premia*. An alternative solution to the problem would be to focus on low-frequency movements in the data, which is what Fisher himself did in his investigation of the relation between interest rates and inflation. In this paper, we did both.

We first turned to a very long historical time series for the US and the UK, using both the annual data themselves and 10-year average of the annual data as our units of observation. We then investigated

UIP using multi-country panel data, starting with monthly observations in our regressions and then using progressively longer averages of the monthly observations. The results with both data sets were much more in accord with theory than those we obtained with Fisher's data and those reported in the recent literature. This was particularly so in the two sets of regressions, in which we used averaged data — slope coefficients not very far removed from unity and regressions that explained substantial portions of the variance of the independent variables.

Chapter 17, "Uncovered interest parity: The long and the short of it," is the last paper in this volume viewed chronologically. I published it in the *Journal of Empirical Finance* in March 2016. It is a straight-forward replication of the experiments reported in the two previous chapters. In it, I examine UIP using a 17-country panel of historical time series data that at its longest — for the US–UK country pair — spans 217 years. The results like those in the other two studies were consistent with the theory. In most countries, bond yields expressed in a common currency bore a positive relationship to one another as UIP predicts. Here, the UIP puzzle disappears. The longer sample period used in this study and in the two earlier studies appears to be the reason. In principle, it allows small-sample departures to cancel one another out and they apparently do so. The issue, the paper suggests, now becomes one of short-run vs. long-run validity of the theory rather than validity *per se*.

4. Financial Integration and Real Interest Rate Equality

The four papers, in this section have the common theme of international financial integration, but approach the issue from somewhat different angles and using different data. Chapter 18, the first of the four chronologically, uses real-interest equalization as a metric for judging integration and investigates the extent to which they have been equalized across major industrialized countries over the long period 1871–1990. Chapter 20 uses the same measure, but higher frequency data for the period of floating exchange rates alone.

Chapter 19 uses a set of even longer time-series data than Chapter 18 to test real-interest equalization and combines this econometric analysis with a historical account extending back to the late classical era. Chapter 21 extends the data used in Chapter 19 to later periods and a much broader sample of countries and then goes on to investigate the reasons why capital flows from rich to poor countries had been so sparse.

Chapter 18, "The Behavior of Bond Yields Across Exchange-Rate Regimes and the Integration of Capital Markets," co-authored by Paul S. Jackson, was published in the *Greek Economic Review* in 1993. It was an outgrowth of Jackson's unpublished master's thesis in the Department of Economics of New York University that I supervised (Jackson, 1992).

In the paper, Jackson and I analyzed bond-yield behavior over time and across the US and eight other major industrial countries during the 120-year period from 1871 to 1990. At the time we wrote the paper, there was a rather widespread belief that the uncertainty engendered by the variability of nominal exchange rates under the floating-rate regime had reduced capital mobility and thus led to increased divergences among interest rates internationally (see as an example McKinnon, 1990). Although the verdict was not unanimous, a number of researchers presented evidence consistent with this hypothesis. The preponderance of such evidence, however, came from analyses of data for the post-WWII period alone, particularly the current float. Our long time series allowed us to reexamine this hypothesis using tests with much greater power than the tests applied to the relatively short span of data for the post-WWII period. They also allowed us to compare bond-market behavior under the float and the Bretton-Woods years with behavior under the gold standard.

Several important findings came out of this analysis. Perhaps most interesting was that the exchange-rate regime did not matter much, if at all, for the behavior of real yields. Over the full sample period, real yields in all of the countries were mean reverting. We could reject the hypothesis of a unit root for real interest rates in every instance for the full period and also for most of the subperiods that we analyzed. Correspondingly, we found strong

indications of relative convergence of real yields: we consistently rejected the hypothesis of a unit roots in the spreads between foreign and US real yields. The cross-country standard deviations of real yields, moreover, were neither significantly nor substantially different across the gold standard, Bretton Woods and current floating-rate periods. Additionally, there was essentially no difference in within-country standard deviations of real yields across these three periods.

Chapter 19, "The Internationalization of Money and Finance and the Globalization of Financial Markets," was published in the *Journal of International Money and Finance* in 2002. Its focus was international financial integration historically. The paper begins with a review of one of the most fascinating episodes in international monetary history — the introduction by Emperor Constantine of a new gold coinage to check inflation that came to be used as international money and continued to play that role for seven centuries. It goes on to consider the evolution of the foreign exchange and credit markets in the medieval era and the growth of these markets in the centuries that followed. It concludes with a presentation of statistical evidence on the degree of integration of stock, bond and money markets over the past three centuries. The implications of both this later quantitative analysis and the earlier historical analysis are complementary. From the end of the seventeenth century, we observe a strong tendency toward international integration in money and bond markets and a similar, but somewhat weaker tendency in that direction in equity markets. This process, however, was both discontinuous and non-monotonic, having been interrupted, and in several instances reversed, as wars and other dislocations intruded. The evidence for earlier centuries, although much more fragmentary and much less precise, points to much the same phenomena having taken place. The difference observed between the two periods as well as over time within the two periods centers around the range of financial assets and number of markets involved and the geographical scope of that involvement.

Chapter 20, "Has International Financial Integration Increased" was written with Lawrence Goldberg and John Okunev and published in the *Open Economies Review* in 2003. In the paper,

we compared the behavior of real interest rate differentials across the major countries under both the Bretton Woods regime and the floating-rate regime. The interest-rate data we used were for quarterly short-term domestic money-market interest rates of six countries, Canada, France, Germany, Japan, the UK and the US over the period 1957 to mid-2000. Our object was to investigate the extent of market integration and how it changed over time. For all 15 possible country pairs real interest differentials were mean reverting and in two-thirds of these cases indistinguishable from zero statistically. For all country pairs on average and for most such pairs individually, moreover, the estimated differentials were not appreciably different in absolute value from the differentials that we estimated for various money-market rates within the US. Additional evidence pointed to a narrowing of differentials under floating rates over time and an increase in speeds of convergence.

Chapter 21, "Institutions, Capital Flows and Financial Integration" was published in the *Journal of International Money and Finance* in 2006. The focus of the paper was on capital flows from developed to less developed countries and, in particular, on the question of why these flows were not much larger. In the paper, I first outline the theoretical arguments with regard to such flows and then go on to review the historical evidence on international financial integration more generally. I then turn to the related literature on economic development, which over the past decade has shifted its emphasis from technology and capital accumulation to the underlying institutional factors that affect investment. I present evidence that such factors also affect rich-to-poor country capital flows. Good policies — the pursuit of price stability, fewer direct interventions and sound institutional structures — are accompanied by higher capital flows and bad policies by lower capital flows.

5. Money and Other Economic Variables and the International Transmission of Disturbances

The eight chapters in this section are on a mixture of topics. Chapters 22 and 23 are studies of the demand for money. The specific

focus of the first of these is the effects of financial innovation on the demand for money; the specific focus of the second is the stability of the demand for money over the course of the business cycle. Chapters 24–27 are concerned with the international transmission of disturbances, inflation in the period from the late 1950s to 1976 in the case of Chapters 24 and 25, cyclical fluctuations in the UK and the US during the gold-standard era in the case of Chapter 26 and differences in the international transmission mechanism under Bretton Woods and floating exchange rates in the case of Chapter 27. Chapter 28 is a study of the Great Inflation and the disinflation that followed throughout the industrialized world. Chapter 29 investigates the performance of the monetary approach to exchange rates using data for Canada and the US.

Chapter 22, "The Demand for High-Powered Money" appeared in the *American Economic Review* in 1976. It was derived from my doctoral dissertation of the same name. When I actually began work on this topic in 1970, it was starting to become apparent that the rising inflation of the time and the ceilings on deposit interest rates then in place in the US were incompatible and that the spill-over effects of this incompatibility would inevitably alter how banks operated. To circumvent the ceilings, banks most likely would introduce new deposit-like liabilities and these in turn very likely would differ from conventional deposits both in their "moneyness" and in the extent to which they paid interest. The result would be a reduction in the stability of demand functions for conventional definitions of money as measured. In these circumstances, the demand for high-powered money might prove more stable than the demand for other, deposit-inclusive monetary aggregates and high-powered money, therefore, a more useful definition of money than those aggregates

The financial innovations did, of course, eventually come to pass and they did affect money-demand stability, but they were only in their infancy in the early 1970s. I, therefore, turned to cross-country data to test the hypothesis. My rationale was that the since differences across countries in deposit quality and deposit interest rates are substantial, the cross-country data would therefore provide a useful alternative laboratory for testing my hypothesis.

The empirical evidence in the main supported this proposition. Across countries high-powered money was the most stable of the four totals I examined even when it was judged on the basis of the simple constant velocity model. This greater stability of high-powered money, moreover, appeared directly attributable to the factors which theory suggests will have an important destabilizing influence on the demand for deposits.

One message for policy makers that came out of this was that policy should be such that the supply of and demand for money not be made more interdependent, as they would be in an environment of high and variable inflation coupled with interest ceilings on deposits and other such regulatory constraints. The other was that, having made them so, the monetary authorities should choose a monetary total as an indicator that was unaffected by such problems and not deduce from the instability in demand of a total that was that money played only a weak role in the economy.[6]

Chapter 23, "The Demand for Money from the Great Depression to the Present," written with Arthur E. Gandolfi, was published in the *American Economic Review* in 1976. Its focus was on the behavior of the demand for money during business contractions. To get around data limitations from the use of the time series alone, we used panel data for the 48 continental US and the District of Columbia for the years 1929 through 1968. We found that on the whole, the demand for money was quite stable over this 40-year period. The standard errors of our regressions varied very little, whether we went from year to year or from one five-year or 10-year subperiod to the next. The income and interest-rate coefficients in regressions run over such subperiods were, in fact, remarkably stable. What little variation we did uncover in the interest-rate coefficients was the exact opposite of the liquidity-trap behavior reputed to have characterized

[6]In an article evaluating Margaret Thatcher's economic policies written two years after she took office, Michael Darby and I constructed a series for high-powered money in the UK that we used to show that in contrast to prevailing beliefs at the time, the monetary policy of the Bank of England had in fact become highly restrictive (Darby and Lothian, 1983).

the 1930s. Interest elasticities instead of increasing substantially, as they would have had a liquidity trap developed, actually declined. We did find shifts in the intercepts of the regressions, but these proved to be predominantly secular rather than cyclical in nature.

Chapters 24 and 25 were originally published as chapters in Michael R. Darby, James R. Lothian and Arthur E. Gandolfi, Alan C. Stockman and Anna J. Schwartz, *The International Transmission of Inflation,* University of Chicago Press for the National Bureau of Economic Research, 1983.

In Chapter 24, "The Timing of Monetary and Price Changes and the International Transmission of Inflation," Anthony Cassese and I present evidence on two issues: the relative contributions to inflation in each of the eight countries we studied of domestic and of international factors, and the relative importance of the channels through which international factors had operated.

One way to approach these issues would have been to estimate more general open-economy models for these countries and to use those models to test the hypotheses of interest. Arthur Gandolfi and I did this in Chapter 25 as did Michael R. Darby and Alan C, Stockman in another study in the *International Transmission* volume. Cassese's and my approach in this chapter, in contrast was to conduct a series of tests of Granger-causality for each country for a number of key relations, some between domestic variables alone, others between domestic and foreign variables. In doing so, we focused on five areas that theory suggested as important: the relation between domestic money and prices, the influence of foreign prices on domestic prices, the influence of foreign interest rates on domestic interest rates, the behavior of the central bank, and the relation between the components of high-powered money and the monetary aggregates.

In all countries, our tests of the money-price relation showed a significant effect of lagged domestic money growth on domestic inflation, which appeared to be fairly robust across the specifications we tried. The strength of these relations suggested that one-shot and transitory phenomena, such as shifts in money demand, were unlikely to have been the major causative factors behind inflation. The absence of a consistent reverse relation from inflation to money

growth for most countries ran counter to explanations of inflation that attributed it primarily to cost-push accommodated by domestic monetary growth. Our results were also at odds with the assumption of continuous price arbitrage with money supplies adjusting with a lag to changes in nominal money demand induced by foreign price shocks. The strongest evidence for international transmission occurred in the asset markets, but even here non-reserve interest rates generally adjusted over time rather than instantaneously to changes in American interest rates.

When we combined the inflation-comparison results with the interest-arbitrage and the foreign- reserve vs. domestic credit results, we obtained a picture of the operation of a self-regulating mechanism preventing long-run monetary independence but allowing some scope for short-term domestic monetary control.

In Chapter 25 "International Price Behavior and the Demand for Money," Arthur E. Gandolfi and I used a reduced-form rational expectations price equation that we estimated for the US and seven other industrial countries to test competing explanations of the inflation of the late 1960s and early 1970s.

A key concern in the estimation of the model was the properties of the demand for money function. Unlike many studies using post-World War II time-series data that relied on the stock adjustment model, we obtained what we regarded as reasonable estimates of the parameters of the long-run demand for money function — particularly the income elasticity — without having to posit unacceptably slow speeds of adjustment characteristic of stock-adjustment models. The adjustment mechanism implicit in the estimated equation also was quite different from the standard formulation. For all eight countries, we found evidence of second-order serial correlation that was consistent with the existence of two types of error processes: permanent stochastic shifts that followed a random walk and other types of disturbances that were transitory in nature. Hence, a shock that altered the equilibrium rate of change of prices would gradually be eliminated, but the level of prices would not necessarily return to its original path. Viewed in retrospect, this result is eminently reasonable. We now know that any time-series process can be split

into a transitory and a permanent component, which is what this finding shows. It is also consistent with what Gandolfi and I found in our study of the demand for money in Chapter 24 that suggested the existence of a missing time-related variable affecting the quantity of real money balances over the long run. With respect to the causes of inflation internationally, our results pointed to domestic money supplies playing the crucial role in the process. We could not rule out oil price shocks as having made some contribution to the increases in the US and most foreign price levels, but relative to domestic money they were clearly of secondary importance.

Chapter 26 "The Gold Standard and the Transmission of Business Cycles, 1833–1932," co-authored with Wallace E. Huffman first appeared in Michael Bordo and Anna J. Schwartz, Eds, *A Retrospective on the Classical Gold Standard* in 1984.

Our objectives in this paper were to investigate the incidence of cyclical fluctuations within countries adhering to the gold standard and the transmission of these fluctuations across countries. Our analysis differed from earlier analyses both in its breadth of coverage, spanning the UK and the US and a period extending back to the earlier part of the nineteenth century, and in its emphasis, being concerned almost exclusively with cyclical fluctuations and with monetary, as opposed to credit or interest rate, data.

In investigating these topics, we first reviewed each of the important cyclical contractions in the UK and US during the century 1833–1932. We then conducted more formal tests of hypotheses about the causes of such contractions and their dissemination across countries. The basis of these tests was a vector autoregressive model estimated for both countries for the combined subperiods 1837–1859 and 1882–1914. The principle purpose of the historical narrative was to see whether a monetary explanation of the business cycle was at least broadly consistent with the data for the two countries. To do so we analyzed the movements in the UK and US money and gold stocks, the apparent causes of those movements, and their relationships to one another and to output over the cycle.

Our vector autoregressive model and associated hypothesis tests produced results consistent with the historical narrative. Our chief

concerns here, as in the historical analysis, were the association of monetary shocks and cyclical declines in output within each of the two countries and the strength of possible alternative channels of transmission between the two countries. The latter include specie flows, price and interest-rate arbitrage, asset-market adjustments, and direct absorption effects. Two principal findings came out of the econometric analysis: monetary shocks were the main source of cyclical fluctuations during this period, and the monetary system itself — the gold standard — was the main mechanism through which the shocks and associated fluctuations in output were disseminated.

Chapter 27 "International Transmission Afloat," written with Michael R. Darby was published in the NBER volume *Money, History and International Finance: Essays in Honor of Anna J. Schwartz* in 1989. In the paper, Darby and I examined the behavior of policy variables and other important economic variables across a sample of 20 OECD countries under both fixed and floating exchange rate regimes, and derived a series of test equations to evaluate the extent of the long-run differences in monetary-policy behavior between the two systems. We then went on to examine the correspondence between shorter run movements in economic variables in the various countries under the two systems. We concluded with a discussion of policymakers' reaction functions.

Our principal finding was that flexible exchange rates had indeed been accompanied by greater long-run monetary policy independence. Across the sample of twenty OECD countries that we examined, nominal variables behaved differently under flexible exchange rates than under fixed. The differences, moreover, were exactly the sort that theory suggests under the two regimes. Inflation rates, nominal bond yields, and monetary policy became more variable under floating rates, and the positive, longer-term covariance between nominal and real rates of money growth that was necessarily a hallmark of the fixed rate system became weak or virtually non-existent. This does not mean that the world became less interdependent across the board or that policymakers in one country actually operated without regard to policy and other developments abroad. On the contrary, a number of the empirical findings reported in the paper — most

notably the continued substantial or rising correlations between bond yields in the US and abroad, and the apparent continued relationship between the balance of payments and monetary growth in most major countries — suggested that interdependence of capital markets, in particular, increased and that central bankers often hesitated to go it completely alone.

The inflation of the late 1970s and early '80s, we argued, could be explained by vestiges of the same type of process. Policymakers, according to our results, in most instances continued to react to balance-of-payments inflows and outflows. In many instances too, the desire for stability of either interest rates or exchange rates, and sometimes both, continued to exert a powerful attraction. Central bankers' reactions, however, appeared to be much more sporadic, and the coordinated movements in domestic monetary policies were, therefore, much more attenuated than under fixed exchange rates. In short, we found a continued commonality in the movements of inflation rates internationally under floating rates, but a much greater disparity around the averages.

In Chapter 28 "The Behavior of Money and Other Economic Variables: Two Natural Experiments" Cornelia H. McCarthy and I tested the performance of the quantity-theory model and the related proposition of monetary neutrality using panel data for two important episodes of monetary-policy regime change — the move to floating exchange rates following the breakdown of Bretton Woods and the shift to less expansive monetary policy that to varying degrees took place in most industrial countries a decade later. The two episodes provided a set of ideal natural experiments. The first came about when overly expansionary US monetary growth proved inconsistent with the fixed exchange rates of the Bretton Woods system; the second as a political reaction to the accelerations in inflation during the 1970s and early '80s. They thus were episodes in which as Bernanke (2002) has put it "money move[d] for reasons that [were] plausibly unrelated to the current state of the economy."

The data we used were for a 20 OECD countries over the years 1960–1998. We focused in particular on the cross-country and

cross-regime movements in these data computing growth shifts, cross-regime changes in the within-regime country average annual rates of growth of the variables, and used these as our units of observation. We then went on to compare our findings for the 20 OECD countries with findings for a control group of 13 additional countries in which monetary policies followed time paths different to those of the OECD countries. As a further check on our results, we estimated a series of money-price regressions using the disaggregated yearly data.

The results of this exercise were highly positive. The money-price relationship that we observe was fully consistent with theory — growth shifts in the rates of growth of the nominal stock of money and the price level were highly correlated and bore a one-to-one relation to one another. Growth shifts in nominal exchange rates were significantly related both to growth shifts in relative price levels and to relative excess supplies of money. The classical neutrality proposition — in this context superneutrality — in general, received strong support.

On the general level of macroeconomic theory, these findings, therefore, provided strong support for the quantity-theory model. On the more specific level of price behavior during the course of the Great Inflation and the disinflation that followed, they show that the quantity theory was completely capable of explaining an overwhelming share of the long-term movements in inflation in the period that we studied. The other factors widely considered to have affected the money–price relationship — oil and commodity prices in the first instance and financial innovation in the second — evidently mattered very little over the long run.

Chapter 29 "The Monetary Approach to Exchange Rates and the Canadian Dollar over the Long Run" written with Bill Francis and Iftekhar Hasan was published in *Applied Financial Economics* in 2001. In the paper, we used Canadian and US data to examine the question of whether recent positive findings with regard to PPP carried over to the monetary approach to exchange rates. The evidence we obtained provides strong support for the monetary model of exchange rates as a long-run proposition and by extension support

for long-run PPP between the US dollar and the Canadian dollar during the sample period.

What makes these results of particular interest is the close link between monetary policies in the two countries. One of the criticisms levied against the studies of PPP is that most were for countries in which monetary policies at one time or another differed widely. Real effects on exchange rates, though perhaps substantial in absolute terms, it was argued would nevertheless prove small in relative terms, in such circumstances. Such studies, it was claimed, will as a result overstate the degree to which real exchange rates have been stable, and in particular reject the unit-root hypothesis when real exchange rates do in fact have economically meaningful permanent components.

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