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International Comparisons of Money Demand: A Review Essay

Prepared by James M. Boughton *

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Abstract

Many studies of the demand for money, covering a wide variety of economies, have demonstrated the importance of financial innovations and shifts in monetary policy regimes, but they have also illustrated the difficulty of measuring and assessing such changes. Because innovations and regime shifts have differed markedly across countries, international comparisons can help identify their effects. This paper reviews the literature on money demand comparisons, focusing primarily on industrial countries. It finds that innovations have had widespread effects, but also that the demand for money is not generally less stable now than it was before those changes occurred.

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Summary

Many studies of the demand for money, covering a wide variety of economies, have demonstrated the importance of financial innovations and shifts in monetary policy regimes, but they have also illustrated the difficulty of measuring and assessing such changes. Because innovations and regime shifts have differed markedly across countries, international comparisons can help identify their effects. This paper reviews the literature on money-demand comparisons, focusing primarily on industrial countries. It finds that innovations and regime shifts have had widespread effects, notably on the trend rate of growth of real balances, but also that the demand for money is generally no less stable now than it was before those changes occurred.

In the past few years, reasonably stable money-demand equations have been estimated for all of the major industrial countries, with residual errors that have not risen significantly with the inclusion of data from the 1980s. Even so, these equations are all more complex than those estimated earlier, at least in the dynamics but often in the equilibrium relationships as well. From a policy perspective, the central problem facing researchers is to identify the factors that have been driving changes in the demand for money and to determine whether those are ongoing influences or discrete shifts in behavior.

In addition to financial innovations and regime shifts, there are four general factors that may have been important determinants of changes in money demand or velocity in one or more of the major countries. First, shifts in inflationary expectations caused money demand to drop in the 1970s and then to rise sharply again when inflation abated in the 1980s. Second, open economy considerations such as expected exchange rate changes may have induced some portfolio shifting between national monies, although the available literature has not revealed pervasive effects. Third, to the extent that income elasticities of demand for money have differed from unity, velocity has become more volatile, reflecting the greater volatility of output in recent years. And fourth, because a substantial portion of money balances (broadly defined) now pays a short-term market rate of interest, shifts in the term structure of interest rates have, in some cases, generated significant shifts in the demand for money. Nonetheless, the evidence does not suggest that the volatility of money holdings was generally higher in the 1980s than it was in the 1960s.

I. Introduction

Estimation of money demand equations is an inexhaustible industry, one that is essential for understanding the workings of monetary policy in spite of the frustrations that it has brought to generations of econometricians and users alike. Scores of articles are published every year on topics such as theoretical specifications, the definition and measurement of money and related variables, policy implications, econometric techniques, exogeneity conditions, and stability properties. A comprehensive survey of such a vast literature, or even a review of all of the relevant issues, would be a massive undertaking; David Laidler (1985) and Goldfeld and Sichel (1990) tackled major pieces of that task, although they primarily surveyed studies relating to the United States. This essay shifts the focus to a broader range of countries and specifically to studies that have compared the demand for money across countries. Comparative studies necessarily offer less insight into any one country's monetary institutions and policies, but they provide a useful counterpoint to intensive country studies by helping to distinguish idiosyncratic from general properties. As Milton Friedman has often emphasized in this context, testing hypotheses with additional data sets is the most persuasive form of evidence available to economists. 1/

When I first examined the stability of the demand for money in the major industrial countries (the G-7) for the OECD in the late 1970s, there was relatively little literature to use as a starting point for making international comparisons. 2/ There was an extensive literature on U.S. money demand, capped by the exhaustive and seemingly definitive studies by Goldfeld (1973, 1976). 3/ There was quite a bit on the United Kingdom, where research was spurred by the 1971 financial reforms known as Competition and Credit Control (see especially Hacche's 1974 study for the Bank of England and Artis and Lewis' 1976 paper) and where the money demand relationship was already being used as an econometric testing ground by Hendry and Mizon (1978). But there were fewer studies of other major countries, and most of the comparative literature had paid little attention to

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1/ See, for a recent example, Friedman and Schwartz's (1991) rejoinder to Hendry and Ericsson (1991).

2/ The Group of Seven (G-7) comprises the United States, Japan, Germany, France, the United Kingdom, Italy, and Canada.

3/ For overviews of that early literature, see Laidler (1977) and Boorman (1982).

questions of stability. 1/ Particularly lacking was a systematic evaluation of whether the instabilities that had been uncovered in the United States and the United Kingdom were an isolated or a more general phenomenon. My conclusion (see McCracken (1977, pp. 276-277) and my 1979 and 1981 papers) was that most other G-7 countries had had a more stable experience, perhaps because they had not undergone such severe financial and economic disturbances.

The 1980s brought more instabilities and a consequent expansion of literature in this field, including a follow-up study by the OECD (Atkinson et al., 1984) and comparative studies by Taylor (1986), Fair (1987), Bordo and Jonung (1987, 1990), Domowitz and Hakkio (1990), Grivoyannis (1990), Hendry and Ericsson (1990), Kearney and MacDonald (1990), Boughton and

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1/ A number of multi-country studies were published more or less contemporaneously with my work for the OECD, and some of those did include at least rudimentary tests for stability. Notable examples were Hamburger (1977), who compared the stability of money demand in Germany and the United Kingdom; Al-Khuri and Nsouli (1978), who compared stability for the G-7 countries (excluding Italy); Arango and Nadiri (1981), who studied the United States, Germany, the United Kingdom, and Canada; and den Butter and Fase (1981), who examined eight European countries. The first three of those studies tested stability via the Chow test. Hamburger arbitrarily broke the sample at the midpoint; Al-Khuri and Nsouli chose the third quarter of 1971, when the Bretton Woods exchange rate system broke down; and Arango and Nadiri used both 1971:3 and one or two other points when exchange rate fixity was abandoned in each country. The Chow test, of course, lacks power against the hypothesis of a break at any other point in the sample. Den Butter and Fase found nonparametric evidence of instabilities by comparing residuals across subperiods and between sample and forecast periods. Other early multi-country studies included Holmans (1961), who compared the volatility of velocity across the G-7 (except Japan) plus Belgium, Denmark, the Netherlands, Norway, Sweden, and Switzerland; Kaufman and Latta (1966), who estimated money demand functions for several of those countries plus Japan; Leponiemi (1966), who compared evidence for Finland with the experience of the United States and the United Kingdom; Coutière (1976), who compared specifications across seven industrial countries (the G-7, but with the Netherlands instead of Canada); Canarella and Roseman (1978), who presented estimates for 11 European countries; and Gandolfi and Lothian (1983), who estimated buffer-stock equations for the G-7 plus the Netherlands. None of the latter group of papers tested for intertemporal stability. Friedman and Schwartz's (1982) study of the United States and the United Kingdom was in a different class altogether because of the very long sample and the emphasis on low-frequency observations.

Tavlas (1990, 1991), and Tsurumi and Kan (1991). 1/ One key issue that has emerged from these and other studies concerns the appropriate specification of the short-run function. Atkinson et al., Fair, Grivoyannis, and Tsurumi and Kan focused on the partial-adjustment model, while Domowitz and Hakkio, Hendry and Ericsson, Kearney and MacDonald, and Taylor used more general error-correction models. Comparing the results of those studies suggests that at least some of the instabilities and statistical problems that have plagued the partial-adjustment model may have resulted from the limited dynamics present in that model, rather than from shifts in portfolio behavior. Error-correction models thus seem to have emerged as the favorite horse in the race, but there are enough questions that can be raised about that approach that a final judgment should probably still be reserved; that issue is discussed in Section II.

A second major theme concerns the explanation of shifts in money demand. Such shifts could arise because of financial innovations, shifts in the monetary policy regime, more general economic disturbances, misspecification of the estimating equation, distributional effects, or unexplained changes in agents' preferences. Quantitative assessment of these factors is very difficult, if not impossible, but an analysis can be made of the timing of disturbances (including their permanence), and in some cases more direct proxies can be developed. These issues are the subject of Section III.

1/ To keep the discussion manageable, I am concentrating here on studies of industrial economies. There also are a number of papers comparing money demand specifications across developing countries. Several studies--Doblin (1951), Latané (1954, 1963), Adekunle (1968), Ezekial and Adekunle (1969), Melitz and Correa (1970), Perlman (1970), Sushka and Slovin (1976), Graves (1978), and Kenny (1991)--have included both industrial and developing countries in time-series or cross-section tests. Comparative studies specifically focusing on developing countries include Khan (1980), Driscoll and Lahiri (1983), Arrau and De Gregorio (1990), Arrau et al. (1991), and Bahmani-Oskooee and Malixi (1991), all of which examine a broad cross-section of countries; Campbell (1970), on comparisons between Korea (with declining inflation) and Brazil (with rising inflation); Ntang (1990), on central African countries participating in the CFA franc zone; Fan and Liu (1971), Fry (1978), Wong (1981), Khan (1982), Arize and Ndubizu (1990), and Tseng and Corker (1991), on Asian countries; Moufti (1976) and Crockett and Evans (1980), on Middle Eastern countries; Darrat (1986a), on oil-exporting countries; and Blejer (1978), Cambiaso (1978), and Darrat (1986b), on Latin American countries. Khan (1975, 1977a) and Taylor (1991) tested Cagan-type models of money demand under hyperinflation for European countries, and Khan (1977b) and Taylor and Phylaktis (1991) tested similar models for Latin American countries. Portes and Winter (1978) examined money demand in centrally planned economies and found properties similar to conventional results for market economies; Charemza and Ghatak (1990) estimated equations for Hungary and Poland and found that factors unique to planned economies were also important.

II. Estimation Issues

Estimation of the demand for money requires careful specification of an adjustment process--or else the use of very low-frequency data, as in Friedman and Schwartz (1982)--since all available evidence strongly indicates the persistence of departures from equilibrium with either quarterly or annual data. The starting point for considering this issue is the partial-adjustment model in which real or nominal money balances are hypothesized to adjust gradually and uniformly to any disturbance. That specification requires simply adding either the lagged value of real money balances or the lagged nominal value deflated by the current price level as an argument in the regression. In real-adjustment form, for example, the model could be written as

$$\Delta(m-p) = \beta\chi + \lambda(m-p)_{-1} + \mu, \qquad (1)$$

where m and p are logarithms of the money stock and the price level, χ is a vector of variables such as real income and interest rates (plus a constant), and μ is a standard residual.

What had already become clear by the late 1970s was that in all of the major industrial countries, the partial-adjustment model implied extremely long adjustment lags. For example, my 1979 paper found adjustment rates (λ) ranging from insignificantly different from zero (United States and Italy) to 20 percent (Germany) per quarter for M1, and from near zero (United Kingdom, France, Germany, and Italy) to 18 percent (United States) per quarter for broader aggregates (M2 or M3). 1/ A zero adjustment rate is equivalent to a unit root in the disturbance term of the equilibrium relationship; the equation thus lacks a stable steady state, and real money balances appear not to be cointegrated with the determining variables (χ). But even the equations with significant adjustment rates display a very high degree of autoregressivity. Most subsequent studies using partial-adjustment models have confirmed the importance of this problem in most major countries and have uncovered serious instabilities that may result from excessive restriction of the dynamics.

The buffer-stock model at first seemed to offer a way out of the long-lag difficulty by adding a second adjustment process: 2/

1/ Definitions of money differ across countries, sometimes because of institutional peculiarities but sometimes arbitrarily. For a general discussion and tabular presentation, see Kumah (1989). Angeloni et al. (1991) discuss the role of cross-border deposits in monetary aggregates in EC countries; they estimate partial-adjustment equations that indicate improved stability when such deposits are excluded from the traditional aggregates. There is an extensive literature on weighted (divisia) aggregates, but all of the comparative studies cited here relate to simple additive aggregates.

2/ For an overview on buffer-stock models of money demand, see Milbourne (1988). Equation (2), the version most commonly estimated, was developed by Carr and Darby (1981).

$$\Delta(m-p) = \beta\chi + \lambda(m-p)_{-1} + \alpha(m-m^*) + \mu, \qquad (2)$$

where m^* is a measure of the anticipated money stock. Even with a near-zero value for λ, real money balances are allowed to respond quickly to shocks via α. The difficulty that has been made clear by examining buffer stock models for narrow and broad aggregates in several countries (see Boughton and Tavlas, 1990, 1991) is that in many cases the dynamics are still excessively restricted; the fit of the equations in many cases is scarcely better than that of the corresponding partial-adjustment models, and the buffer-stock model may be encompassed by a less restricted error-correction specification, such as:

$$\Delta(m-p) = \gamma\Delta\chi - \lambda(m - \beta_0 p - \beta\chi)_{-1} + \mu, \qquad (3)$$

where $\gamma\Delta\chi$ is shorthand for a variety of current and lagged changes that might characterize the adjustment process, and λ now applies to the lagged equilibrium (cointegrating) relationship rather than just lagged real balances. 1/

The main question with regard to specification is whether the error-correction models that have been appearing with increasing frequency in the literature have really solved the problems associated with the more restricted models, or whether their success reflects a sophisticated form of data mining. On one level, it is safe to conclude that the error-correction approach has successfully pointed us away from a dead end, because the unit root problem has been vanquished. There is now a wealth of evidence covering a wide variety of countries showing that real money balances are cointegrated with the traditional arguments in the demand function and that dynamic processes can be estimated so as to explain short-run fluctuations as well. Any equation that has an extremely high degree of autoregressivity is failing to capture an important aspect of the dynamics.

But error-correction models have their own peculiarities and pitfalls. First, the underlying cointegrating relationships are far from being unique, and there is no generally accepted method for choosing among them. Soren Johansen has introduced some very helpful techniques for estimating and evaluating multiple cointegrating vectors (see Johansen, 1988, and Johansen and Juselius, 1990), but there are a number of other methods available (see Stock and Watson, 1991), and if there are multiple significant vectors, one still has to determine nonparametrically which if any represents the long-run demand function.

Second, because the specification of error-correction models is relatively open-ended, the parameter estimates may end up looking rather strange and possibly not at all like our prior expectations. The most serious problem that has cropped up in my own recent international comparisons (and in some single-country studies) is that the estimated steady-state

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1/ For a more detailed discussion of the specification and estimation of error-correction models of money demand, see Boughton (1991b).

price elasticity (β_0 in equation 3) is significantly non-unitary in a number of cases, implying that the demand for money is not homogeneous in the price level even in the long run. For example, Boughton and Tavlas (1991) found long-run price elasticities less than one for M1 in the United States and Japan and for broader aggregates in Japan, Germany, France, and the United Kingdom.

The lack of price homogeneity is hard to detect when the equilibrium relationship is estimated by itself or with limited dynamics, because the parameters are estimated with so little precision that it is difficult to reject unity. Thus most researchers have been lulled by their priors into imposing homogeneity at an early stage. But the implications of rejecting a unit coefficient are still ambiguous. A lack of homogeneity could mean that the demand function has been misspecified or not identified, but--especially in a small sample--it could also mean that there are measurement errors or aggregation biases in the data.

Third, although relatively general and unrestricted error-correction models almost always do relatively well in-sample, their post-sample performance is not always superior to that of more conventional equations. Boughton and Tavlas (1991) reported F-statistics for stability at an arbitrarily selected break point after the fourth quarter of 1985; those tests showed that in eight of ten cases (we studied two aggregates in each of five countries), the error-correction models had the highest F's, although the differences between them and the statistics for partial-adjustment and buffer-stock models were significant in only two cases. The most likely explanation for the gap between in-sample and post-sample performance is that the specification of the error-correction models is data-dependent. With enough effort, one can even root out all the instabilities that show up through recursive or rolling regressions within the available data sample, by finding ex-post proxies for whatever shifts might have occurred. But if one sets aside part of the sample while searching for the optimum specification, elimination of post-sample instabilities is quite a bit harder.

The bottom line is that the development of error-correction models has greatly expanded our understanding of the demand for money: we know that demand functions still exist in all of the major countries and do not have unit roots, we know that the dynamics are much more complex than we used to think, and we know that a failure to identify those dynamics can seriously distort our view of the long-run demand function and can make the parameters appear unstable. Nonetheless, we should reserve a fair degree of caution in assessing the error-correction models that have appeared in the literature. As I emphasized in two other recent papers (1991a, 1991b), more work is needed to ensure that the techniques are appropriate and are at least the equal of available alternatives, and to ensure that the functional forms are not sample-specific.

III. Policy Issues

Perhaps the most striking implication of recent empirical work on money demand, especially the international comparisons, is that the demand for money has not been as seriously distorted by financial innovation or by shifting policy regimes as might have been expected. Accounting for innovations is important, since institutional changes can affect elasticities and even the functional form and can make forecasting more difficult; but once those innovations have been allowed for, there has not been a general tendency for the demand for money to become less stable over time.

In the past few years, reasonably stable money demand equations have been estimated for all of the major industrial countries, with residual variances that have not risen significantly with the inclusion of data from the 1980s. But these equations are all more complex than those estimated earlier, at least in the dynamics but often in the steady state relationships as well. In other words, there now seem to have been dormant factors that were always present but the influence of which was difficult to detect until they began to show more variance in the recent period.

From a policy perspective, the central problem is to identify the factors that have been driving changes in the demand for money and to determine whether those are ongoing influences or once-off shifts in behavior. I would identify five general classes of factors that may have been important in one or more of the major countries: (1) shifts in inflationary expectations, (2) open-economy considerations such as expected exchange-rate changes, (3) the effect of non-unitary real income elasticities on velocity, (4) shifts in the term structure of interest rates, and (5) financial innovations and shifts in the policy regime.

Inflationary expectations may be an important determinant of real money demand (apart from whatever influence such expectations have on nominal interest rates) to the extent that agents treat money as a substitute for real assets. Obviously the expected inflation rate would have undergone a very wide cycle over the past two decades, and this factor would have depressed money demand throughout much of the 1970s and raised it again in the 1980s. Because early studies of money demand were based on periods when inflationary expectations would have shown little variability in most major countries, this factor generally was inadequately accounted for.

The importance of shifts in the inflation rate (as a proxy for expectations) is supported by most recent empirical studies, but econometric work is hampered by the ambiguities in interpreting such a proxy and by the possibility that the expectations function may have been unstable (see Cuthbertson and Taylor, 1990). Taking a much simpler approach, the role of major cycles in inflation can be seen fairly clearly, with a few exceptions, by examining Figure 1. These diagrams show real balances, narrowly and more

broadly defined, for each of the five largest industrial countries. 1/ The scale is logarithmic, and the quarterly data extend from 1963 through mid-1991 (the ending date varies slightly between countries). For each country, a loglinear trend has been fitted, broken into three subperiods, roughly covering the periods before, during, and after the inflationary boom that lasted from around 1973 through 1982. 2/ For the three countries that experienced a pronounced inflationary cycle, the depressing effect on real balances in the middle, high-inflation, period is clearly seen. Germany and Japan, however, escaped that inflationary cycle, and the shifts in trend there have been less pronounced.

Exchange rate expectations--which influence the demand for money in currency-substitution models--have been found to be important in a number of single-country studies, but establishing a general pattern has proved to be elusive. 3/ Arango and Nadiri (1981) found at least marginally significant effects from foreign interest rates for the United States, Canada, Germany, and the United Kingdom, based on partial-adjustment equations estimated over 1960-75; and Howard and Johnson (1983) found some effects for the United Kingdom and Switzerland (1973-80 data). 4/ In contrast, my 1979 paper (using 1960-77 data for the G-7 countries) found that Eurodollar interest rates were significant only in the M1 equation for Germany and the M2 equation for Canada, while changes in effective exchange rates were insignificant in all cases. Bahmani-Oskooee and Pourheydarian (1990) found significant effects (over 1973-87) from a distributed lag on the real effective exchange rate for the United States and Canada (though not for Japan), but that finding is suspect because of the absence of any other dynamics in the equations. Kremers and Lane (1990) found that an aggregate

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1/ Narrow money balances are M1 balances as defined by the national authorities, except for the United Kingdom, where M1 includes only non-interest-bearing deposits and data prior to 1975 have been spliced using the old M1 definition. Broad money balances are national-definition M2 balances for the United States and France; M2 plus CDs for Japan; M3 for Germany; and M4 minus wholesale deposits for the United Kingdom. Data are from national sources.

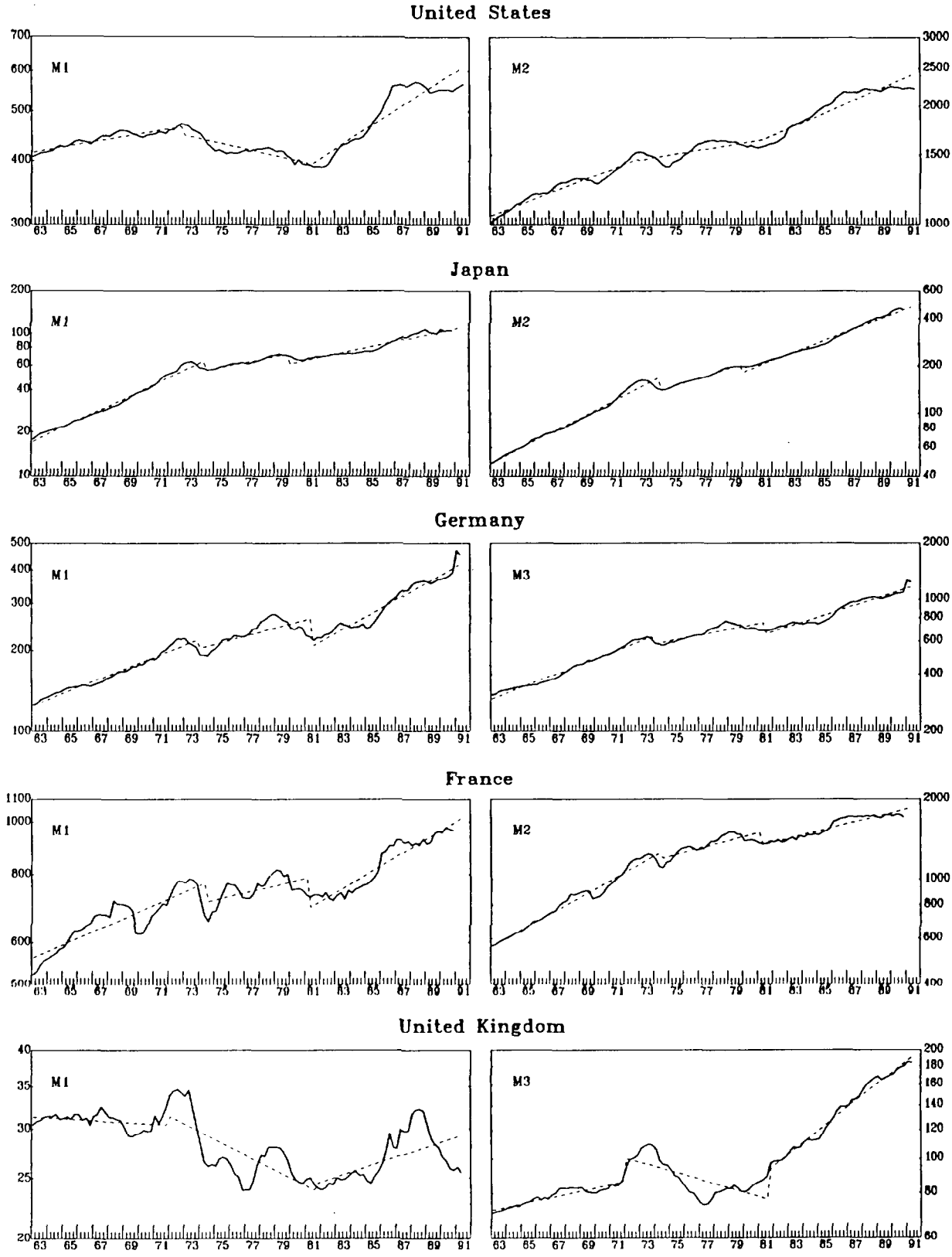
2/ The break points differ between countries, according to maximum values for 1-step Chow tests in the neighborhood of 1973 and 1982, from regressions on the unbroken trend. The middle periods are: 1973:1 - 1982:1 (United States and United Kingdom), 1973:2 - 1983:2 (Germany), 1973:3 - 1982:4 (France), and 1973:4 - 1980:1 (Japan).

3/ More general effects have been found for high-inflation developing countries in which "dollarization" is empirically important; see Ramirez-Rojas (1985).

4/ The Arango-Nadiri equations included the forward discount on foreign exchange as well as domestic and foreign interest rates, but the forward discount is approximately a transformation of the other two variables. Howard and Johnson measured the expected rate of depreciation by the realized depreciation over the subsequent three months; foreign interest rates were mostly insignificant in their tests, and the exchange rate variable was significant in only two of six equations.

Figure 1. Five Large Industrial Countries: Real Money Balances, 1963-91

(logarithmic scale; dashed line is fitted broken trend) 1/



Source: see text.

1/ Money balances in billions of local currency units, except Japan (trillions of yen), deflated to 1980 prices.

money demand function for countries participating in the exchange rate mechanism of the European Monetary System (1979-87) was not only stable but actually fit better than similar equations estimated for the individual countries. That finding provides support for the hypothesis that agents diversify across currencies when exchange rates are reasonably well fixed, but it is also consistent with the view that risk aversion may severely limit currency substitution when exchange rate expectations are uncertain.

The reason that non-unitary real income elasticities are important is that many researchers tend to focus on the behavior of velocity rather than of real money balances; 1/ unless the real income elasticity is unity, changes in the growth rate of real income will systematically affect velocity even with no shift in the demand function for real balances. If velocity is volatile, aiming policy at a fixed target for monetary growth will be inappropriate, but the information content in the aggregates will not necessarily be diminished, as long as one allows properly for the effect of the income elasticity of money demand. In theory, of course, there is no particular reason to expect a unitary elasticity; it could well be lower (as in the Baumol-Tobin and Miller-Orr models) or higher (as in Friedman's "luxury good" model).

Empirical evidence for many countries suggests that income elasticities may differ substantially from unity, but there is no general pattern as to whether they are greater or less than unity. Empirical findings are sensitive both to the functional form and to the sample period. 2/ Furthermore, there have been marked changes in the trend rate of output growth in most countries: lower in the 1970s, with some recovery more recently. One thus might expect this factor alone to have reduced the velocity of M1 and

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1/ For a general analysis of the behavior of velocity in the G-7 countries, see Isard and Rojas-Suarez (1986). Bomhoff (1990) compares the statistical properties of velocity across the same countries using a Kalman filter model. Bordo and Jonung (1987, 1990) study velocity for the United States, the United Kingdom, Canada, Sweden, and Norway. Hoeller and Poret (1991) and Kole and Leahy (1991) estimate P-star velocity models for 20 industrial countries and for Japan and Germany, respectively.

2/ Among recent multi-country studies, Faig (1989) found less-than-unitary elasticities for M1 balances in the United States, Germany, the United Kingdom, and Canada. Bordo and Jonung (1990) estimate M2 elasticities that are insignificantly different from unity for the United States and the United Kingdom and significantly less than unity for Canada, Sweden, and Norway. Domowitz and Hakkio's (1990) OLS estimates for M1 were less than unity for France and the United States and greater for Germany; the U.K. elasticity jumped from 0.5 to 1.2 between their early period (1961-72) and the later period (1977-85). Boughton and Tavlas (1991) found elasticities that were significantly less than unity for M1 in France and Japan, unitary for M1 in Germany and M2 in the United States, and greater than unity for M1 in the United Kingdom. Tsurumi and Kan's (1991) M1 elasticities were less than unity for the United States but greater than unity for Canada and Japan.

raised that of broader aggregates relative to trend in the 1970s, but the timing and significance would have varied across countries.

The fourth explanation of swings in money demand is shifts in the term structure of interest rates. With increasing importance, a substantial portion of money balances--especially for the broader aggregates--now pays an interest rate close to the short-term market rate. The elasticity of money demand with respect to short-term market rates may thus be quite low and may even be positive. In such an environment, the long-term rate may be a better proxy for the substitute yield. With no change in the average level of interest rates, a tilt toward relatively higher short-term rates then would be expected to raise the demand for money (broadly defined), not lower it as most earlier models would have predicted. 1/ Again it turns out to be dangerous to generalize about this factor across countries, perhaps because the link between own yields and market yields differs across countries and between aggregates. *But George Tavlas and I have found that* it is important for broadly defined money balances in the United States, Japan, and Germany, with generally insignificant effects elsewhere.

That leaves financial innovation, which may be grouped together with policy regime shifts because many of the major changes in financial markets over the past two decades have no doubt been responses to efforts by central banks to control monetary growth. When monetary targeting became a common policy strategy in many countries in the 1970s, frequently accompanied by partial deregulation of financial markets, innovations soon followed. Those innovations, such as the development of Eurocurrency markets or the expansion of consumer deposits outside the banking system, led to further regime shifts including the modification or abandonment of monetary targeting. Although these innovations have received the lion's share of attention in the recent literature, it may be argued that their effects have been less pervasive and persistent in the large industrial countries than one might have thought. 2/

Financial innovation comprises a variety of activities that can be only partially quantified, but there are at least five methods for dealing with this problem within the context of standard regression analysis. First, one can specify dates when major financial changes took place and incorporate shift dummies for those dates. This procedure breaks down, however, if

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1/ Estimation of term-structure effects has always been difficult, owing to collinearity. Heller and Khan (1979) dealt with that problem for U.S. data by replacing the level of interest rates with the level, slope, and curvature of the yield curve; to my knowledge, however, that technique has not been applied successfully to other countries. In Boughton (1991b) I argue that the collinearity problem is not serious in error-correction models in which interest rates enter with different lags or with varying degrees of differencing.

2/ For discussions and tests of the role of financial innovation and liberalization in developing countries, see Arrau and De Gregorio (1990), Arrau et al. (1991), and Tseng and Corker (1991).

innovation is ongoing, as it has been in the large industrial countries for the past two decades. Second, one can deal with ongoing innovation by incorporating a trend. The major limitations of that approach are that a trend could also result from the omission of important trended variables, and that even ongoing innovations are unlikely to proceed at an even pace.

A third method is to specify a conventional function and examine the residuals to see if they are systematically related to the presumed pattern of financial change. 1/ If included variables are correlated with the omitted innovations, however, this procedure will understate the importance of the latter. Fourth, one can test for the persistence of disturbances, as with the Cooley-Prescott estimator or the Cusum-of-squares test. 2/ Finally, one can incorporate proxies for or direct measures of financial innovation, such as returns on newly introduced assets; these procedures work similarly to and may suffer from the same limitations as the dummy-variable approach mentioned above. 3/

In view of the weakness of inferences that can be drawn from econometric studies, it may help to simplify the problem by turning again to Figure 1 and focusing on the differences in the timing, nature, and importance of the major breaks in trend. For example, only in the United States is there a substantially greater downward break in real M1 balances than in the broader aggregate. This comparison is revealing because most innovations would have been expected to affect narrow balances more than broad; that is, to induce shifts within the broad aggregates in response to changes in the terms on which specific included assets were offered, rather than shifts between the broad aggregates and excluded assets.

In the U.S. case, real M1 balances by end-1981 were 23 percent below the level they would have reached on the basis of the pre-1973 trend; real M2 balances were 14 percent below the earlier trend. Of course, the difference between these shifts need not be attributed to financial innovation: M1 demand may have been relatively sensitive to the increases in inflation and nominal interest rates that occurred during that period, although if the

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1/ Dooley and Spinelli (1989) applied this method to France and Italy; they found overpredictions for France that were in line with the growth of newly introduced assets, while for Italy the overpredictions were too large to be explained in that manner.

2/ Tsurumi and Kan (1991) allow gradual changes in coefficients in order to represent the evolution of regimes.

3/ See Hendry and Ericsson (1990) for an application using learning-adjusted yields on new financial assets. The practical limitation is that the yields on new assets tend to be collinear with existing yields after an initial adjustment period. Bordo and Jonung (1987) developed several proxies for monetization and financial sophistication; in their 1990 paper, however, they noted that the effects are difficult to assess because some of those proxies are highly correlated with permanent income. Siklos (1989) found that the Bordo-Jonung institutional variables were not sufficient to explain instabilities in the benchmark model, except for Canada.

real income elasticity is less than unity the concomitant weakness of economic activity might have offset that effect. Thus the 9 percent gap could be taken as a rough outside estimate of the potential effect of the innovations that occurred in the 1970s in the United States. But whatever effects there might have been in other countries, these diagrams suggest that they must have been much smaller, except possibly in the case of Japan.

As noted earlier, neither Germany nor Japan experienced a sustained rise in inflation in the 1970s. But their experience with money demand was very different: whereas Japanese real balances fell sharply below previous trends, those in Germany did not. This contrast would suggest that innovations were relatively more important in Japan, even though the decline in Japanese M2 was just as great as that in M1. Indeed, there was a considerable decline in the market share of banks in Japan after 1973 and a corresponding rise in non-monetary assets and money-conserving strategies such as overdrafts (see, for example, Shimamoto, 1983, and Suzuki, 1983). Innovations of that type would exert similar downward pressure on the demands for both M1 and M2.

These simple relationships may be formalized by examining the variances of deviations from trend in each of the subperiods shown in the diagrams (Table 1). In eight of ten cases, the variance rises in the 1970s, but in five of those the variance drops back in the 1980s. Comparing the 1980s with the pre-1973 period (final column), the variance increases in only six of the ten cases, and--with the clear exception of U.S. M1--the increases tend to be rather modest. In other words, the introduction of a pair of break points representing major shifts in inflationary pressures accounts for most of the prima facie unstable behavior of real balances in most cases other than U.S. M1.

On balance, surprisingly little is left unexplained. In spite of wide differences in country experience with respect to institutional developments, economic performance, and policy regimes, there have been few breaks even in the most simple analysis of trends in real balances. Furthermore, a growing body of empirical literature, spurred by the development of cointegration techniques and error-correction models, has been increasingly successful at explaining shorter-run fluctuations in money demand and at least at explaining away what had earlier appeared to be unstable demands. The longer-run stability and the ex-ante predictive ability of these models remain largely untested, but it seems safe to conclude that the demand for money is alive and well, just more complex than it had once appeared to be.

Table 1. Five Large Countries: Variance of Deviations in Real Money Balances from Loglinear Trend, 1963-91 1/

		(1) 1963-91	(2) 1963-72	(3) 1973-81	(4) 1982-91	(4) / (2)
United States	M1	0.12	0.02	0.06	0.30	16.3
	M2	0.11	0.06	0.13	0.15	2.3
Japan	M1	0.19	0.19	0.17	0.19	1.0
	M2	0.13	0.14	0.17	0.10	0.7
Germany	M1	0.25	0.08	0.40	0.27	3.2
	M3	0.16	0.09	0.19	0.19	2.1
France	M1	0.20	0.25	0.21	0.12	0.5
	M2	0.15	0.14	0.19	0.11	0.8
United Kingdom	M1	0.41	0.15	0.54	0.55	3.7
	M3	0.27	0.05	0.70	0.07	1.3

1/ Exact periods differ, as in Figure 1. Variances are multiplied by 100.

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