Myths and Misconceptions of Exchange Rates

"There is no shortage of muddled ideas in economics. Politicians, business leaders, and even economists frequently make statements that do not stand up to careful economic analysis. For some reason, this seems to be especially true in international economics" (Krugman and Obstfeld, 2000, p. 23).

I. Introduction

Misconceptions about the welfare benefits of free trade are widespread in the community such as the belief that foreign competition is unfair and harmful to a country and its workers. Despite these myths, the economic case for free trade has been won in the policy arena in the sense that proponents of trade intervention must argue a special case with the status quo (trade liberalisation) presumed to be optimal. Parallels also arise in the area of international monetary economics: for example, the widespread belief that a current account deficit is undesirable and necessitates policy redress has given way to a more considered assessment by policymakers in some countries of the existence of distortions in savings and/or investment decisions to justify policy intervention.

The behaviour and functioning of foreign exchange markets has attracted a large number of conjectures. Popular conjectures include the following beliefs: that flexible exchange rates are unstable due to destabilising speculation; that movements in exchange rates are "excessively volatile"; that depreciating exchange rates trigger "vicious" inflationary circles and that uncertainty arising from flexible exchange rates is detrimental to international trade and investment. However, in contrast to the above cases which are drawn from static and dynamic trade theory, there is no theoretical welfare benchmark against which the merits of alternative exchange rate regimes may be evaluated. In the presence of market frictions that justify the use of national monies, both fixed and flexible exchange rate regimes are second-best. Partially reflecting this ambiguity, little or no consensus exists among the community, economists or policymakers concerning the "truth" of these conjectures.

The purpose of this paper is to examine and dissect ten popular "suspect conjectures" about exchange rates. The implications of the conjectures for exchange rate policy are also reassessed.[1]

The ten conjectures may be divided into two main categories: the first group contain propositions concerning (mis)understanding of how exchange markets function and their characteristics such as efficiency and excess volatility while the second group of conjectures link certain behavioural features such as exchange rate uncertainty with perceived harmful effects on the national and global economy. The conjectures are not generally drawn from economic theory but from empirical regularities (see, Mussa,

[1] The paper also contains the following precautionary warning from Krugman: " My onetime teacher Charles Kindleberger used to tell his students that anyone who spends too much time thinking about the international monetary system ends up going a little mad" (Krugman, 1989, p. 99).

1983). Mussa, for example, identifies a number of propositions based upon empirical regularities observed during the experiences of floating exchange rates in the early 1920s, 1930s and 1970s. The propositions include, among others: "the spot exchange rate approximates a random walk"; "the forward rate is an unbiased predictor of the corresponding future spot rate" and "countries with large trade deficits tend to have depreciating currencies"(Mussa, 1983, pp.166, 174, 181). His main message is to argue that the monetary model of exchange rate determination provides stronger theoretical support for the propositions compared to the traditional single-period flow (elasticities) model. However, once the sample period is extended to include the past twenty years, some of the empirical regularities disappear (for example, trade deficits and depreciating exchange rates), others remain (nominal exchange rate follows a random walk) while new "puzzles" emerge such as the co-existence of slow convergence towards purchasing power parity with high short-run volatility of real exchange rates. Furthermore, the forecasting ability of the monetary model has since come under sharp attack (see Meese and Rogoff, 1983).

In order to avoid falling into a similar trap, the approach used in this paper follows Triffin (1969) in his earlier analysis of the myths of the adjustment mechanism under the Gold Standard.[2] Triffin adopts two basic tests of economics; logical consistency or theoretical explanation (referred to as "textbook abstract") and conformity of the conjecture and theory with the major facts ("historical abstract"). This approach also carries pitfalls. The "textbook" model of exchange rates has undergone dramatic shifts in the past fifty years.[3] The earlier elasticities (partial equilibrium) trade flow model dominant in the 1950s was superseded by the Keynesian absorption approach of the 1960s which was subsequently eclipsed by the monetary and asset market models developed in the 1970s and 1980s.

Parallel with new theoretical developments, the application of the new econometric methodology of cointegration has led to the overturning of earlier empirical findings, especially with respect to purchasing power parity. In some instances (for example, uncovered interest parity), interpretation of empirical evidence remains inconclusive. Nevertheless, the combined use of theory and empirical evidence helps identify the conditions under which a proposition provides a useful although not necessarily exact description of exchange rate behaviour.

The significance of conjectures about flexible exchange rates extends well beyond academic interest or media commentary and lies at the core of past and present policy debate on the functioning of the international monetary system. Conjectures about the

[2] According to Johnson, Triffin's contribution to international monetary policy debate was underrated. "The undisputed dean of economists specializing in the problem of international monetary system is, of course, Robert Triffin of Yale, though this fact has often been obscured in academic controversy by the natural propensity of the scientific community to undervalue the importance of recognition of a problem and overvalue the display of elegance, worldly wisdom and professional dispassionateness at its solution" (Johnson, 1972, p. 106).

[3] Extending further back over the past 200 years, the literature on the balance-of-payments and exchange rates has undergone several revolutions, oscillating between the classical 18th century works of Hume and Cantillon and the Keynesian models developed in the 1930s to 1960s to the revival of classical theory by the monetary approach, spearheaded by Mundell (1961) and Johnson (1977).

harmful effects of unstable and excessively volatile exchange rates underlie past and present proposals for reform of the international monetary system such as target zones (see Frenkel and Goldstein, 1986). The earlier debate on fixed versus flexible exchange rates conducted in the 1950s and 1960s favouring the retention of the status quo of Bretton-Woods was heavily reliant upon the belief that flexible exchange rates are unstable due to destabilising speculation. Friedman's dissenting argument that speculation and flexible exchange rates are stabilising was a minority view. During the 1980s, belief in efficient financial and foreign exchange markets shifted the majority view of economists in favour of Friedman. However, the prolonged period of excess returns to U.S. dollar denominated assets in the first half of the 1980s, the share market crash of 1987 and the 1996/97 currency crisis in South-East Asia has reignited the earlier mistrust of the working of exchange markets.

The paper is organised as follows. Section II discusses and examines each conjecture with reference to its policy significance, theoretical basis and empirical evidence. Section III brings together the main conclusions and reinterpretation.

II. Ten conjectures about exchange rates

Myth (1): Economists know what determines the exchange rate.

The premise that economists know and understand the determinants of exchange rate behaviour underpins an extensive theoretical and empirical literature, policy discussion and media commentary. The view that economic fundamentals exert a systematic influence on exchange rates is implicit in attempts to explain currency movements. Expressed in the words of one commentator: "No matter which way currencies zig or zag, it seems there is always an analyst with a quotable, ready explanation" (Hopper, 2000, p. 267).

This faith in the ability of economic fundamentals to explain exchange rate behaviour remains unshaken despite the identification of serious shortcomings in the explanatory power of exchange rate models. After reviewing the empirical literature, Isard concluded: "…were it not for their moral integrity, many risk-averse economists would probably be willing to take large open positions in the exchange markets if they knew they had inside information about forthcoming data or policy actions relating to inflation rates, interest rates, or international payments balances" (Isard, 1987, p. 3).

The above view is not shared by all economists. In their introduction to conference proceedings dealing with exchange rate behaviour, Brunner and Meltzer highlight the inadequacies of existing exchange rate models. "The behaviour of exchange rates remains an unresolved problem…the balance-of-payments theory of exchange rates prevalent in the early postwar period failed to explain the pattern emerging under a floating regime. The asset market approach of the 1970s failed also" (Brunner and Meltzer, 1987, p. 2).

More bluntly stated, in Krugman's words: "So I will give you a forthright statement about the dollar: I don't know….The fact that nobody knows is crucial for the current dilemmas of international monetary policy." (Krugman, 1989, p. 60).

Do economists know what determines the exchange rate? How are "fundamentals" based models of exchange rates to be reconciled with the dominant time-series characteristics of exchange rates? The contrasting views on this issue highlight differing interpretations of the post-Bretton Woods experience of floating of the major currencies and the lessons to be learnt.

Policy significance

The existence of a systematic linkage between policy fundamentals and the exchange rate is a necessary condition for establishing a stable nominal anchor for the domestic price level in open economies. Under fixed exchange rates with a reserve centre, monetary policy of the reserve or nth country determines the world price level. Under flexible rates, domestic monetary growth rate is the anchor to which the domestic inflation rate returns in the long run. The linkage between macro policy and the nominal exchange rate sets an anchor for medium-term market expectations of the nominal exchange rate under the assumption of rational expectations. Without this anchor, national economies and the international monetary system under flexible exchange rates become vulnerable to systemic financial instability arising from self-fulfilling speculative bubbles or exchange rate expectations influenced by extrinsic factors.

A robust relationship between fundamentals and the exchange rate has practical policy relevance at a national and global level. In highly integrated national economies, the exchange rate is a key mechanism transmitting domestic shocks (policy and non-policy) from one economy to another. In the presence of policy spillovers, macro policy coordination is a means of exploiting these externalities, thereby maximising global welfare. During the 1980s, concrete macro policy coordination proposals in terms of non-synchronised fiscal coordination by Japan and the United States (a more expansionary Japanese fiscal policy accompanied by more restrictive U.S. fiscal policy) were suggested to eliminate persistent current account imbalances of the G-2 countries. Such proposals presume a systematic (and agreed) linkage from policy fundamentals to the current account and the exchange rate. Lack of agreement on these linkages has been identified as one of the main obstacles to macro policy coordination (see Horne and Masson, 1988). But the issue is more fundamental: does **any** systematic relationship exist between macro policy and the exchange rate?

Reform proposals for target zones also require a robust relationship between policy fundamentals and the nominal or real exchange rate, both for setting a real exchange target and for central bank intervention through monetary policy to maintain the target within the zone. Much of the debate on target zones has focused upon the issue of choice of the target exchange rate. For example, equilibrium exchange rates derived from purchasing power parity and structural models have been proposed as possible

benchmarks for establishing a real exchange rate for target zones (see Frenkel and Goldstein, 1986;Williamson, 1992-93). Again, the proposals collapse in the absence of any relationship between monetary policy and the exchange rate.

Textbook abstract (theory)

The earlier textbook model of exchange rate behaviour is the elasticities flow model of the foreign exchange market (see, for example, Sodersten, 1970). In the elasticities model, the equilibrium exchange rate is determined by flow demand and supply of foreign exchange which in turn are driven by demand and supply of imports and exports in goods markets (trade fundamentals). In a single market, the stability condition in a Walrasian sense is that a small increase in price causes excess supply while a small decrease causes excess demand. The key issue to which the question of stability of the foreign exchange market was directed was to identify the conditions under which excess demand for foreign currency induces an exchange rate depreciation, thereby restoring the equilibrium exchange rate in response to exogenous shocks. This issue was central to contemporary policy debate on whether a parity realignment under an adjustable peg regime would improve or worsen the balance of payments (see Harberger, 1949).

Under the assumption of a perfectly elastic supply curve of exports, the stability condition is the well- known Marshall-Lerner condition that the sum of elasticities of demand for imports in both countries exceed unity. The size of import demand elasticities also has implications for the related issue of explaining high exchange rate volatility; the larger the import demand elasticities, the smaller the percentage response of the equilibrium exchange rate to an exogenous shock to the foreign exchange market such as changes in demand for imports and exports. Typically, the sum of estimated impact import elasticities for manufactured goods lies below unity but increases over periods beyond a year (Krugman and Obstfeld, 2000, p. 483)

The demise of the elasticities model as a satisfactory explanation of exchange rate behaviour is not undermined by the issue of stability per se: its disappearance from modern texts reflects theoretical and empirical limitations. The primary theoretical weakness is a partial equilibrium focus that ignores the equilibrating roles played by other economic variables in external adjustment, specifically, real income and domestic absorption and asset market clearing. Empirical deficiences are apparent from inconsistencies between the model and empirical regularities such as persistent current account imbalances (the elasticities model assumes trade and current account balance are maintained in each period) and exchange rate volatility under flexible rates that far exceeds volatility in trade fundamentals.

The dominant textbook paradigm of nominal exchange rate behaviour is the monetary model: the assumption of perfect substitutability between domestic and foreign bonds restricts the model to be a special case of the general class of asset market models.[4] A

[4] The popularity of the monetary model is demonstrated in its use in the main intermediate texts (for example, Krugman and Obstfeld, 2000) as well as by journalists and economic analysts (see Hopper, 2000).

central insight of the asset market model is that the exchange rate is the relative price of national monies. Hence, the factors influencing asset prices, and especially market expectations of future exchange rates will influence the current exchange rate.

Monetary models of exchange rate determination are built upon a dual set of asset and goods market equilibrium conditions given by uncovered interest parity and purchasing power parity conditions, respectively. Combined with the assumption of rational expectations that pins down market expectations to that driven by the expected path of fundamentals, the model provides clear-cut predictions linking economic fundamentals (money supply and factors influencing money demand in both countries) with the expected and actual paths of exchange rates.

The model is described below by equations (1) to (4).[5] Equations (1) and (2) describe domestic and foreign money demand: equation (3) and (4) describe uncovered interest parity and purchasing power parity conditions, respectively. Rational expectations is assumed although both adaptive and extrapolative theories of expectations are consistent with a specification that allows temporary violation of price clearing in the goods market. The assumption of rational expectations has, however, a special significance for the modelling exchange rates as asset prices since the expected path of fundamentals influences critically the path of the expected and hence, the actual exchange rate. Rational expectations is a necessary condition for the efficient markets hypothesis to hold: if the foreign exchange market is efficient, then unexpected changes in economic fundamentals, especially during periods of high uncertainty may help explain the "puzzle" of high exchange rate volatility.

Variables are defined as follows: m_t, p_t, and y_t are logs of the domestic money supply, domestic prices and domestic output, respectively (corresponding foreign variables are marked with an asterisk). Domestic interest rate at t on deposits maturing at t+1 is given by i_t (foreign interest rate with asterisk): s_t is the log of the exchange rate (number of units of domestic currency per unit of foreign currency). E [.] is the rational expectations operator conditional on information at t. Exogenous variables y_t and m_t may include stochastic elements: it is assumed that m already incorporates an exogenous disturbance.

$$m_t - p_t = y_t - \alpha i_t \qquad (1)$$

$$m_t^* - p_t^* = \beta y_t^* - \alpha y_t^* \qquad (2)$$

$$p_t = s_t + p_t^* \qquad (3)$$

[5] Model specification follows Bartolini and Bodnar (1996) with all markets (stock and flow) assumed to be cleared each period. An alternative specification which allows for three periods (t=0, 1, 2) corresponding to initial equilibrium before shocks, short-run equilibrium (money market cleared but flows not yet influenced stocks) and long-run equilibrium (stock and flow markets clearing) is given in Horne (1983). Choice of the Bartolini and Bodnar specification is motivated by the desire to link the monetary model directly with empirical tests of excess volatility reported in their paper.

$$i_t - i_t^* = E_t[s_{t+1} - s_t] \quad (4)$$

$$s_t = f_t/1 + \alpha + (\alpha/1 + \alpha)E_t[s_{t+1}] \quad (5)$$

$$\text{where } f_t = \left(m_t - m_t^*\right) - \beta\left(y_t - y_t^*\right)$$

The equilibrium exchange rate is driven by two components; current fundamentals (f_t) and a linear function of its own value at s_{t+1}.

Solving equation (5) forward up to t + h gives:

$$s_t = (1/1+\alpha)\left\{\sum_{i=0}^{h-1}(\alpha/1+\alpha)^i E_t[f_{t+i}]\right\} + (\alpha/1+\alpha)^h E_t[s_{t+h}] \quad (6)$$

The solution to the equilibrium nominal exchange rate contains two components: the first term is a linear combination of economic fundamentals) while the second term is the bubble component which represents the extraneous element that is not part of the economic system (more precisely stated, that component in a stochastic setting removed from the stochastic process under consideration). For present purposes, the bubble component will be excluded from the model solution by imposing the condition that the limit of the second term $(i \to \infty) = 0$ as given by equation (7). The potential role of speculative bubbles as a means of reconciling theory with facts and as a possible explanation of excess exchange rate volatility is taken up in the discussion below.

In the absence of speculative bubbles with condition (7) imposed, the equilibrium exchange rate at t is determined solely by current and expected fundamentals, as given by (8).

$$\lim_{i\to\infty}(\alpha/1+\alpha)^i E_t[f_{t+i}] = 0 \quad (7)$$

$$s_t = (1/1+\alpha)\sum_{i=0}^{\infty}(\alpha/1+\alpha)^i E_t[f_{t+i}] \quad (8)$$

The general macro policy implications of the model are clear-cut: the equilibrium exchange rate given by equation (8) is driven by the current and expected paths of economic policy fundamentals, namely monetary policy in both countries including the variables (output and interest rate) assumed to influence money demand. With assumed flexible goods prices and all stock and flow markets clearing and expectations fulfilled, an expansion in the domestic money supply relative to foreign money supply is predicted to raise domestic goods prices and depreciate the nominal exchange rate proportionately.

The asset market model also provides a plausible explanation of high nominal and real exchange rate volatility. If flexible prices are assumed (continuous purchasing power parity), the assumption of rational expectations together with non-stationarity in the money supply process will generate non-stationarity in the nominal exchange rate (see Adamas and Chadka, 1991). Relaxation of the assumption of continuous purchasing power parity together with rational expectations and instantaneous asset market-clearing (uncovered interest parity) will generate volatility of nominal and real exchange rates with both the nominal and real exchange rate overshooting their long-run equilibrium levels in response to unexpected monetary shocks (see Dornbusch, 1976). Once the assumption of perfect asset substitutability is relaxed, short-run undershooting and overshooting of the nominal and real exchange rate may occur.

Historical Abstract (empirical evidence)

Empirical tests of the asset market model may be grouped into two classes; tests of the model's short and long-run predictions and tests of the key assumptions (rational expectations, stable money demand, parity conditions). The first group of tests involve within and out-of-sample tests of the model's predictions and its predictive power relative to alternative benchmarks, including a random walk hypothesis. Both sets of tests have been conducted on the monetary model as well as portfolio versions of the asset model that allow for imperfect asset substitutability between domestic and foreign bonds.

Before turning to the empirical literature, it is useful to note the diverse set of stylised facts confronting the monetary model which span the earlier interwar period of floating and thirty years of currency experience under post-Bretton Woods. The two most striking and consistent features of exchange rate behaviour are high nominal and real exchange rate volatility and approximation of the level of the spot rate to a random walk. In the post-Bretton Woods period, new puzzles have emerged such as the persistent excess returns to U.S. dollar denominated assets in the early 1980s and the combination of slow convergence towards purchasing power parity with high real exchange rate volatility.

The post-World war II data encompass major changes in the global environment; a higher level of risk (not necessarily caused by flexible exchange rates), larger real shocks relative to monetary shocks in the 1980s and 1990s and movement towards greater financial and trade integration with accompanying stronger interdependencies between national economies. The overall implications of these developments for explaining exchange rate behaviour are unclear. For example, a higher level of risk and uncertainty will be reflected in all asset prices and not solely exchange rates. Sizeable and variable risk premia undermine the uncovered interest parity condition but greater economic integration strengthens both parity conditions. The longer period of experience under floating rates may also help agents' ability to adapt to the new environment through a learning process, thereby strengthening support for the assumption of rational expectations.

The issue of consistency of theory with empirical regularities needs first to be addressed. Observed high volatility of nominal and real exchange rates is fully consistent with the asset market model, reflecting two main factors, exchange rate expectations and differential speeds of adjustment of goods and asset markets. (The separate issue of "excess" volatility is discussed under myth (3) below.)

The second observed regularity of non-stationarity of nominal exchange rates is not so easily reconciled with the model (the issue of stationarity of real exchange rates is addressed under myth (5)). This property is also supported by univariate and multivariate empirical tests (see Adams and Chadha, 1991). Excluding bubbles, and assuming price flexibility, non-stationarity in nominal exchange rates derives from non-stationarity in the stochastic process generating the fundamentals. Once the assumption of continuous price flexibility is relaxed, even if fundamentals such as the money supply follow a random walk, the exchange rate need not, reflecting slow price adjustment.

Non-stationarity of nominal exchange rates is not inconsistent with the model (for example, if all shocks are assumed to be permanent) but a puzzle is apparent. The model suggests that at least part of movements in nominal exchange rates are driven by systematic or predictable forces whereas observed behaviour suggests **all** movements are unpredictable. This outcome is contrary to earlier debate in which proponents of flexible rates argued that as long as policy is predictable, so, too will be the exchange rate. Even if policy uncertainty is reduced, "news" appears to dominate exchange rate behaviour.

Formal empirical tests have been undertaken on the monetary and asset market models (for surveys, see Isard, 1978; 1987; Horne, 1983; Macdonald and Taylor, 1992; MacDonald, 1995). Broadly grouped, the empirical findings are characterised by three distinct phases; an optimistic period during which the monetary model appeared to work well when tested against data on the main currencies covering the 1970s and 1920s: a period of pessimism marked by the apparent breakdown of the ability of economic fundamentals to forecast out-of-sample exchange rate movements in the late 1970s and 1980s compared to a random walk benchmark and, more recently, a period of reassessment, especially in relation to empirical support for purchasing power parity as an anchor for the long-run real exchange rate.

When applied to a variety of sample sets covering the 1920s, Canada (1950-1962) and 1970s, the key prediction of the monetary model, namely the ability of relative monetary disequilibria to track movements in the nominal exchange rate is well supported empirically (see Horne, 1983). Notably, the above sample periods are marked by large monetary shocks relative to real disturbances and apparent money demand stability. Empirical tests conducted on UIP and PPP give mixed results: Frenkel's tests of absolute and relative purchasing power are supported by 1920s data but not for the 1970s (Frenkel, 1981). The earlier data reject uncovered interest parity (but with support for covered interest parity once allowance is made for transactions costs). This finding is well recognised as a rejection of the joint hypothesis of zero risk

premium and rational expectations with ensuing research effort directed towards identifying the cause of rejection.

The second or pessimistic phase marks the inability of the monetary model to explain stylised facts such as the "disappearing marks" (appreciation of the mark against the U.S. dollar in the late 1970s (see Frankel, 1978) and the inability of monetary fundamentals to explain the persistent nominal and real appreciation of the U.S dollar against the yen and the mark from 1980 to 1985. More formal empirical tests conducted by Meese and Rogoff (1983) confirm the apparent breakdown of the out-of-sample forecasting ability of monetary and portfolio balance models against a random walk benchmark. Their original finding and subsequent reaffirmation is that the forecasting ability of asset market models deteriorates as the period is shortened below one year; for forecasts below a year, a random walk is superior to monetary models. Subsequent research using cointegration methods also reverses the earlier support for purchasing power parity using data from the 1970s and 1980s.

The third period is marked by a reassessment of asset market models and purchasing power parity with more robust cointegration tests overturning the earlier rejection of relative purchasing power parity and providing support for long-run stationarity of the real exchange rate (see Macdonald, 1995). The specific issues of uncovered interest parity and purchasing power parity are addressed in myths (4) and (5) below.

The following set of conclusions may be reached in regard to myth (1); economists know what determines the exchange rate.

1. The asset market model provides a plausible explanation of several striking empirical regularities of flexible exchange rates such as high nominal and real exchange rate volatility compared to the earlier trade model. The monetary model also links directly macro policy fundamentals with the expected and actual path of the exchange rate.

2. At the same time, gaps between theory and observation need reconciliation. The major gaps include large and persistent swings in real exchange rates, weak out-of-sample predictive power of the monetary model, especially over short time horizons and reconciling time-series properties of exchange rates with structural models.

3. From a policy perspective, gaps between theory and fact may not matter as long as the underlying explanation of exchange rate behaviour approximates reality and does not undermine their ability to achieve macro policy objectives. For example, a strong and positive correlation between nominal exchange rate depreciation and inflation differentials need not hold exactly to be a useful policy directive. However, other gaps such as large and persistent swings in real exchange rates and rejection of uncovered interest parity present serious dilemmas for policy in terms of the effectiveness of sterilised intervention (whether undertaken independently or as a

coordinated effort) and appropriate exchange rate policy such as targeting the real exchange rate.

The above problems may arise from restrictive assumptions within the model such as complete and homogeneous information sets available to market participants. But they may also arise from factors excluded in the model solution such as speculative bubbles. Some economists have attempted to revitalise exchange rate models in terms of the latter. The contention that exchange markets are unstable and subject to bubbles is misconception (2).

Myth (2): Floating exchange rates are unstable owing to destabilising speculation.

The contention that flexible exchange rates are unstable due to destabilising speculation underpins much of the earlier debate on fixed versus flexible exchange rates in the 1950s and 1960s. The debate conducted between its principal protagonists, Nurske (1944) and Friedman (1953) focused upon the apparent instability of floating exchange rates in the 1920s. The essence of Friedman's argument was that destabilising speculation (defined by him as speculators on average selling when the domestic currency is depreciating and buying when it is appreciating) acts against speculators' self-interest because speculators would lose money as a group.

Subsequent movements of the major currencies in the more recent period of flexible exchange rates has revived the earlier debate under the guise of speculative bubbles, as defined earlier and interpreted more loosely in the literature and policy discussion as self-fulfilling exchange rate prophecies. For example, one prominent commentator reinterpreted the earlier debate along these lines:

"the traditional fear that floating exchange rates will be subject to destabilising speculation due to speculative bubbles that do real harm is, unfortunately, strongly supported by the evidence of the 1980s" (Krugman, 1989, p. 77).

Policy significance

The issue of instability of flexible exchange markets due to destabilising speculation lies at the core of the fixed versus flexible exchange rates debate and, more fundamentally, free markets versus intervention in the foreign exchange market. In contrast to the free trade debate, there is no theoretical benchmark of Pareto optimality owing to the presence of frictions as reflected in the use of national monies and exchange rate regime. In the presence of market frictions, both regimes are second best.

It is noted at the outset that the concepts of exchange rate instability and speculation are not well-defined in the policy debate with the terms, "instability", exchange rate

movements and volatility being used interchangeably.[6] Regardless of the precise interpretation adopted of the above concepts, the policy presumption is that (private) speculation is destabilising and undesirable and hence justifies activist policy, whether through episodic central bank intervention to "stabilise" exchange rates or a switch to fixed rates.

Theory

An essential starting point is to define the concept of speculation. Friedman's argument may then be evaluated as well as the more recent reinterpretation of "unstable" exchange rate behaviour in terms of speculative bubbles.

The concept of speculation is defined as a process for the transfer of price risks for durable assets and goods (see Singleton, 1987). The assumed motives for speculation are critical for the debate since speculation may arise from differences in beliefs and a willingness to take risks. In the case of the latter, trade motivated by risk diversification is usually considered to be desirable. Hence, the focus of the following discussion is directed towards the first type of behaviour, usually interpreted in the literature and policy debate as "pure speculation", especially when these beliefs are assumed to derive from extrinsic factors rather than fundamentals.

The theoretical welfare benchmark of "pure speculation" is defined as a situation in which total monetary gain from speculation is zero (and initial trade positions are uncorrelated with market returns). In this situation, agents have rational expectations and are initially trading optimally. This case corresponds to that of Friedman. But it is clear that the conditions of rational agents and perfect competition are quite restrictive. Relaxation of these conditions, for example, market power enjoyed by central banks would enable speculators to make money and be better off. Even if the restrictive case is assumed, there is a further ambiguity in the definition of speculator (as recognised by Friedman). All traders, including buyers and sellers, private and official are potential speculators. The definition is usually restricted to private agents who initiate trade with a sole purpose of making profits but this definition is arbitrary and breaks down in a general equilibrium framework.

Returning to the Friedman case: purely speculative trade would not occur (being against agents' self-interest) in a situation in which Pareto optimum already holds. In this situation, there is no role for central bank intervention. But the policy case for flexible exchange rates over fixed also collapses. In the presence of frictions, one exchange rate regime is as good as another. Once these restrictive assumptions are relaxed, speculation may be welfare-enhancing as would intervention. A case could be argued against flexible exchange rates on other grounds, for example, unequal income distribution that arises from larger temporary changes in real exchange rates compared to fixed rates. However, as in the trade debate, policies that directly address the

[6] For example, in their discussion of the debate from the perspective of the 1970s, Artus and Young (1979) use the term "unstable" in terms of its "commonsense" meaning of moving up and down frequently (p. 677).

underlying structural rigidities in goods and labour markets are preferable on efficiency criteria.

The case for policy intervention based upon the belief that speculative activity reflects bubbles is even less convincing, especially when it is alleged that bubbles are the reason for divergence between movements in the exchange rate as predicted by the fundamentals and that of the observed rate. As noted in Flood (1987), bubbles cannot explain the Meese and Rogoff finding because the authors forecast the exchange rate using the ex-post realised values of fundamentals. Hence, bubbles will show up on both sides of the equation.[7]

Empirical evidence

Notwithstanding the weak theoretical grounds for arguing that bubbles help reconcile theory with fact, a growing body of work has attempted to provide empirical support for speculative bubbles, especially as an explanation for the persistent excess returns to investors holding U.S. $ denominated assets in the early 1980s. As demonstated in the theoretical discussion, bubbles are model-specific being definitionally equivalent to the difference between the market fundamental value of the exchange rate model and its observed price. There are also empirical difficulties in testing bubbles, especially in distinguishing bubbles from other sources of exchange rate volatility such as non-stationary fundamentals (see Towe, 1989).

A study by Borensztein (1987) has attempted to test directly two hypotheses as explanations of the excess return to $-denominated assets from late 1980 to 1984. The hypotheses are a possible peso problem (a small but significant probability of a large

[7] The flow market model may be used to clarify the conditions under which speculation flows are likely to be dominant as well as their impact on the response of the exchange rate to exogenous shocks (see Mussa, 1983). Speculative capital flows are defined as flows driven by expected changes in exchange rates. In figure 1, the right-hand panel shows the intersection of excess demand for foreign exchange (D-S curve)with the supply of foreign exchange to the domestic economy provided by speculators (SP curve). E is the expected future equilibrium exchange rate. If E< E, as shown in the diagram, speculators expect an exchange rate depreciation (rise in E), and will take profits from a net long-run position from foreign currency. The net supply of foreign exchange provided by speculators to the market is a function of expected profits (SP curve). The more elastic is SP relative to D-S, the greater is the effect of speculators' expectations on the current exchange rate.

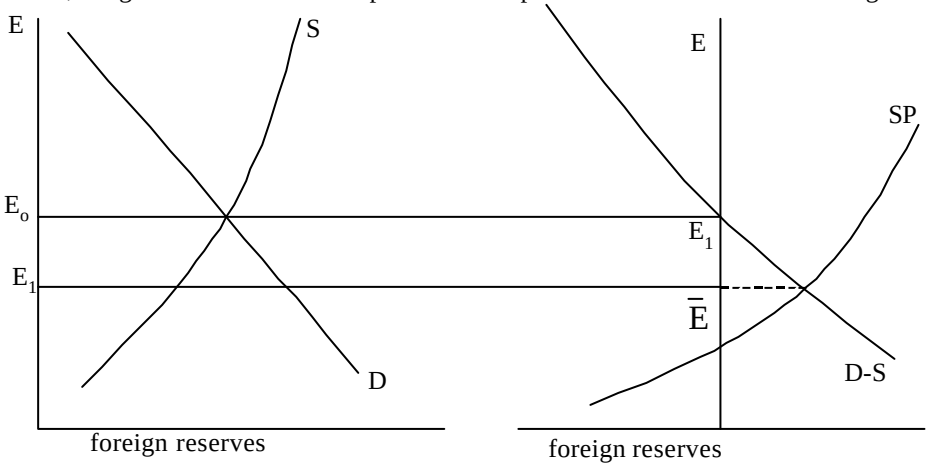

Figure 1

dollar depreciation that did not occur) and a speculative bubble, as defined above. The two explanations predict similar exchange rate behaviour but the forces driving the exchange rate are different. In the case of the peso problem, the expectation of a policy regime switch drives exchange rate behaviour whereas in the case of a bubble, it is the expectations of "rational" agents based upon factors other than fundamentals. The tests are favourable to both hypotheses. As acknowledged by the author, the bubble hypothesis is, however, inconsistent with the persistent appreciation of the dollar since a deceleration in the rate of appreciation would precede the bursting of the bubble.[8]

Even if bubbles cannot explain the gap between theory and fact, some observers have argued that bubbles, nevertheless, explain "excessive" volatility of exchange rates. The contention that exchange rates have been excessively volatile is myth (3).

Myth (3): Flexible exchange rates are excessively volatile.

The belief that exchange rates have been excessively volatile since the breakdown of Bretton-Woods is widespread in the literature and policy discussion, underpinning a number of recent reform proposals. Some economists have argued for direct intervention in the workings of exchange markets through regulation ("sand in the wheels") while others have used the perceived weakness of excess volatility to argue for a return to greater fixity of exchange rates.

Despite the apparent consensus on the existence of excess exchange rate volatility, two economists noted recently that:

"…after 15 years of research, evidence on the ability of the most popular exchange rate models to match the observed variability of exchange rates rests largely on misspecified and weak statistical tests" (Bartolini and Bodnar, 1996, p. 75).

Policy significance

The stylised fact of a sharp increase in nominal and real exchange rate variability since the breakdown of Bretton-Woods is well established. However, a statistical measure of volatility based upon unconditional variance is a weak basis for policy concern with "excess volatility". The relevant issue for policy is whether variability in flexible exchange rates has exceeded that predicted by economic fundamentals. Answering the latter question requires defining volatility in terms of conditional variance (the average volatility of unanticipated movements in exchange rates) and construction and measurement of benchmark against which excess volatility is to be assessed. Since there is no unique model of exchange rates and the assumed stochastic process generating economic fundamentals, an inherent ambiguity exists when assessing "excessive (conditional) volatility".

[8] Empirical tests conducted on the Lebanese pound (end-1982-November, 1987) support the bubble hypothesis (see Towe, 1989).

Theory

Both flow and stock models of exchange rates provide a theoretical benchmark of exchange volatility. In the flow model, volatility of exchange rates in response to exogenous shocks depends upon import demand elasticities; the lower the elasticities, the greater the volatility of the exchange rate. In view of the lack of direct policy control over trade flows, it is doubtful that policymakers are concerned with whether exchange rates have been excessively volatile relative to trade flows. (The separate issue of the effect of exchange rate volatility on trade flows is considered in myth (7) below.)

As already noted, the monetary model provides a plausible explanation of high exchange rate volatility. Exchange rates are modelled as forward-looking relative asset prices that reflect unanticipated change in relative demand and supply of domestic and foreign monies. Exchange rate volatility will reflect agents' expectations of changes in determinants of money supplies, interest rates and income as specified above. Thus, during periods of high uncertainty, the "news" variable will tend to dominate exchange rate behaviour.

Process-switching whereby agents switch their beliefs about the expected paths of fundamentals will also generate "bubble-like" behaviour and may offer a possible explanation of excess volatility. In this situation, the switch is known to agents but not to observers and, hence fundamentals will diverge from the observed exchange rate.

Empirical evidence

In order to define and measure "excess volatility", a reference benchmark is required. Even if a case could be made for using unconditional variance as the measure of volatility, it is not obvious that average exchange rate volatility observed in the pre-Bretton Woods period is an appropriate choice of benchmark. The post-Bretton Woods period is characterised by high volatility of **all** asset prices (as well as commodity prices). Compared with volatility of other asset prices such as share prices and short-term interest rates, volatility of exchange rates has been lower. Compared with volatility of goods prices, exchange rate volatility has been higher but this pattern reflects differential speeds of asset and goods markets.

If, as argued in the theoretical discussion, the concept of conditional variance is adopted, empirical tests of excess volatility will depend upon the choice of an appropriate reference exchange rate. For example, the chosen benchmark may be the predicted value at t-1 of the exchange rate at t obtained from equation (5) of the monetary model. The gap between the value of the perfect foresight or fundamental exchange rate and the predicted (benchmark) exchange rate represents fundamental exchange rate "surprises", conditional on the model (see Bartolini and Bodnar, 1996)[9].

[9] The solution to the fundamental value of the exchange rate is obtained from equation (7) of model setting $s_t = E_t [s^*_t]$

An alternative benchmark is to assume that the fundamentals follow a random walk in which case the nominal exchange rate itself follows a random walk.

Earlier empirical tests of excess exchange rate volatility using variance bounds tests support the hypothesis of excess volatility. However, these tests suffer from a number of statistical weaknesses (including non-stationarity of variables) that weaken their power to reject the null hypothesis of no excess volatility (see Scott, 1991). More recent empirical tests by Bartolini and Bodnar (1996) using the asset market model applied to the main currencies in the post-Bretton Woods period reject the excess volatility hypothesis when the first benchmark is used. There is, however, evidence of excess volatility when exchange rates are measured as deviations from a random walk benchmark but this finding is empty of policy significance.

Since excess volatility is consistent with that expected by the fundamentals driving exchange rates in monetary models, does this mean that the foreign exchange market is efficient? Some economists have argued thus and suggested further that the forward exchange rate is a good predictor of the corresponding future spot rate. This is myth (4).

Myth (4): The foreign exchange market is efficient.

According to the efficient markets hypothesis, financial markets always price assets correctly: in an efficient market with rational agents, exchange rates are forward relative prices and will incorporate all information available to agents, including expected changes in the underlying fundamentals. In the words of one commentator:

"The efficient markets hypothesis has so dominated thinking about financial markets that few remember that it is a hypothesis rather than a fact" (Krugman, 1989, p.85).

The related issue of the linkage between the forward rate and the corresponding future spot rate has also attracted considerable attention, especially in the area of treasury management.

"From time to time, economists have suggested that forward exchange rates have some predictive power in determining the value of future spot exchange rates. In practice, one has nothing to do with the other"(Manuel, 2000, p.3).

Policy significance

Until the share market crash in 1987, belief in the efficiency of financial markets was dominant in the 1970s and 1980s. in the aftermath of the crash, a number of reforms were proposed to regulate the behaviour of financial markets with the objective of reducing "excess" volatility. Such an objective makes little sense in terms of the above discussion: an appropriate policy goal is not to reduce volatility per se but instead to attempt to eliminate or reduce the gap between the observed asset price and its fundamental value. The concept of fundamental value has a clear-cut interpretation in

financial markets such as equities and bonds, being equal to the discounted present value of expected future dividends. But the absence of a unique and unambiguous market value for the exchange rate severely restricts the practical policy relevance of attempting to move the exchange rate to its fundamental value through regulation.

Tests of unbiasedness in forward exchange markets are also joint tests of a zero risk premium and perfect asset substitutability. Establishing the validity of uncovered interest parity has practical policy relevance for the effectiveness of sterilised intervention operations. If uncovered interest parity fails to hold and there is imperfect asset substitutability, scope for sterilised intervention operations exists under flexible exchange rates that would enable a central bank to retain control over the domestic money supply.

The relationship between the forward and future spot rate is also of interest to treasury managers. However, even if the forward rate is an unbiased and efficient predictor of the future spot rate, it need not be a good predictor. On the contrary, the opposite is likely under the principles that govern asset market behaviour and the efficient markets hypothesis. Any divergence between the two variables will reflect information not available at the time of setting the forward rate. Thus, during periods of high new information, little or no correlation may be observed even if the efficiency hypothesis holds.

Theory

Under the efficient markets hypothesis, the current exchange rate will reflect all information to agents at t. The forward rate is an unbiased and efficient predictor of the spot rate over the same maturity period. Equivalently, the interest rate differential which equals the forward premium, given transactions costs will be an unbiased and efficient predictor of subsequent change in the spot rate.

More formally stated, if agents are risk neutral and endowed with rational expectations, the forward rate for maturity h periods ahead will equal the market's expectations of the spot rate at t+h.

$$f_t = s^e_{t+h} \tag{9}$$

$$s^e_{t+h} = E[s_{t+h} | I_t] \tag{10}$$

$$\Delta s^e_{t+h} = E[\Delta s_{t+h} | I_t] \tag{11}$$

Allowing for a risk premium λ_t

$$\Delta s_{t+h} = \Delta s^e_{t+h} + \eta_{t+h} \tag{12}$$

$$fp_t = \Delta s^e_{t+h} + \lambda_t$$

$$(fp_t = f_t - s_t = \text{ln forward premium})$$

Under rational expectations and a risk premium, the efficient markets hypothesis is given by equation (13)

$$fp_t = \Delta s_{t+h} + \lambda_t + \varepsilon_{t+h} \qquad (13)$$

A test of the efficient markets hypothesis is to regress the actual change in the spot exchange rate or the forward premium:

$$\Delta s_{t+h} = \alpha + \beta fp_t + u_{t+h} \qquad (14)$$

The null hypothesis under the joint hypothesis of zero risk premium and rational expectations is: $\alpha = 0$, $\beta = 1$ and u_{t+h} (for $h = 1$) is uncorrelated. An alternative test is to test for orthogonality of the forecast error.

Empirical evidence

Theory needs to be reconciled with two main empirical regularities; evidence of serial correlation in forward markets as reflected, for example in profitable filter trading rules and a low correlation between forward rates and the corresponding future spot rate (see Isard, 1987; Manuel, 2000). The first fact is inconsistent with the efficient markets hypothesis while the second is not. More formal tests of equation (14) or the uncovered interest parity condition (equation (5)) reject the joint hypothesis under investigation (see Isard, 1987).

It is well recognised that empirical rejection of the uncovered interest parity hypothesis need not imply inefficiency because the hypothesis under investigation is a joint one, involving rational expectations and the absence of a risk premium. The main empirical puzzle is to determine whether rejection reflects non-rational expectations or a sizeable risk premium. Assuming covered interest parity holds, the difference between the change in the spot rate and ex-ante level of the forward premium equals the sum of risk premia and the unexpected change in the corresponding spot rate. Data presented in Isard (1987, Table 1, p. 10) show large risk premia for the 1980s.[10] This evidence suggests that the assumption of a negligible risk premium that underpins the monetary model not valid.
In summary, the following may concluded with respect to the efficiency hypothesis:

[10] As Isard notes, cited data are based on survey data rather than the unobserved expectations variable in usual tests of uncovered interest parity and hence the differential cannot be explained by a possible peso problem.

1. Empirical evidence rejecting the hypothesis of excess volatility supports the efficient markets hypothesis. However, this finding is model specific and considerably weaker than empirical support for efficiency of share markets (see Scott, 1991).

2. Rejection of the hypothesis of uncovered interest parity is not necessarily inconsistent with the efficient markets hypothesis provided this rejection is interpreted as reflecting large, exchange risk premia for the currencies under investigation.

3. A systematic linkage exists between the interest rate differential and movements in exchange rates but the uncovered interest parity condition seems to be a "major inaccuracy".

Even if uncovered interest parity is not supported empirically, the long-run prediction of the monetary model will hold, provided purchasing power parity holds. This is myth (5).

Myth (5): Purchasing power parity holds.

Purchasing power parity (PPP) is "the disarmingly simple" empirical proposition that national price levels are equalised when measured in a common currency. Provided goods arbitrage brings about broad parity in prices across a sufficiently large range of individual goods (law of one price), then there will also be a high correlation in aggregate price levels. Purchasing power parity plays a central role in open-economy macroeconomics by setting an anchor for the long-run equilibrium real exchange rate..

But is PPP "an identity, a truism, an empirical regularity or a grossly misleading simplification?" (Dornbusch, 1992, p. 260).

Many leading economists, among them, Cassell, Keynes and Samuelson have answered this question in quite different ways. Cassell is generally credited with the revival of PPP after World War I by his proposal that parities of the main currencies be reset based upon the accumulated inflation rates since 1914 (see Dornbusch, 1992). Cassell interpreted these divergences from PPP as temporary and short-lived. Keynes also recognised the likelihood of departures from purchasing power parity but interpreted such deviations as arising from systematic real shocks such as productivity differentials between countries.

Policy significance

The policy significance of PPP has several dimensions, depending upon its precise interpretation (absolute or relative version) and, if the latter, how deviations are to be interpreted, whether temporary, reflecting, for example, slower goods market adjustment relative to the money market or permanent, reflecting, for example, productivity differentials. Even if transitory departures from PPP are large and long-lived in the presence of backward-looking price contracts, long- run stationarity of the real exchange may, nevertheless, provide a benchmark for exchange rate policy such

as targeting the real exchange rate. However, in the case of permanent departures from PPP, pursuit of a similar policy would impede the adjustment process by preventing the necessary adjustment of relative goods prices.

Earlier policy discussion focused upon the use of the real exchange rate as a benchmark for determining the par values of currencies of countries returning to the Gold Standard with mixed success.[11] More recently, PPP has been proposed as an exchange rate benchmark for European transition economies restoring convertibility as well as a reference equilibrium real exchange rate in target zones (see Williamson, 1992-3).

The empirical regularity of large and long-lived swings in real exchange rates in the post Bretton –Woods period has attracted policy interest in terms of formulating an appropriate response to these deviations. To the extent that PPP departures are interpreted as reflecting monetary factors, such policies may be offensive or defensive. An example of the former is the pursuit of a disinflationary exchange rate policy by Latin American countries in the 1970s (with varying success) that attempted to set the exchange rate below the prevailing rate of inflation. An example of the latter is implementing macro policy to stabilise the domestic economy in the face of large shocks to the real exchange rate. (Such independent "beggar-thy-neighbour" policies, even if optimal from an individual country perspective are not optimal from a global welfare perspective.) If real exchange rate movements reflect adjustment to systematic real shocks, the above policies are neither nationally nor globally optimal and, worse, may destabilise the economy.

Theory

Consider two countries (home and foreign) which produce a range of homogeneous tradeable goods. For each good, the "law of one price" is assumed to hold, assuming markets are fully integrated and perfectly competitive. Summing the prices of all traded goods in each country and with each price given the equivalent weight in the sum, absolute purchasing power parity is given by equation (3) of the model (in logs) and reproduced below. In this special case, the law of one price holds for both individual goods and for aggregate price levels. An increase in the level of domestic prices, given foreign prices (through an increase in relative money supply) will result in a proportionate depreciation of domestic currency (referred to as the proportionality property).

$$s_t = p_t - p^*_t \qquad (15)$$

[11] The controversial U.K. decision under Churchill as Chancellor of the Exchequer to use PPP to restore its prewar gold parity with the U.S. dollar in 1925 is generally regarded as a mistake because the parity level was overvalued with resulting deflation and unemployment to achieve adjustment rather than through nominal exchange rate depreciation.

The key implication of absolute PPP is that under the assumption of costless, spatial arbitrage, the prices of a common basket of goods in two countries (measured in a common currency) is the same.

The above is a theoretical equilibrium condition, valid only if the specified assumptions hold. The issue is its validity as an empirical proposition. One obvious violation is trade barriers in which case even if a good is perfectly homogeneous, prices of the good will not be equalised in different locations at a given time.

Allowing for a constant factor k representing trade or other barriers:

$$s_t = k + p_t - p^*_t \qquad (16)$$

Rewriting equation (16) in terms of changes in relative prices where

$$\Delta s_t = \Delta p_t - \Delta p^*_t \qquad (17)$$

Equation (17) is relative purchasing power parity as interpreted by Cassell. Once the assumption that goods in respective countries are not identical owing to non-traded goods is relaxed, the law of one price no longer holds and PPP will hold only in its weak form if homogeneity conditions are met. Even if the law of one price fails to hold, if product homogeneity holds, so does PPP in its weak form.

Purely monetary shocks such as unexpected changes in money supply and demand will leave the real exchange rate constant. However, systematic departures from PPP caused, for example, by productivity differentials will require adjustment in the long-run equilibrium real exchange rate.

Empirical evidence

An extensive empirical literature exists on PPP (for surveys, see Officer, 1976; Kreinin and Officer, 1978; Katseli-Papaefstratiou, 1979; Dornbusch, 1992; MacDonald, 1995; Rogoff, 1996). The most consistent finding is the failure of the law of one price and absolute purchasing power parity to hold. Excluding a small set of highly homogeneous traded commodities such as gold, the law of one price does not hold but deviations tend to dampen out fairly rapidly. Persistent and long-lived deviations from PPP characterise the behaviour of real exchange rates. In contrast to earlier empirical tests rejecting weak or relative PPP, more robust cointegration tests support the mean-reversion or stationarity property of real exchange rates.

A new puzzle has emerged: how to reconcile slow convergence towards PPP with high, short-run nominal and real exchange rate volatility (see Rogoff, 1996).
The puzzle arises because explanations of short-term volatility of real exchange rates in terms of unexpected monetary shocks and slow price adjustment imply rapid adjustment towards PPP once price adjustment takes place. Alternatively, an

explanation of slow convergence towards PPP in terms of real exchange rate adjustment to real shocks cannot explain high real exchange rate volatility.

Empirical evidence based upon the earlier floating experience and post-Bretton Woods reported in MacDonald (1995) suggest that the real exchange rate is mean reverting (the residual in an estimated version of equation (17) in which levels of the nominal exchange rate, domestic and foreign prices, while individually non-stationary time series move together in a linear combination (cointegrated) such that the residual real exchange rate series is I (0) or stationary). However, a consistent finding is violation of the homogeneity property (proportionate long-run movement in domestic prices and nominal exchange rates). The empirical issue is how to interpret this finding: whether the violation reflects measurement errors (a long-standing problem with testing PPP); small sample bias or systematic real shocks, especially in the post-Bretton-Woods period.

No fully satisfactory explanation for the co-existence of persistent departures from PPP and high real exchange rate volatility is presently available. Nevertheless, two relevant pieces of empirical evidence provide a major share of the "jigsaw"puzzle. First, evidence on violation of the law of one price for a wide range of consumer goods suggests that, despite the trend towards greater international goods integration, internal markets remain more highly integrated . Hence, price differentials across countries for similar goods will be more volatile than price differentials within a country for dissimilar goods. Second, there is some empirical support for the role of productivity differentials in traded goods relative to non-traded goods in explaining real exchange rate movements (see MacDonald, 1997). This finding suggests that deviations from PPP reflect very long-run technology diffusion across countries. If this is the case, the monetary model's prediction of full adjustment of the nominal exchange rate to price differentials within a fairly short horizon of one to two years needs modification.

Myth (6): There is no risk in foreign trade.

Myth (6) is based upon the presumption that the cost of exchange rate risk is equivalent to the cost of forward cover. In order to assess its validity, it is necessary to determine what is meant by exchange rate risk and uncertainty. (For the purposes of the discussion, the two terms are used interchangeably, ignoring the Hayek's distinction between risk (quantifiable uncertainty) and pure uncertainty (non-quantifiable)).

Two types of risk are associated with exchange rate transactions; transaction-specific risk, defined as the effect of exchange rate variability on price (in domestic currency) and thereby profits or loss associated with a specific trade transaction and systemic or trade-related risk associated with the effects of persistent real exchange rate variability on uncertainty in investment planning and production in the traded goods sector. The first type of risk may be eliminated by forward cover at a cost borne by private traders. The cost of forward cover as measured by the bid-ask spread is a small

proportion of the value of a currency (typically around 1/10 of 1 percent). The second type of risk creates distortions to investment decisions (for example, weighting too heavily expected returns in the early stages of investment planning) and cannot be insured against.

It might appear that the existence of both types of risk implies that total uncertainty or risk is higher under flexible exchange rate compared to fixed. This contention underpinned earlier debate on instability and destabilising speculation discussed earlier. However, this belief is fallacious as it ignores the hidden costs to the economy of the government or central bank bearing exchange rate risk under fixed exchange rates. By fixing the exchange rate, the government (or central bank) bears all the risk with the costs (opportunity costs of holding foreign reserves) spread over all members of the community and not those solely engaged in trade. Thus, the difference between the two regimes does not lie in the presence or absence of risk but in their different distributional effects (a point made in an early contribution by Lanyi (1969)).

A further point is one noted in Friedman (1953); total uncertainty is not necessarily greater under one exchange rate regime or the other. Choice of exchange rate regime does, however, affect the form in which the uncertainty is manifested in the economy. For example, suppose there is an adverse shock to domestic output. In the monetary model assuming sticky prices and flexible exchange rates, this shock will be reflected in a fall in money demand, creating excess money supply relative to that abroad with a resulting nominal and real depreciation of domestic currency, thereby insulating domestic output. If, however, the exchange rate is fixed, the fall in foreign reserves reduces the domestic money supply and magnifies the initial contraction in domestic output. It is also possible, as argued in Friedman that a flexible exchange rate regime may lower total uncertainty, depending on the policy response. For example, an attempt under fixed rates to sterilise foreign reserve outflows through domestic credit expansion will magnify the initial external disequilibrium.

Myth (7): Volatile exchange rates have an adverse effect on trade.

A popular and widely-held perception is that exchange rate volatility, by increasing risk and uncertainty discourages international trade and investment. Somewhat puzzlingly, the consistent finding of empirical research is that little or no systematic relationship exists between these variables. An earlier review of empirical studies reached this conclusion:

" the large majority of empirical studies…are unable to establish a systematically significant link between measured exchange rate variability and the volume of international trade, whether on an aggregated or on a bilateral basis" (IMF, 1984, p.36).

The above finding is reconfirmed in a recent survey (Cosby, 2000). In view of its key role in the debate on fixed versus flexible exchange rates, it is worthwhile to examine more closely the theoretical underpinnings and empirical evidence.

Policy significance

The existence of a negative relationship between exchange rate volatility and international trade and investment has implications for national and global policy. At a national level, evidence of a strong adverse effect of exchange rate volatility and trade would provide some economic rationale for foreign exchange market intervention by central banks to stabilise exchange rates or "smooth out temporary fluctuations in exchange rates".

At a global level, the contention lies at the root of the arguments used against the adoption of flexible exchange rates by groups of countries. It motivates a number of reform proposals calling for a return to some form of fixed rates such as target zones.

Theory

The premise underpinning a negative relationship between exchange rate volatility and international trade seems plausible: an increase in risk will induce risk-averse agents to shift from more risky to less risky activities. Thus, exchange rate volatility will induce a shift from trade-related activities to domestic activities. However, despite its plausibility, closer examination shows that the theory is ambiguous.

The ambiguity exists even in a simple trade model which focuses solely only upon decision-making under risk for an individual producer in a perfectly competitive market faced with the decision as to whether to produce for foreign or domestic markets (see De Grauwe, 1988). The only risk facing the producer is uncertainty of the price in domestic currency for output sold in the export market owing to uncertainty about exchange rates.

The producer is assumed to maximise expected utility of income (total revenue). The key issue is: how does the increase in variability in exchange rates affect optimal resources directed to the export sector? If the exporter is sufficiently risk-averse , the increase in exchange rate risk will lead to an increase in the expected marginal utility of income revenue, thereby inducing a rise in export activity. The increase in risk facing a very risk-averse exporter leads to an expansion in export activity to compensate for the large fall in revenues (sizeable income effect). The conjecture usually ignores the above income effect or assumes it to be small relative to the substitution effect away from relatively risky activities. But there is no a priori case for making this assumption and the reverse is more plausible.

Empirical evidence

A prolific body of empirical work has attempted to identify and estimate the effect of exchange rate volatility on international trade (for surveys, see IMF, 1984; Cosby, 2000) with little success. The stylised fact of a slowdown in world trade since the breakdown of Bretton-Woods is consistent with the conjecture but may be spurious in view of the above theoretical ambiguity. A number of factors such as a deceleration of

the economic integration process by industrial economies and slower world economic growth may explain the observed weakening of trade growth.

The main empirical finding is to refute the conjecture but there are exceptions (see, for example, Akhar and Hilton, 1984; De Grauwe, 1988; Arize and others, 2000). Closer inspection shows that much of the empirical literature supporting the hypothesis is not robust once different measures of exchange rate volatility or sample periods are used.[12] Alternatively, the results rely upon a different mechanism than that discussed above. For example, De Grauwe finds a negative and significant relationship between real exchange rate volatility and growth of world trade for a cross-section of industrial countries (1960-69 to 1973-84) based upon a political economy channel that links trade intervention with real exchange rate misalignment. Nevertheless, the influence of exchange rate volatility on trade growth is much weaker than either income growth and the slowdown in the integration process.

Myth (8): Depreciating exchange rates lead to higher inflation (vicious circles).

The belief that countries with depreciating flexible exchange rates are drawn into a vicious circle of inflation which reinforces the initial exchange rate depreciation was a dominant feature of policy debate in industrial countries in the 1970s environment of high inflation. In 1976, the Belgium Annual Report warned "… of the Belgium economy being afflicted by this malignant fever and drawn into the vicious circle of foreign exchange rates and prices" (see Bilson, 1979, p. 3).

More astute commentators noted that " a vicious circle will not develop unless monetary policy is accommodating. Thus, policymakers who use the vicious circle argument against exchange rate flexibility offer the rare example of critics who criticise their own inadequacies" (Vaubel, 1980, p. 176).

Policy significance

The contention that depreciating exchange rates trigger a vicious inflationary circle (and, conversely, appreciating exchange rates generate a virtuous deflationary circle) reflects yet a further dimension of the fixed versus flexible exchange rates debate. This contention underpins the belief that flexible exchange rates contribute to the dynamic instability of the national and global economy by removing the discipline of fixed exchange rates and the balance of payments constraint on domestic monetary policy of non-reserve countries.

Two different policy stances on the above issue have been adopted by countries with floating rates. One position is characterised by the stance of "benign neglect" adopted

[12] The conceptual and measurement issues relating to exchange rate volatility already discussed also recur. The majority of empirical studies define and measure volatility in terms of unconditional variance, using the standard deviation of the level of nominal or real exchange rates as a proxy for exchange rate risk. Assuming the predictable component of total observed variance can be diversified away, the relevant variable is conditional variance, that is the unpredictable component of observed variance. When the latter measure is used (see Gotur, 1984), reworking the Akhar and Hilton sample period rejects the conjecture.

by the United States in the 1970s until the Plaza Agreement (September 22, 1985) to undertake coordinated intervention to bring about a dollar depreciation: the inflation rate is primarily determined by domestic monetary policy with the exchange rate playing a passive role in the adjustment mechanism of transmitting shocks domestically and abroad. The opposite position is reflected in the policy statements cited above; namely, that the exchange rate is an independent source of inflationary pressure and hence justifies measures to stabilise exchange rates.

Viewed solely from a national policy perspective, the first-best solution seems clear-cut: reduce the source of exchange rate depreciation if it is generated domestically by relative monetary expansion or avoid accommodating an exogenous shock to inflation that originates outside the domestic economy. While the role and stance of domestic monetary policy is a key variable to be considered, this argument ignores the output costs of disinflation. Reformulated, the policy issue is devise a macro policy mix that minimises the output/price variability tradeoff, given country-specific parameters such as openness, pass-through and wage-price indexation. Alternatively interpreted within the broader fixed versus flexible debate, the policy issue is whether flexible exchange rates worsen this tradeoff. If this is the case, the vicious circle hypothesis merits attention.

Theory

Consider two extreme theories of price relationships in an open economy.[13] One model is the law of one price already discussed. Under the assumptions of goods arbitrage, no transport costs, no trade barriers, perfect competition, goods homogeneity, full information and price flexibility: the price of good i in the domestic country equals the foreign price of the same good expressed in the same currency. The above case assumes full pass-through from exchange rates to import prices in domestic currency with a resulting proportional relationship between movement in the nominal exchange rate and domestic prices.

At the other extreme, assume each country is fully specialised in producing its own good with imperfect substitutability between domestic and foreign goods and fixed wages. Given unit wage costs and assuming a constant mark-up of prices over unit labour costs, a proportional relationship holds between movement in the nominal exchange rate and relative price levels. (This model is incomplete because of assumed exogeneity of exchange rates, nominal wages and the mark-up factor.)

Between these two extremes, open-economy models of exchange rates will generate a positive relationship between exchange rates and prices of imports (in domestic currency). Pass-though to domestic prices will depend on such factors as the degree of product differentiation and market segmentation.

The flaw in myth (8) is easy to identify; an exogenous disturbance will not induce exchange rate depreciation and price rise unless accompanied by an accommodating

[13] The flow elasticities trade model assumes fixed domestic prices in each country.

monetary policy. If the cause of the vicious circle lies in monetary policy, it is policy-engendered.

It would be tempting to rest the case here. But there is a further flaw in the argument once the role of stabilisation policy is introduced, whether as a trigger for the vicious circle or response to it. The proposition ignores the short-run trade-off between output and price variability. Restated, a case for vicious circles needs to demonstrate that this trade-off would worsen under flexible exchange rates relative to fixed.

The relevant theoretical question reduces to the following: are there plausible conditions under which this trade-off worsens under flexible rates? Henderson (1980) provides one scenario; his model is a portfolio balance model that allows for sterilised intervention under flexible exchange rates and partial wage indexation. In this environment, the trade-off worsens in an economy with flexible exchange rates faced by adverse real or monetary shocks (for example, a shift from domestic money to foreign bonds). In contrast, under fixed exchange rates, policymakers are able to sterilise the impact of the shock on the domestic money supply, leaving the exchange rate and price of domestic good unchanged. Under flexible exchange rates, the induced exchange rate depreciation increases the price of the domestic good. In order to maintain the same output under the two regimes, policymakers must accept higher price volatility under flexible rates.

Empirical evidence

During the 1970s, a positive correlation existed between the magnitude and diversity of inflation rates of the major industrial countries and widespread adoption of flexible exchange rates. However, since the early 1980s, all countries, independent of exchange rate regime have experienced falls in the level and variability of inflation. At an individual country level, stylised facts support a positive relationship between exchange rates and import prices in domestic currency although there is evidence of incomplete pass-through for industrial countries. But in terms of the preceding theory, this empirical regularity is empty since exchange rates are endogenously-generated. There is no theoretical benchmark against which vicious circles may be measured.

Earlier empirical work based upon causality tests of exchange rates and domestic prices (see Bilson, 1979) support the vicious circle hypothesis for some countries, for example Italy in the 1970s. However, these studies suffer from the above weakness, that is, the endogeneity of exchange rates. No empirical work has attempted to test directly Henderson’s prediction. However, indirect empirical evidence on the key assumptions of wage indexation and capital immobility together with high pass-through coefficients in developing countries suggest that the conditions for vicious circles are better met in developing and transition economies (the majority of which are already on some form of fixed exchange rates) rather than industrial economies in which the debate originated.

Myth (9): Countries with large current account deficits tend to have depreciating currencies.

The linkage between movements in exchange rates and current account imbalances has long been of interest to economists. A commonly held view is that expressed in myth (9), namely that " countries with large trade or current account deficits tend to have depreciating currencies and countries with large trade or current account surpluses tend to have appreciating currencies" (Mussa, 1983, p.181). Other economists have noted that "almost any combination of deficits and surpluses is possible, depending on the underlying exogenous disturbance altering the economic system" (Sachs, 1981, p. 202).

Policy significance.

Under Bretton-Woods, policy concern centred on whether small parity realignments could bring about external payments adjustment to correct "fundamental disequilibrium". In the post-Bretton-Woods period, attention shifted to the role of flexible exchange rates and appropriate macro policies to eliminate persistent current account imbalances such as that experienced in the United States and Japan. Specifically, policy questions have been increasingly framed in terms of "how much dollar depreciation is needed to achieve a sustainable U.S. current account?"

A second set of policy questions arises in the context of reform proposals to strengthen the international monetary system. On such proposal is for greater macro policy coordination between the United States and Japan to eliminate current account imbalances. However, concrete policy coordination proposals (for example, non-synchronised fiscal policies) require agreement on the impact of policies on the exchange rate and current account. Other reform proposals such as target zones also require agreement on the equilibrium exchange rate which in turn needs some understanding of how macro policies will influence the exchange rate and current account.

Theory

The textbook trade flow model of exchange rates is a logical starting point to explain the CA-e linkage. In the model, the current account acts as an equilibrium condition determining the exchange rate at each point in time. Provided the stability condition (M-L elasticity condition) is satisfied, an exchange rate depreciation will eliminate a trade or current account deficit. The higher the import demand elasticities, the smaller the exchange rate adjustment required. In the absence of capital mobility, flexible exchange rates act as a "closure" mechanism, ensuring current account balance.

Keynesian general equilibrium models developed in the 1950s and 1960s focus upon the respective roles of expenditure-change (induced movements in real income and domestic absorption) and expenditure-switch (movements in relative prices) to bring about external adjustment. In the presence of capital immobility, a similar prediction

to the elasticities model holds: an exchange rate depreciation accompanies an improvement (surplus or deficit-reduction) in the current account. However, under high capital mobility, the CA-e linkage is severed. For example, a budget deficit financed by bond issue will induce an exchange rate appreciation and current account deficit (the twin deficits hypothesis) financed by capital inflow.

The long-run property of money neutrality in the monetary model cuts the linkage between the nominal exchange rate (a monetary "phenomenon") and the current account (a real variable). Once the assumption of perfect asset substitution is relaxed, a linkage operates between the dynamic feedback effects of accumulated net foreign asset stocks (external debt if negative) on current account flows and the exchange rate. The predicted long-run dynamic linkage is a current account deficit and depreciating exchange rate in order to generate the trade surplus necessary to match debt-servicing payments and thereby ensure full stock and flow equilibrium. However, depending upon the shocks to the economy, degree of capital mobility and the nature of the mechanism transmitting these shocks to the current account and economy, a range of CA-e paths may be generated over the medium term.

Empirical evidence

The most consistent empirical regularity is the absence of a robust linkage between exchange rates and current accounts; a finding fully consistent with the above theory. The earlier empirical regularity observed in Mussa (1983) for the 1970s does not hold up under close scrutiny (see Sachs, 1981, pp. 258-9), especially when the sample period is extended into the 1980s and 1990s. For example, data collected in Sachs for the G-7 countries (1973-79) show a positive relationship exists between average annual percentage change in nominal and real exchange rates and deviations between the current account and the average CA/GDP ratio for the group. However, this relationship fails to hold for a group of smaller, industrialised countries. Once the data are extended into the 1980s, even the first relationship breaks down.

Returning to the policy issues raised above, two main messages deserve emphasis. First, the type of policy question framed above is misplaced as it ignores the endogeneity of current account imbalances and the exchange rate. Because of this endogeneity, there is no unique linkage between the two variables. Second, a longer time horizon than that normally adopted in policy discussion is useful and necessary in analysing the CA-e linkage in view of the dynamic nature of the variables under discussion and feedback effects from stocks to flows.

Myth (10): Low exchange rate pass-through provides a free lunch.

Exchange rate pass-through is the responsiveness of import prices in domestic currency to nominal exchange rate movements. A permanent nominal exchange rate change will be fully reflected in import prices in domestic currency in the long run. However, in the short run, imperfectly competitive foreign firms may attempt to

maintain prices and market shares by absorbing revenue fluctuations due to exchange rate change through profit margins.

There is some evidence of incomplete pass-through in most countries but in particular, lower pass-through in industrial countries compared to developing economies. Some economists have argued that low pass-through is especially beneficial to countries with flexible exchange rates and an inflation targeting regime on the grounds that it allows the inflation target to be maintained in the face of nominal exchange rate shocks with smaller price variability, given output variability. In the words of one commentator:

"For an economy with a very low rate of exchange rate pass-though, even an extreme policy of inflation targeting can be pursued without destabilising the price level-there is in a sense a 'free lunch' in that the trade-off between inflation stabilisation and output stabilisation is much less pronounced" (Devereux, 2000, p.11).

Policy significance

The size of exchange rate pass-through has long been of policy significance but from a somewhat different perspective than that adopted above. Earlier interest centred on concerns that low pass-through, especially in Japanese manufactured goods impeded the external adjustment mechanism under flexible exchange rates by preventing the necessary relative price adjustment from taking place.

Present policy focus has centred upon the implications of pass-through for the choice of monetary regime in open economies. In countries that have adopted a regime of flexible rates and inflation targeting, the degree of domestic price responsiveness to nominal exchange rate shocks matters insofar as these shocks require interest rate adjustment and resulting cost in terms of output variability in order to maintain the target inflation rate. Some economists have argued that countries with a high pass-through coefficient face a worse price/output variability trade-off compared to those with low pass-through.

Theory

The monetary model assumes a composite traded good with full pass-through from nominal exchange rate movements to import (traded goods prices) in domestic currency, leaving import prices in foreign currency unchanged. At the other extreme, the monopolistic pricing model assumes nominal exchange rate changes are fully absorbed by the mark-up over domestic costs. Between the two extremes, the consumer price index is a weighted average of traded and non-traded goods prices with first-order impact effects of nominal exchange rate shocks depending upon the degree of openness and pass-through coefficient.

The above discussion ignores second-order price effects of short-run real exchange rates on aggregate demand and domestic prices acting via the current account. Even

with low pass-through, an open economy will face some price variability through the second channel. However, the price dynamics will differ from an economy with high pass-through since the first channel tends to be faster-acting compared to the second indirect mechanism. Other policy trade-offs also need to be considered, including that between profit and domestic price variability and between variability of domestic prices and current account imbalances.

Empirical evidence

No direct empirical tests have been conducted of the free lunch hypothesis. Such tests would need to address the problem of endogeneity of the pass-through coefficient to monetary regime. Recent empirical simulations of a related issue, whether the price/output trade-off is improved by targeting the prices of non-traded goods are of interest (see Ryan and Thompson, 2000). Simulations of the Australian economy using a specific model and targeting rule suggest that the dynamic effects from the second (aggregate demand) channel are sufficiently strong to eliminate the initial gains to price stability derived from bypassing the direct pass-through channel from nominal exchange rate shocks to domestic prices.

III. Conclusions and reassessment

The main conclusions of the paper are summarised below. The conjectures are divided into three groups, according to respective status based upon theory and empirical support. The first group contains the conjectures that are rejected on either or both grounds. The second group contains those that are not rejected and the third group include the remaining propositions about which existing theory and/or empirical evidence is ambiguous or inconclusive.

By far the largest number of conjectures fall within the first group (myths 3, 4, 6, 7, 8, and 9). In the absence of a Pareto optimum welfare benchmark of optimality of exchange rate regime, policy debate on fixed versus flexible exchange rates has relied heavily upon these conjectures. But the main message of this paper is that they have weak or no theoretical and empirical support.

The second group is the smallest and contains only one conjecture, PPP. Somewhat surprisingly, given its controversial history, relative purchasing power parity is supported by empirical evidence. A close and positive correlation between long-run movements in nominal exchange rate depreciation and inflation differentials is a good approximation to reality. However, the co-existence of high short-run volatility of nominal and real exchange rates together with large and persistent departures from purchasing power parity limit the policy relevance of PPP as traditionally used. These deviations weaken its practical usefulness, whether used as a benchmark for resetting parities, for targeting the real exchange rate or adjusting per capita incomes for the purposes of cross-country incomes comparison.

The third group of conjectures present the greatest challenge to research and policy since this group includes myth (1).

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