NBER WORKING PAPER SERIES

G3 EXCHANGE RATE RELATIONSHIPS: A RECAP OF THE RECORD AND A REVIEW OF PROPOSALS FOR CHANGE

Richard H. Clarida

Working Paper 7434
http://www.nber.org/papers/w7434

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
December 1999

G3 Exchange Rate Relationships: A Recap of the Record and a Review of Proposals for Change

Richard H. Clarida

NBER Working Paper No. 7434
December 1999

ABSTRACT

This paper is a recap of G3 exchange rate relationships since the collapse of Bretton Woods and an analysis of recent proposals for changing the way the G3 countries currently conduct exchange rate policy. We seek to understand these proposals in the context of the status quo monetary policies and intervention arrangements that are likely to be pursued by the G3 central banks in the absence of any formal arrangements among their governments to limit exchange rate volatility. The advocates of the proposals for change have made their assessment of the global costs of exchange rate volatility and (their estimates) of exchange rate misalignments, especially as these apply to the emerging economies through their linkages to the global capital markets. In their view, the status quo is unacceptable, and a sustained effort to limit G3 exchange rate fluctuations would deliver benefits to the world economy that would outweigh the value that they place on any loss of monetary autonomy in the G3 that would be required to maintain such a system. The skeptics make a positive, not a normative, judgment that the sorts of proposals that are on the table will not, in practice, get around the 'impossible trinity' of international finance.

Richard H. Clarida
Department of Economics
Columbia University
420 West 118th Street
Room 1014 IAB
New York, NY 10027
and NBER
rhc2@columbia.edu

1. INTRODUCTION

With the world still ensnared in what President Clinton has called "the worst international financial crisis of the last fifty years" there is renewed interest in re-thinking and redesigning the global 'financial architecture'. Trillions of dollars flow each day through the world's foreign exchange and securities markets, making capital and the opportunity to diversify risk available around the world to borrowers and issuers deemed worthy of access. Although such access to the international financial markets has expanded enormously in both scale and scope over the last decade - the international capital markets were simply off limits to most private and many official borrowers and issuers in most countries until the early 1990s - the "contagions" following the December 1994 Mexican crisis and the June 1997 Thai crisis have made painfully clear how fragile such access can be even for theretofore sound credits in growing, stable, well managed economies.

Of course, it is not just in and among the emerging markets that turmoil has originated and contagion has spread. Japan is in the midst of its second recession of the decade, with a fragile banking system to bail out and a mountain government debt, much of it accumulated from a succession of unsuccessful fiscal stimulus packages, to service. Deflation continues while short-term interest rates in Japan have been pushed to just north of absolute zero. As the Japanese economy continued to contract, the yen began 1998 by continuing an ongoing

depreciation against the dollar that, in the spring, produced the weakest yen/dollar exchange rate of the decade, only to be whipsawed in the summer and fall by a U-turn appreciation of some 25 percent that caught the financial markets, not to mention academics, completely by surprise.

The US and Europe, while not themselves in the grip of financial and currency crises, were certainly not immune from their effects. In the US, the current account deficit widened as exports to Asia and Latin America sagged and imports surged. Following the Russian default in August 1998 and the repricing of risk and consequent seizing up of big chunks of the US and global capital markets that soon followed, the Federal Reserve cut interest rates three times, specifically citing the "international situation". In Europe, the DM and other ERM currencies strengthened as safe haven capital flowed in, (correctly) anticipating the successful launch of the Euro in January 1999. As in the US, exports to Asia contracted but, unlike the US European growth prospects dimmed. In response, the Bundesbank and other central banks followed the Fed and cut interest rates in their last official acts as independent central banks before becoming part of the ESCB.

There are many issues that arise as part of any effort to re-think, let alone redesign, the global financial architecture. Recent papers on this subject have explored such topics as the regulation, supervision, and risk assessment of financial institutions engaged in international borrowing and lending (Calomiris (1998)), the role and function of the global capital market under the existing architecture (Obstfeld (1998)), the case for capital controls (Bhagwati (1998)), the case for currency unions (Dornbusch (1998)), the case for target zones (Williamson (1998), the causes and consequences of currency crises (Krugman (1997); Feldstein (1999)), and the role of the IMF in sorting all this out (Eichengreen (1999).

This paper is a recap of G3 exchange rate relationships since the collapse of Bretton Woods and an analysis of recent proposals for changing the (*ad hoc*) way the G3 currently conduct exchange rate policy. We seek to understand these proposals in the context of the monetary policies and intervention arrangements that are likely to be pursued by the G3 central banks in the absence of any formal arrangements among their governments to limit exchange rate volatility.

Because most countries outside the G3 invoice a large fraction of their international commerce and denominate and even greater portion of their international borrowing in dollars (and to a lesser extent yen and euros), the wide swings in bilateral G3 exchange rates that we observe have large effects on the trade flows, capital flows, portfolio composition, and - as recent research (Krugman (1997)) demonstrates - the vulnerability to speculative attack in the many countries that choose, for reason of inflation stabilization or to facilitate their integration into the global capital market, to peg their exchange rates to the dollar (or yen or Euro).[1] Notwithstanding the recent turmoil in international financial markets, the experience of countries such as Argentina and Hong Kong that have weathered recent crisis contagions with currency boards may make it more likely that other small open economies will adapt to the vicissitudes of the global capital market not by adopting a flexible exchange rate, but rather by giving up monetary autonomy altogether and linking their money supplies and interest rates to a G3 currency via a currency board or even complete "dollarization".[2]

---

[1] For this reason, Mckinnon (1998) has recently characterized the yen-dollar exchange rate as the 'loose cannon' behind the Asia crisis.

[2] Dornbusch (1998) among others has made this point. Obstfeld (1998) argues that, for many countries, there may not a viable alternative between choosing a currency union with a G3 country or allowing the exchange rate to float freely.

The plan of the paper is as follows. In Section 2, we review the G3 countries' experience with managed, floating exchange rates since 1973. The future may not be like the past, but with 25 years of data since the collapse of Bretton Woods, it is certainly possible to characterize the status quo and to make an educated guess about the likely future behavior of G3 exchange rates under the existing institutional arrangements. We document stylized facts of the post-Bretton Woods experience with managed floating, discuss the recent empirical research on the relationship between exchange rates and fundamentals, examine some popular definitions of and evidence for currency 'misalignments', and review post-Plaza efforts to use intervention as a tool for dampening exchange rate volatility.

In Section 3, we consider some of the criticisms of the post-Bretton Woods exchange rate experience levied by, among others, Krugman and Miller (1993), Volcker (1995), McKinnon (1997) and Williamson (1998). These and other papers argue that exchange rate volatility appears to be excessive, that deviations of exchange rates from fundamental equilibrium values are persistent, that the costs of volatility and misalignment are not insignificant, and that benign neglect is an inappropriate policy response to (and may in fact be one of the causes of) the observed wide fluctuations in G3 exchange rates.

In Section 4, we detail the key features of five prominent proposals (Volcker (1995); Williamson (1998), McKinnon (1997); Wolf (1999)) that have recently been put forward for the G3 countries to adopt some form of a target zone system among themselves to keep exchange rates inside a wide band surrounding an estimate of their equilibrium levels.

In Section 5, we outline several potential challenges to the durability of the proposed wide band target zone arrangements. These include: the conflicts that can arise between domestic and international objectives; the possibility of speculative attacks that exploit the

difficulty counties face in making credible commitments to enforce target zones given these competing domestic and international policy objectives; the conflicts that can arise between countries over the assignment of responsibility for adjusting monetary policy to maintain the target zone; the difficulties in conducting monetary policy when targeting an asset price such as an exchange rate; the uncertainties surrounding the estimate of the equilibrium exchange rate that must used to define the central parity around which the bands are set; the particular challenges that Japan faces in credibly committing to exchange rate stability in the context ongoing deflation, a yawning output gap, huge budget deficits, and with a newly independent central bank seeking to establish its distance from the Ministry of Finance; the degree of latitude that will in practice be available for G3 central banks to pursue independent monetary policies given the difficulties that may face in making credible commitments to enforce the proposed target zone arrangements. Section 6 provides some concluding remarks.

There are two appendices. In Appendix 1, we review the theoretical case for a target zone system as a means to reduce exchange rate volatility. As is well known, a credible target zone for an exchange rate about its long run equilibrium level can, in theory, deliver a 'honeymoon' bonus that makes the exchange rate less volatile within the band than would otherwise be the case. Moreover, as Svensson (1994a) has emphasized, a credible target zone can, in theory, provide some latitude for participating countries to pursue independent monetary policies while maintaining full international capital mobility.

In Appendix 2, we review the evidence on how the most well known target zone arrangement, the European Monetary System, operated in practice. The collapse of the original, 'narrow band', EMS in 1992-1993 made even many of the original EMS supporters (and certainly all of the original skeptics) doubtful about the sustainability in practice of a target zone

system in a world of international capital mobility and divergent macroeconomic outcomes (due perhaps, but not necessarily, to asymmetric shocks). The theoretical latitude to pursue independent monetary policy was not available in practice to countries, such as Britain, when their business cycle conditions called for lower interest rates than Germany's (Clarida-Gali-Gertler (1998)). After the summer of 1993, and until the EMU parities were locked in late 1998, a 'wide band' of plus or minus 15 percent of parity was adopted for the currencies that remained in the ERM. We review the ERM experience with 'wide bands' at the conclusion of Appendix 2.

2. G3 EXCHANGE RATES SINCE 1973

Figure 1 plots the history of bilateral monthly dollar, yen, and dm exchange rates since the collapse of Bretton Woods and the advent of (managed) floating in 1973. Figure 2 plots the recent, post-Louvre history of these exchange rates as well as the history of the (synthetic) Euro along with estimates of the PPP levels of these exchange rates.[3] We see that, on average over periods of several years, the simple PPP relationship

$$E = P/P^*$$

appears to provide an anchor for these exchange rates (Frankel and Rose (1996)). However not only have deviations from PPP been large, they have also been persistent and volatile. The short run volatility of G3 real exchange rates is one of most robust - and to many observers disturbing - characteristics of the post Bretton Woods floating exchange rate experience. It reflects, at least in part, the fact that nominal exchange rates are forward looking asset prices that adjust

[3] We use consumer price indexes to construct an estimate of the *changes* in the PPP exchange rate. To pin down the *level* of the PPP exchange rate, we assume that the bilateral exchange rates were at PPP in 1987 the year of the Louvre Accord. Results would be similar if we used sample average deviations of an exchange rate from the ratio of CPIs.

continuously to clear the global capital market whereas money goods prices are often sticky and adjust only gradually to clear the international goods markets (Dornbusch (1976); Mussa (1982)).

PPP is a useful construct for placing medium run currency movements in context, but it is neither necessary nor sufficient for a currency to be properly 'aligned'. Shifts in the supply of or demand for national outputs will in general require and adjustment in the terms of trade and/or the relative price of non-traded goods and these relative price adjustment will in general necessitate a departure from PPP (Obstfeld and Rogoff (1997)). Moreover, any required adjustment in the terms of trade or relative price of non-traded goods in response to a 'real' disturbance will in general require an adjustment in the 'nominal' exchange rate (Obstfeld (1985)). Clarida and Gali (1994) estimated structural empirical model of the dm-dollar and the yen-dollar exchange rates on data from the 1970s through the early 1990s. They decomposed observed quarterly changes in bilateral real exchange rates into three sources: exchange rate changes driven by shocks to money supply and demand ("asset market" shocks), exchange rate changes driven by shocks to the demand for national outputs ("demand" shocks), and exchange rate changes driven by shocks to the supply of national outputs ("productivity" shocks). They concluded that a substantial fraction of the of the short run variance of real as well as nominal exchange rate changes is due to "asset market" shocks.[4] For example, as is shown in Table 1, Clarida-Gali (1994) estimated that 47 percent of the variance of the 3 month change in the dollar/dm real exchange rate is attributed to 'asset market' shocks, while 36 percent of the variance of the 3 month change in the dollar/yen real exchange rate is attributed to 'asset market'

[4] Clarida - Gali (1994) do not separately identify shocks to money supply and money demand but label a linear combination of these underlying disturbances as an 'asset market' shock. Eichenbaum and Evans (1995) use a different methodology to identify the importance of shocks to 'monetary policy' and obtain similar results.

shocks. Most of the remaining variance of real exchange rate changes is attributed to shocks in the relative demand for national outputs; very little (less than 10 percent) is attributed to productivity shocks. This does not mean that productivity shocks have been small; rather it follows from the observation that it is only the country specific component of productivity that drives the real exchange rate.

The Clarida-Gali model also provides a natural measure of when and to what extent the dollar-dm and dollar-yen were over or undervalued relative to their 'long run equilibrium' levels during the 1970s, 1980s, and early 1990s. In the Clarida - Gali model, the long run equilibrium exchange rate is precisely defined: it is the multivariate Beveridge-Nelson permanent component of the real exchange rate adjusted by the multivariate Beveridge-Nelson permanent component of the of the ratio of US to German or Japanese price levels. Intuitively, the Beveridge-Nelson permanent component of a time series is the long horizon forecast of that series (adjusted for any drift) that is consistent with all restrictions that may be imposed on the multivariate macro model that is used to make the forecast.[5] The Clarida-Gali model does not impose any assumption or restriction on the long run equilibrium exchange rate; for example, it does not assume that the equilibrium real exchange rate adjusts to achieve a particular level for the current account balance in the long run.[6] Figure 3 depicts Clarida and Gali's estimates of the over or undervaluation (relative to long run equilibrium) of the dollar-dm and dollar-yen exchange rates that occurred in the 1970s, 1980s, and early 1990s. As is evident from the graphs, the estimated over and undervaluations of these key exchange rates have often been large and persistent.

---

[5] Cumby and Huizinga (1990) were the first to employ the multivariate Beveridge - Nelson decomposition approach to study exchange rates.

[6] This is the assumption used by Williamson (1994) and researchers at the IMF in constructing their estimates of 'fundamental equilibrium exchange rates'.

The Clarida-Gali - and for that matter any other - time series approach to estimating the long run equilibrium real exchange rate cannot formally distinguish between two competing interpretations of the deviations of the exchange rate from the long run equilibrium. According to one interpretation, the one emphasized in the Clarida - Gali (1994) paper, these deviations do not represent exchange rate misalignments but instead reflect the interplay of sticky goods prices with nominal and real shocks that have transitory as well as permanent components. Another interpretation of such decompositions is that the large and persistent departures from long run equilibrium do represent misalignments.

Another, complementary, approach to assess the link between exchange rates and fundamentals in the G3 has been taken by Mark (1995). Using the simple monetary model of exchange rate determination as a starting point, he first confirms the widely held notion that quarter to quarter or even year over year changes in dollar/dm and dollar/yen nominal exchange rates during the post Bretton-Woods years have essentially been orthogonal to contemporaneous values of key fundamentals such as relative national money supplies and relative national outputs. However, at longer horizons of two, three, or four years, Mark presents striking evidence that cumulative nominal exchange rate changes are well explained by the initial deviation of the exchange rate from its 'fundamental value'. That is, Mark estimates that if, in a given quarter the dollar-dm or dollar-yen exchange rate is overvalued relative to the monetary approach fundamentals, then it will tend to depreciate on average until the initial overvaluation is eliminated in three or four years. Mark's point estimates suggest that between half and three - quarters of the variance of three and four years changes in nominal bilateral G3 exchange rates is accounted for by this simple measure of initial over or undervaluation relative to the flexible price monetary approach fundamentals. In his words, "[t]he improved fit attained as [the

horizon] increases suggests that *the noise that dominates quarter to quarter changes* in [G3 nominal exchange rates] averages out over long horizons (Mark (1995), p. 210, emphasis added)."

The 'noise' that dominates short run changes in G3 nominal exchange rates (both real and nominal) has not, in general, diminished appreciably over the last 25 years. Figure 4 depicts for each bilateral nominal exchange rate a rolling standard deviation of monthly log changes since 1977. We see that the volatility of monthly changes in the yen-dollar and yen-dm exchange rates has, if anything, risen during the 1990s to levels last observed during the early 1980s, and is much higher than during the late 1970s. However, we do observe in recent years a substantial decline in the volatility of the dm-dollar exchange rate back to the ranges observed in the late 1970s. Figure 4 also shows that the recent volatility of the (synthetic) euro-dollar exchange rates leading up to EMU behaved similarly to dm-dollar volatilities.[7] The volatility of G3 exchange rates that is actually observed was greatly underestimated by the early advocates of floating exchange rates such as Harry Johnson (Obstfeld (1995)). They predicted that "flexible exchange rates would tend to remain constant so long as underlying economic conditions (including government policies) remained constant . . [I]f economic changes or policy changes occurred . . . the flexible exchange rate would gradually either appreciate or depreciate as required to preserve equilibrium."

The mere presence of this volatility (or its failure to diminish over time) is not in itself inconsistent with the notion that G3 exchange rates are determined in a rational, efficient asset

[7] The synthetic Euro series is taken from the **Financial Times** and is constructed as a GDP weighted average of the 11 bilateral EMU exchange rates with the dollar and yen.

market that respond only to tangible 'news' about fundamentals.[8] The Dornbusch (1976) overshooting model links exchange rate volatility to the jump in nominal exchange rates that occurs under rational expectations in response to a rise in the money supply or a fall in money demand that requires a divergence between the home and world interest rate. Another possible explanation for exchange rate volatility is the fact that 'news' about current fundamentals may also be providing information about the future *growth rate* of fundamentals, in which case the jumps in the exchange rate may (rationally) be more volatile than the 'news' about current fundamentals (Mussa (1976)). Some of the recent empirical evidence presented in Clarida and Gali (1994) and Eichenbaum and Evans (1995) suggests that the magnitude of overshooting and/or magnification in response to an asset market disturbance may be substantial. As shown in Figure 5 (which is taken from Clarida-Gali (1994)), in response to an a rise in money supply (or a fall in money demand) that causes a long run depreciation of 1.5 percent in the dollar/dm exchange rate, the immediate in jump in the nominal exchange rate is *three* times larger.

Although G3 exchange rates since 1973 have exhibited "wide swings" and volatility that has failed to diminish over time, their determination has not been left entirely to the foreign exchange markets. Periodically in the 1970s (most notably with the November 1978 'dollar rescue package'), and more frequently and systematically since 1985, the G3 countries have led coordinated intervention operations to 'calm disorderly markets', to 'lean against the wind' as their exchange rates drift away from the official perception of their fundamental equilibrium levels, or to 'lean with the wind' to push exchange rates back to their 'fundamental equilibrium

[8] The following paragraphs draw heavily upon the discussion in Obstfeld (1995) and Dominguez and Frankel (1993).

levels'. Perhaps the most explicit, coordinated such effort along these lines followed the February 1987 Louvre Accord which established formal, but secret, target zones for the major currencies around their February 1997 levels. For at least several years following the Louvre accord, new - but still secret - target zones were reestablished around new central parities that more accurately reflected the 'market realities' of the time. Figures 6 and 7 present one prominent market maker's assessment of US post-Louvre intervention strategy in the dollar-dm and dollar-yen markets.[9]

The conventional wisdom on sterilized foreign exchange intervention is that its effects are expected to be small and short-lived unless backed up by changes in monetary policies (Henderson and Sampson (1983); Edison (1993)). This is essentially the position of the US Treasury. To the extent that other researchers find more significant effects of sterilized intervention (Dominguez and Frankel (1993); Catte, Gali, and Rebecchini (1992), these effects are often attributed to the signaling effect of intervention. As stated by Dominguez and Frankel, "intervention operations - which after all are small compared with the private market - probably [can] not sustain control of the foreign exchange market for long without the sense of direction provided by monetary policy and might be used to pursue inconsistent policy goals even if such control could be sustained (Dominguez and Frankel (1993), p. 139)."

Which aspects of the G3 (US, Japan, Germany) exchange rate experience of the last 25 years are most likely to characterize the exchange rate experience of the new G3 (US, Japan, and Euroland) in the absence of (and perhaps even after agreement to) any new arrangements among their governments to further limit exchange rate flexibility? Notwithstanding the growing body

[9] The definitive account of G3 intervention operations is Dominguez and Frankel (1993).

of empirical evidence that the medium term *direction* of bilateral exchange rate movements has appropriately reflected the macroeconomic fundamentals, it most likely will continue to be the case that the bulk of short-run exchange rate *volatility* and perhaps even the *magnitude* of medium run exchange rate swings will be difficult to explain, even after the fact, by observed realizations of the fundamentals (Obstfeld (1995)). Second, it will likely also continue to be the case that the levels of bilateral G3 exchange rates will often and persistently to wander away from empirical estimates of their *long run* equilibrium values, whether these are determined by a PPP relationship or a more elaborate calculation of fundamental equilibrium levels that takes into account shifts in the terms of trade and sustainable current account flows. Third, there is reason to believe that the recent observed divergence between declining and modest dollar-euro volatility on the one hand and rising and high dollar-yen and euro-yen volatilities on the other may well continue. The US and Euroland have similar inflation rates, will likely have similar monetary policy strategies, and are not likely to subject the foreign exchange markets to any large structural fiscal policy surprises. By contrast, Japan is wallowing in deflation and recession, with a central bank and finance ministry that appear unwilling or unable - because of the banking crisis - to reflate the economy and bring inflation up to US and Euroland rates. Moreover, the sheer magnitude of the debt that Japanese government has issued - and likely will continue to issue - is apparently generating significant uncertainty in the global capital markets. Until Japan's banking crisis, deflation, and debt hangover problems are resolved, and their resolution will certainly require much more than - and might very well in fact he hampered by - a Japanese commitment to limit exchange rate flexibility, wide swings in the yen-dollar and yen-Euro exchange rate are not an unlikely prospect.

3. G3 EXCHANGE RATE EXPERIENCE SINCE 1973: CRITIQUES

Many if not most of the criticisms of the post Bretton-Woods experience with floating exchange rates - the 'non' system as it is sometimes called - begin with the presumption that much of the short run volatility in exchange rates - and the failure of the volatility to diminish over time - is the result of 'bandwagons', 'destabilizing speculation', 'herd behavior', and other pathologies of an international capital market that is thought to be far from 'efficient'. For example, Williamson states, "[t]he case for rejecting floating is based on the evidence that asset markets in general, and the foreign exchange markets in particular, are driven by herd behavior rather than rational expectation (Williamson (1998), p. 2)." Similarly, Krugman and Miller argue that, "[t]here is no evidence supporting the view that exchange markets are efficient, or even that speculation will generally be stabilizing. We certainly have no grounds for dismissing the views of experienced market practitioners who warn of the potential for large exchange rate swings that are unjustified by the fundamentals (Krugman and Miller (1993), pp. 313-314)." From the presumption of an inefficient foreign exchange market follows the second critique of the post Bretton-Woods status quo: that the inefficient foreign exchange market not only generates excessive short run volatility, but also can produce - when these excessive short run exchange rate changes cumulate over time - significant and sustained 'misalignments' of exchange rates relative to the levels that would be justified by the fundamentals.

The costs of excessive exchange rate volatility are thought, by many authors, to be manageable - but not trivial - due to the ready and ever increasing availability of financial derivative products for hedging short and intermediate run foreign exchange exposure. But hedging entails costs, especially as the horizon lengthens, and is not always possible when the

foreign currency cash inflows or outflows to be hedged are themselves uncertain. The costs of exchange rate 'misalignments', if they are in fact as common and as sizable as some suggest, are believed to be "extremely harmful to macroeconomic stability and microeconomic efficiency (McKinnon and Ohno (1997), p. 52)." By altering international relative prices (the terms of trade), domestic relative prices (of nontraded goods), and the prices of traded commodities relative to traded differentiated products through a process McKinnon and Ohno (1997) label 'price diffusion', excessive exchange rate volatility and persistent misalignments are often held responsible for depressing bilateral trade flows, distorting investment decisions, and misallocating the outsourcing locations chosen by multinational firms. Moreover, because most countries outside the G3 invoice a large fraction of their international commerce and denominate and even greater portion of their international borrowing in a G3 currency (especially the dollars), the wide swings in bilateral G3 exchange rates that we observe have large effects on the trade flows, capital flows, portfolio composition, and the vulnerability to speculative attack in the many countries that have chosen to peg their exchange rates to, in particular, the dollar. Volcker (1995) sums up well (and presciently) the essence of these critiques of the existing 'non'- system:

> There is a reluctance to make a sufficiently strong commitment to [exchange rate]stability for fear the effort could fail, at political and economic cost. What is not adequately weighed in the balance, is the disintegrating force of present exchange rate arrangements, with its inherent uncertainties and false pricing signals. The irony . . . is to observe the enormous energy and political capital dedicated in recent years to reducing already low tariffs to minimal levels, only to see the potential gains in efficiency and trade overwhelmed by the volatility of exchange markets. In the same vein, in all our discussions of the problems of development ... of emerging economies, we don't give much weight to their stake in more stable exchange markets.
>
> (Volcker (1995), p. 8)

4. RECENT PROPOSALS FOR LIMITING G3 EXCHANGE RATE VOLATILITY

In 1993, following the collapse of the ERM , the IMF published a study (Goldstein *et. al.* (1993)) that outlined several suggestions, gleaned from talks with government officials and market participants, for improving the operation and durability of international agreements to limit exchange rate volatility and prevent misalignments. Since several of these ideas are embodied in the recent proposals for limiting exchange rate volatility among the G3, and since the designs of these proposals are aimed at making any future arrangements among the G3 more durable than the ERM turned out to be (as discussed in Appendix 2), we begin our analysis of the proposals that have recently been put forward by discussing some of the 'policy options in the aftermath of the crisis' presented in Goldstein *et. al* (1993).

The first suggestion published in the IMF report is for target zone arrangements to have more frequent (and smaller) changes of central parities within the band.[10] The aim is to design a coordination process that would produce timely agreement on the need for small, systematic adjustments in central parities, one that would 'depoliticize' these adjustments and restore the 'two way' bet for speculators. One goal of this strategy is to reduce greatly the need for large re-alignments and to put more responsibility for exchange rate changes "in the hands of technicians (p. 19)". Another goal is to allow the exchange rate to do more of the work in allowing a country to adjust to real shocks which, it is hoped, would reduce the need for countries to agree on interest rate changes.

---

[10] The following paragraphs draws heavily on Goldstein et. al. (1993), pp. 17-20.

The second suggestion published included in the IMF report is for target zones to feature wider bands. The aims are to discourage "one way bets," to allow the exchange rate a greater role in facilitating macroeconomic adjustment, and to provide some leeway for central banks to pursue interest rate policies tailored to domestic macroeconomic circumstances. The third suggestion discussed in the IMF report is to urge policymakers to build up the credibility of the target zone arrangement by acting to convey their preferences for exchange rate stability.

> The key is to build up credibility gradually by showing the markets that *whenever there is a potential conflict between the internal and external requirements for monetary policy, the* ***exchange rate is king***. Once the markets learn that countries are not schizophrenic about monetary policy and that exchange rate adjustments - when they occur - will be small, attacks will cease (emphasis added).
>
> (Goldstein, *et. al.* (1993), p.20)

The report goes on to discuss doubts that can be raised about this option, and in particular notes that building credibility in this way puts a great deal of weight on the coordination of interest rate changes in a world in which significant differences exist between the internal and external requirements for monetary policy. Another important issue, one that we shall pursue next, is whether or not it is even possible to build credibility for a wide band arrangement if countries, such as the US and Euroland, have independent central banks with inflation and output stability goals that the markets (rationally?) expect will take precedence over the exchange rate objective when these goals come into conflict.

We now outline the essential ingredients of five proposals that have recently been offered to limit the volatility of and to prevent misalignments in G3 exchange rates. We review proposals by Volcker (1995), McKinnon (1997), Williamson (1998) and Wolf (1999). For completeness, we begin with a discussion of the status quo.

The Post - Plaza Status Quo

McKinnon ((1997), p. 531) characterizes the post Plaza status quo arrangements among the G3 as follows. There appeared to be, for several years following the Louvre Accord in February 1987, a general inclination to set broad target zones for the dm-dollar and yen-dollar exchange rates in the range of plus - or - minus 10 to 12 percent of central parity. The central parities were not announced and the zonal boundaries remained 'flexible'. As disparities in economic fundamentals emerged, the central parities were adjusted (although it is not known how often since the adjustments were confidential). Even after the zones were abandoned (and there are those who would know who claim they were never really in force) there have continued to be occasional coordinated intervention operations with the aim of reversing short run trends (leaning against the wind) when a bilateral exchange rate has become sufficiently 'misaligned' so as to cause concern among officials. Often these coordinated interventions have not been conducted in secret, but have been done publicly. As a rule, the domestic monetary impact of these interventions has been sterilized immediately so as to leave short-term interest rates unchanged. Domestic monetary policies in each country have been devoted to achieving and maintaining a low - but positive - and stable rate of inflation.[11]

---

[11] This is not to say that these policies have always been successful. Japan, in particular, is beset with a fragile banking system and debt burden accumulated from a string of failed fiscal packages. Notwithstanding a parade of cuts in the short term interest rate by the BoJ to its current level 0.0002 per annum, monetary policy in Japan during the 1990s has failed to produce low and stable inflation but instead has contributed to persistent deflation in producer prices over the last several years. McKinnon and Ohno (1997) and Ito *et. al.* (1997) provide superb and detailed accounts of the challenges faced by the Bank of Japan during the 1990s. See also Krugman (1997).

None of the G3 is an explicit, public inflation targeter, but all three G3 central banks have in the past appeared to pursue what Clarida-Gali-Gertler (1998) dub 'soft hearted' inflation forecast targeting: a strategy in which short term interest rates are set with the aim of stabilizing both expected inflation as well as deviations of output from potential. It is important to note that no G3 central bank - including the pre-EMU Bundesbank - has pursued a price level targeting objective. That is, the evidence indicates that when inflation over (or under) shoots its implicit target, the price level is rebased for the purpose of targeting next year's inflation (Clarida-Gertler (1997)). To this point, the G3 have not appeared to coordinate their implicit inflation targets, although both the Fed and the ECB are thought to have a target for CPI inflation of 2 percent. There is more uncertainty about the aims of the newly independent Bank of Japan.

Here is the official G7 statement of the status quo:

> Exchange rate misalignments can heighten uncertainty in the global economy and can be detrimental to growth and trade. When exchange rates appear to move out of line with underlying fundamentals, close monitoring is necessary and coordinated responses may be required. We should continue our close cooperation in exchange markets with this foundation, taking into account the fact that
>
> - a clear and consistent articulation of a common G7 view can have a stabilizing influence [on exchange rates];
>
> - interventions can be effective in certain circumstances, especially when they reinforce changes in policies and/or underlying fundamentals that lead to changes in market expectations about future exchange rates;
>
> - the instrument of intervention must be used judiciously, given its implications for monetary policy and the amount that the authorities can mobilize relative to the size of the international capital markets. Nevertheless, these factors do not impede our joint ability to send a clear message to the markets, if and when appropriate;
>
> - interventions are more likely to be effective when they are concerted and reflect a common assessment.
>
> (June 1997 Report of G7 Finance Ministers as quoted in Cross (1998), p. 117)

The Volcker (1995) Proposal

In his Stamp Lecture presented at London University in 1995, Paul Volcker called for a set of G3 exchange rate arrangements that would "moderate and reverse exchange rate fluctuations among the key currencies before they become extreme, rather than being forced to respond defensively, after substantial risk to the world economy is already evident (Volcker (1995), p. 7)." The Volcker (1995) proposal contains the following provisions.

First, the participating countries (US, Japan, and Euroland), in consultation with the IMF, would reach a consensus on "broadly appropriate equilibrium values" for their *nominal bilateral* exchange rates. These would be the central parities of the new system. Actual nominal bilateral exchange rates would be allowed to fluctuate within a *target zone* of plus or minus 10 percent around these central parities. The proposal allows for an initial transition period during which fluctuations of up to plus or minus 15 percent would be permitted.

Second, the G3 countries would need to be prepared *jointly* to defend the target zones with intervention, and on a substantial scale if necessary. Inframarginal intervention would not be discouraged. Third, the proposal recognizes that, almost certainly, sterilized intervention would not be always in all circumstances be enough, even with wide bands, to maintain the integrity of the target zone. Thus, the Volcker (1995) proposal on page 7 calls for the G3 central banks to "modify their monetary policies in support of the exchange rate objective".

> Relatively wide and potentially movable exchange rate ranges are in a sense a compromise between the logical extremes of fixed and floating rates. The idea, for all its analytical appeal, does not lend itself to slogans or sound bites, nor to instinctive political or public support. The question will be asked, when the defense of the range is required, if 10 percent is all right, what about 11 or 12 or more? Is it really worth spending money in the exchange markets, modifying monetary policy, and taking care to balance the budget just to save another percentage point or two?

> The answer must be yes. What is at issue is not that last percent but whether governments will succeed in inducing the market itself to stabilize exchange rates. The success or failure in that effort is plainly dependent on the credibility of official intentions. But when that credibility is established, markets will work with governments, not against them, to maintain a sense of equilibrium.
>
> (Volcker (1995), p. 8)

While the proposal is clear that countries will, at least on occasion, need to modify their monetary policies in support of the exchange rate commitment, it is silent on the assignment of this responsibility between the weak and strong currency country. However, the proposal does call for the IMF to work with and, when necessary, to lead the G3 countries in determining a course of action for coordinating the changes in monetary and or fiscal policies necessary to support the exchange rate objective.[12]

The Volcker (1995) proposal on page 7 recognizes that "the extent to which countries are prepared to announce publicly the 'equilibrium ranges' and the frequency with which they might be modified are sensitive points", yet it seems clear that Volcker intends that the target zone for nominal bilateral G3 exchange rates to be publicly announced (perhaps after a transition period?). Moreover, Volcker argues that an appeal of the wide band target zone is that it facilitates making any necessary changes in the central parities in such a way that minimizes the possibilities of one way bets. It calls for such changes to be made, whenever possible, in amounts that are substantially smaller than the width of the band, so that the exchange rate need not move much, or perhaps at all, when such adjustments are made.

---

[12] In this regard, the IMF would play the role of resolving "commitment and coordination problems" as discussed in Eichengreen and Kenen (1994).

The Williamson Proposals

John Williamson has, more than anyone else, promoted the idea of implementing a target zone arrangement with wide bands around exchange rate levels that are consistent with medium term equilibrium in the current account. In a recent article (Williamson (1998)), he has outlined two proposals for setting up such a system: a proposal for a moving or "crawling" band system and another, closely related, proposal for a system of "monitoring bands".

According to Williamson (1998), a moving band involves a *central bank* undertaking a *public* obligation to maintain the exchange rate within a *wide*, *publicly* announced band (of plus or minus 10 percent or even 15 percent) around a parity that is periodically adjusted in small steps so as to keep the band in line with fundamentals. Williamson envisions three factors that would contribute to a systematic adjustment - or crawl - in the central parity. First, a country would certainly want to adjust the nominal exchange rate by the amount of the inflation differential with the other country or, in the case of a central parity expressed in terms of a basket, the other countries with which the home country is trying to stabilize the exchange rate. Second, a country might desire for its central parities to adjust gradually so as to allow for a real appreciation following a rise in aggregate demand or for a real depreciation following a fall in aggregate demand. Third, a country with rapid rise in productivity in the traded goods sector relative to the service sector might wish to offset the Balassa-Samuelson effect with a gradual nominal appreciation of the exchange rate.[13]

---

[13] Japan for many years experienced a trend real appreciation of the yen that has been attributed to the Balassa-Samuelson effect. This might suggest allowing for a gradual appreciation of the nominal yen exchange rate as part of a Williamson moving band system. However, much recent discussion, including the in depth studies of McKinnon and Ohno (1997) and Ito *et. al.* are quite critical of the syndrome of the 'ever higher yen' and the deflationary force that it they claim it has

To pin down the central parity, Williamson suggests deriving it from an estimate of the *real, effective* exchange rate that would be consistent with "macroeconomic balance" in the medium term. Macroeconomic balance, in turn, requires both internal balance (full employment) and external balance. External balance is defined as a current account deficit (or surplus) that is 'sustainable' and consistent with the medium term current account positions of other countries (Williamson and Henning (1994)). Although in practice many countries choose a central parity expressed as a bilateral nominal exchange rate, and much of the discussion about future G3 exchange rate arrangements presumes that such arrangements would be defined in terms of *bilateral* nominal G3 exchange rates, Williamson (1998) on page 8 points out that choosing a bilateral nominal exchange rate "has the advantage of simplicity, but it can also have a severe disadvantage for a country with a diversified trading pattern." For this reason, some countries, such as Chile, establish central parities with respect to baskets of currencies of their major trading partners. Indeed, in his earlier writings Williamson was explicit in recommending that the major countries "negotiate a set of mutually consistent target [zones] for their [nominal] effective exchange rates (Williamson (1986), p. 166)." We would tend to agree with Williamson (1986) that it makes sense to focus on effective exchange rates. After all, it is real effective exchange rates that, with a lag, influence trade flows and aggregate demand.[14] As we shall see

---

had. For this reason, McKinnon (1998) calls for a constant yen/dollar central parity, and Wolf (1999) calls for a floor on the yen/dollar rate, that would, in the face of the Balassa-Samuelson effect, require Japan to have faster trend CPI inflation than the US.

[14] However, any distortions in investment decisions or multinational outsourcing decisions that arise from 'misaligned' exchange rates are likely to be related to persistent, bilateral

below, the nominal trade-weighted dollar has, over the last 11 years, rarely - and then only briefly - departed from a band of plus or minus 10 percent of it 1988 level. This is also essentially true for the trade - weighted dm. By contrast, the trade - weighted yen has often, persistently, and substantially fluctuated by much more than plus or minus 10 percent of its 1988 level and, for reasons that are well known has closely mimicked the yen-dollar exchange rate.

The commitment implied by announcing the band is to intervene at the margins to prevent the rate from going outside the band. However, Williamson states that most countries that operate wide bands (and, we would add, the EMS countries that were operating with much narrower bands (Svensson (1992)) also make a practice of 'intervening' within the margins, typically to discourage the rate from approaching the edge of the band. This practice is in contrasts with the original theoretical target zone models that assumed away infra marginal interventions and thus implied that the exchange rate will spend *most of its time* near the edge of the band (Bertola and Caballero (1992)). Indeed, as Svensson (1994a) points out, target zone systems that have in practice succeeded in stabilizing exchange rates have done so by committing monetary policy (which sometimes appears under the label of non-sterilized intervention) to that objective, even *when the exchange rate is and so as to maintain it* inside the band. Williamson acknowledges that "intervention alone is unlikely to suffice to defend a band against strong market pressure. The next line of defense is usually *to change monetary policy*, tightening it when the problem is a too weak currency (emphasis added; Williamson (1988), p. 10)."

---

misalignments. The distortions would not tend to 'cancel out' even if the bilateral misalignments did on a trade weighted, multilateral basis.

Williamson (1998) is silent on the assignment of responsibility in the cases in which more than one currency threatens to breach its target zone.[15] However, in earlier work (Williamson (1986)) he endorsed "a regime of discretion, whereby the strong currency countries would act [to depreciate their currencies] if the participating countries judged that deflation posed a more serious global threat than inflation, and the weak currency countries would act [to appreciate their currencies] in the converse case (Williamson (1986), p. 167)."

Williamson (1998) provides three reasons in support of a wide band arrangement. The first reason is that the band needs to be wide because estimates of equilibrium exchange rates are imprecise. The second, as is discussed in Appendix 1, is that a wide band can, in theory, give scope for cyclical variations in monetary policy to influence short-term interest rates. However, even a fully credible wide band of plus or minus 10 percent allows for only modest differences in long term, say 10 year, yields. In fact, if the expectations hypothesis of the term structure is true, and the long rate is an arithmetic average of current and expected future short term interest rates, then if the bandwidth from central parity is $\chi = 0.10$ and it takes n years for rates to return to global levels, the maximum differential in the yields to maturity on a home and foreign 10 year bonds is always 100 basis points.[16] The third reason for a wide band cited by Williamson is "to

---

[15] Note that if the central parities are defined in terms of nominal effective exchange rates as called for by Williamson (1986), then it can easily be (and often has been) the case that the nominal effective dollar is comfortably inside a plus or minus 10 percent band while at the same time the nominal effective yen wanders far away from any such a band.

[16] In general, if central parity is to be restored in n years, then uncovered interest parity implies that the maximum cumulative interest differential is given by

$$(R^*_{t,1} - R_{t,1}) + (R^*_{t+1,1} - R_{t+1,1}) + \ldots + (R^*_{t+n-1,1} - R_{t+n-1,1}) = \chi.$$

From the expectations hypothesis of the term structure, for a maturity of L years we have

contain speculative pressures". According to this view, "the wider the band, the greater the possibility of a rebound in the rate and hence the possible cost of an unsuccessful attack, and the less is the possibility that speculators will catch the authorities in the no win situation of having to try and defend a disequilibrium rate (Williamson (1998), p. 9)."

Williamson (1998) also outlines a closely related proposal for a "monitoring" band. The key difference between the moving wide band just discussed and a monitoring band is that "the latter does not involve an obligation to defend the edge of the band. There is a presumption that the authorities will normally intervene to discourage the rate from straying far from the band, but they have *a whole extra degree of flexibility* in deciding the tactics that they will employ to achieve this. In particular, if they decide that market pressures are overwhelming, they can choose to allow the rate to take the strain even if this involves the rate going outside the band (Williamson (1998), p.7)." Williamson suggests that the width of a monitoring band should be narrower, say plus or minus 5 percent, than width chosen for a target zone with 'hard'margins, plus or minus 10 percent, since under the former there is no *obligation* to defend the band, but only a promise to *start* defending the band once the margin has been crossed. According to Williamson, the "advantage of [a monitoring band] is that it would avoid drawing a sharp line in the sand, whose breach gives a signal to the market that policy has failed and all bets are now off (Williamson (1998), p. 12)." Again, Williamson is silent on the assignment of responsibility in the cases in which more than one currency threatens to breach its monitoring zone.

$$R_{t,L} = (1/L)[R_{t,1} + \ldots + R_{t+n-1,1} + R^*_{t+n,1} + \ldots + R^*_{t+L-1,1}]$$
$$R^*_{t,L} = (1/L)[R^*_{t,1} + \ldots + R^*_{t+n-1,1} + R^*_{t+n,1} + \ldots + R^*_{t+L-1,1}]$$

Subtracting, we obtain for any $n \leq L$ and for any sequence of interest differentials that satisfy the expectation that central parity will be restored in n years,

$$R^*_{t,L} - R_{t,L} = \chi/L$$

Thus, if n = 3 years, zonal boundaries of 0.10 permit 1 year interest rates to fall 333 basis points

The McKinnon Proposal

Ronald McKinnon (1997) has recently proposed a "Common Monetary Standard for the 21st Century" which is among the most ambitious and fully articulated proposals for a new G3 exchange rate and monetary regime. This is so, notwithstanding the fact that it was published in 1997 before EMU came into existence. If anything, EMU makes it easier to interpret McKinnon's proposal. In presenting it, we will substitute 'ECB' for 'Bundesbank' and 'Euroland' for 'Germany'. McKinnon's proposal embodies the following elements. First, the G3 would *publicly* announce a target zone for the bilateral yen/dollar and euro/dollar exchange rates of plus or minus 5 percent around central parities that are consistent with purchasing power parity for traded manufactures. Second, the G3 would defend these parities through non (or only partially) sterilized intervention. The arrangement would be entirely symmetric. For example, if the yen weakened against the dollar, the Bank of Japan would be expected to tighten Japanese monetary policy by selling dollars and buying yen thus draining reserves from the Japanese banking system a raising short term yen interest rates. Likewise, the Federal reserve would be expected to ease US monetary policy by selling dollars and buying yen thus adding reserves to the US banking system and lowering short term dollar interest rates. McKinnon recommends, in light of the evidence presented in Dominguez and Frankel (1993), that these joint non-sterilized interventions be publicly announced so as to enhance their signaling value. Third, under the McKinnon proposal, the G3 central banks would jointly commit to a *price level target* for their respective producer price indexes. When combined with the commitment to a central parity determined by the initial PPP exchange rates between the US and Euroland, this would require

---

below those in the rest of the system for each of 3 years.

not only that the Fed, the ECB, and the BoJ have a *common inflation* target, but also that they *do not rebase* their price level targets following and over or undershooting of PPI inflation. Thus, for simplicity, if the agreed upon common PPI inflation target is 0, then in a year in which US PPI inflation was 2 percent, the Fed in the following year would be mandated to tighten monetary policy so as to achieve a 2 percent *deflation* in the US PPI. McKinnon does not anticipate that this price level target would come into conflict with the nominal exchange rate target, because in his reasoning, PPP for traded goods *is* the equilibrium exchange rate as long as the markets believe that central banks will target PPP.

McKinnon explicitly recognizes that his proposal, and - we would add - any target zone proposal, is vulnerable to speculative attack. In particular he states that, "[t]he waves of speculation that swept the EMS in September 1992 and again in August 1993 are indications of what might happen to CMS21 in a broader context ...When international capital markets are wide open, such speculative attacks - warranted or unwarranted - on particular currencies can't be ruled out (McKinnon (1997), p. 518)." McKinnon's proposal explicitly allows for an 'escape clause': a country is allowed to suspend, "temporarily", its promise to devote monetary policy to the objective of keeping its bilateral exchange rates within a band defined by PPP. However, McKinnon's 'restoration rule' calls for the wayward country to devote monetary policy to the goal of restoring the PPI price *level* that prevailed when the suspension occurred before re-entering the exchange rate arrangement *at the original parity.*

The Wolf Proposal

In a recent article in the **Financial Times**, Martin Wolf (1999) outlined a proposal (which draws in part on ideas presented McKinnon (1998) and Krugman (1998)) for Japan and Euroland

to set a unilaterally enforced ceiling on their respective bilateral nominal exchange rates with the dollar. That is, the Bank of Japan would commit to conduct monetary policy in such a way that the yen/dollar exchange rate not be allowed to strengthen beyond some level, say 110 yen to dollar (the level suggested by Wolf), but there would no additional commitment, as there would be with a target zone, for the BoJ to prevent the yen from weakening beyond some upper threshold for the yen/dollar exchange rate. Similarly, the ECB would commit to conduct monetary policy in such a way that the dollar/euro exchange rate not be allowed to strengthen beyond, say, 1.30 dollars per euro (a level at which the euro is roughly 10 percent stronger than the level prevailing upon its introduction) but, again, there would no additional commitment for the ECB to prevent the euro from weakening beyond some lower threshold for the dollar/euro exchange rate. Thus there would be no central parities to defend, and a currency depreciation in Japan or Euroland which coincided with slumping economy would not mandate a tightening of monetary policy to defend a band which did not exist.

Unlike other proposals in which the goal is to achieve exchange rate stability and to prevent currency misalignments while at the same time trying to provide some leeway for countries to pursue their own monetary policies, the idea behind the Wolf proposal is to *constrain* monetary policy in certain states of the world in which it is feared that, because of an effort on the part of the central bank to demonstrate its independence, monetary policy is contributing to deflation and stagnation. Note the asymmetry. According to Wolf,

> Neither the ECB nor the Bank of Japan is at all likely to start an inflationary spree. Thus, there seems little need for exchange rate floors. Ceilings on the appreciation of the yen and Euro against the dollar are a different matter... The Japanese case is clear. Convincing the Japanese public that there is a ceiling to the yen's rate against the dollar would be the single most effective way of eliminating the specter of deflation. . [With an exchange rate ceiling] Japanese inflation could not then be consistently below that in the US. This would make it

> easier for Japanese authorities to establish negative real rates of interest, if (and when) needed. What about Europe? ... The ECB's price stability objective may similarly prove compatible with stagnation ... Against such a background, a threat by the European finance ministers to impose a ceiling on euro's rate against the dollar seems at least a sensible tactic . . . The ECB will protest furiously. But the ministers can, it appears, override such objections - or agree to drop the proposal in return for an inflation target of, say, 2 percent.
>
> Wolf (1999)

5. CHALLENGES FACING EFFORTS TO LIMIT EXCHANGE RATE VOLATILITY

> So what is the dilemma of the international financial architecture? It is that, essentially because of the threat of currency speculation, you can't get everything you want. More specifically, insisting on having any one of the three desirable attributes in an international regime . . . adjustment, confidence, and liquidity . . . forces the abandonment of one of the others. As a result, there is a limited menu of possible regimes - and each item on that menu is unsatisfactory in some important way.
>
> (Krugman (1998), p.1)

An essential appeal of the proposals reviewed in Section 4 is derived from their promise to relax the constraint imposed by the 'impossible trinity' of international finance: the impossibility of the mutual coexistence of international capital mobility ('liquidity'), stable exchange rates ('confidence'), and independent national monetary policies ('adjustment'). How can these proposals promise to resolve the 'dilemma' refereed to by Krugman? By permitting - in theory - central banks to adjust short term interest rates in line with domestic macroeconomic conditions without resort to capital controls, and yet still maintain exchange rate stability (at least within the width of the bands) and perhaps also to benefit from the 'honeymoon bonus' predicted by the theoretical target zone models. As we review in Appendix 1, a credible target zone reduces the opportunities for one way bets against a central bank while still promising to rule out extreme exchange rate fluctuations. If speculators expect intervention and the commitment of monetary

policy to the exclusive goal *of* defending the zonal boundaries, the target zone delivers an added benefit by stabilizing intra band movements without the need to devote monetary policy to that goal when the exchange rate inside the band. That is, a credible wide band gives policymakers more scope for active monetary policy when it is most needed which, in turn enhances the initial credibility of the arrangement that was necessary for (limited) monetary autonomy in the first place. Thus, it is sometimes argued, a 'virtuous circle' may result. Or in the words of Obstfeld and Rogoff, "[t]arget zones would thus appear to provide a good practical balance between the seeming chaos of flexible rates and the straightjacket of fixed rates (Obstfeld and Rogoff (1995), p. 91)."[17]

Notwithstanding the potential promise of the proposals reviewed in Section 4, skeptics (including Obstfeld and Rogoff) argue that in practice, arrangements for limiting exchange rate volatility are not likely to live up to their promise of doing so without running up against the constraints of the impossible trinity. In particular, it is argued that, as long as countries put priority on maintaining unfettered access to the international capital market, and as long as the markets have some doubt that the "exchange rate [will be] king" whenever there is a potential conflict between the internal and external requirements for monetary policy, then any agreement to limit exchange rate volatility by adopting target zones, even those with wide bands, will be not be durable and "may be little more than a placebo, differing in principle from a freely floating exchange rate only to the extent that it effects market psychology (Obstfeld and Rogoff (1995), p. 92)."

[17] This paragraph draws heavily on the discussion in Obstfeld and Rogoff (1995) p. 79.

The literature suggests a number of potential challenges to the durability of wide a band target zone. These include: the conflicts that can arise between domestic and international objectives; the conflicts that can arise between countries over the assignment of responsibility for adjusting monetary policy to maintain the target zone; the possibility of speculative attacks that exploit the difficulty counties face in making credible commitments to enforce target zones given competing domestic and international objectives; the difficulties in conducting monetary policy when targeting an asset price such as an exchange rate; the uncertainties surrounding the estimate of the equilibrium exchange rate that is used to define the central parity around which the bands are set; the particular challenges that Japan faces in credibly committing to exchange rate stability in the context ongoing deflation, a yawning output gap, huge budget deficits, and with a newly independent central bank seeking to establish its distance from the Ministry of Finance; the limited degree of latitude that may in practice be available for G3 central banks to pursue independent monetary policies if they wish to reduce exchange rate volatility. We discuss each of these challenges in turn.

The Potential Conflict between Domestic and International Objectives

A virtue of the proposals is that they explicitly recognize the conflicts that can arise between domestic and international objectives. As Obstfeld and Rogoff (1995) emphasize, target zone systems are not in practice fragile because it is *infeasible* for central banks to tighten monetary policy sufficiently to enforce them; rather, they are fragile because history suggests that central bankers (and the executives who appoint them and the legislators who pass the laws that define their mandates) are *unwilling* "to cling to an exchange rate target without regard to what is happening in the rest of the economy (Obstfeld and Rogoff (1995), p. 79)."

Depending on the stage of the business cycle and the constellation of shocks that have hit the economy, the exchange rate commitment may not necessarily - or even most of the time - be in conflict with the other goals of monetary policy. As we discuss shortly, this appears to have been the case in the US in 1995 when the (trade weighted) dollar was very weak, in Germany in 1995-1996 when the (trade weighted) mark was very strong, and in the US in 1998 when the (trade weighted) dollar was very strong. However, history is full of examples in which domestic objectives and the exchange rate target do come into conflict. For example, as we review in Appendix 2, conflicts between domestic stabilization objectives and the commitment to the (narrow band) EMS were the proximate cause of the 1992 crisis (Clarida-Gal-Gertler (1998).

Conflicts over the Responsibility for Adjusting Monetary Policy

All the proposals recognize that, under certain circumstances, the zonal boundaries will come under pressure, pressure that derives from the weakness of one currency relative to at least one other currency. For proposals that define central parities by bilateral nominal exchange rates (say relative to the dollar), it is true that when one currency is weak and at the edge of the band, at least one other one is strong and at the other edge of the band. For arrangements that define central parities in terms of nominal effective exchange rates, this will not always be the case, but it will sometimes be the case. It would then be necessary for the countries involved to agree on an *assignment* of responsibility for changing national monetary policies so as to maintain the integrity of the band. The McKinnon (1997) proposal is explicit about the assignment that would be required, calling for *symmetric* adjustment in the weak currency country (which would need to tighten monetary policy) and the strong currency country (which would need to ease). The Wolf (1999) proposal would require that Japan or Germany ease unilaterally if its currency

strengthened sufficiently against the dollar. The other proposals are not as explicit about the assignment of the burden of adjustment. History indicates that, in practice, weak currency countries often seek to pressure strong currency countries to ease monetary policy, but that these efforts are most often rebuffed, usually because such a change in policy would come into conflict with domestic policy objectives in the strong currency country. There is a broader point to consider. Since end of the gold standard, there is not a single example of a fixed exchange rate or target zone system that has been maintained with symmetric adjustments of national monetary policies and open capital accounts.

Consider the following thought experiment. Suppose that in December 1998, the G3, in anticipation of the successful launch of the euro, had agreed to central parities of 1.18 dollars and 115 yen (the levels prevailing at the time) and to bands of plus or minus 10 percent. Would the ECB now, after its recent 50 basis point cut in interest rates, be willing to tighten (and would the Eurofin Council be happy if it did) if the euro drops to $1.05? Would the BoJ now be willing to tighten (and would the MoF be happy if it did) if the yen moves above 125? Would the Fed be willing to ease under either circumstance?

Speculative Attacks Driven by Market Doubts about the Commitment to Defend the Zone

During the ERM crisis, short term interest rates in Sweden were raised to 500 percent (on an annualized basis) and short term interest rates in Italy were estimated to be 1000 basis points higher than warranted by domestic macroeconomic conditions (Clarida-Gali-Gertler (1998); Appendix 2). In neither case was this enough and both countries allowed their currencies to float. A promise to ignore the consequences of such high interest rates on the banking system, investment, and employment may well not be credible. If the markets attach some positive

probability (possibly less than one) that the target zone is not credible, even a wide band target zone can be vulnerable to speculative attack. In particular, Obstfeld and Rogoff (1995) argue that while "a wide band may postpone the day of reckoning on which the exchange rate comes under attack, it does not postpone it forever. When the zone's boundaries are reached, maintaining them in the face of speculative pressure presents all the problems of a fixed exchange rate."[18]

Why might promises by the G3 governments to maintain exchange rates within wide band target zones not be credible? For the reasons we have already mentioned and for some others we shall discuss below. The markets recognize that, at some point in the future, domestic and exchange rate objectives may come into conflict, and perhaps foresee that there may be squabbles among the G3 over the assignment of responsibility to change monetary policy. In the absence of a track record in which the exchange rate has been "king", the markets may well expect past behavior to continue should future conflicts arise. Indeed, the IMF Capital Markets Report quoted above explicitly acknowledges that this is the likely outcome. Under these plausible circumstances, and by the logic of the 'second generation' speculative attack models reviewed in Appendix 2, an attack may take place well before the fundamentals themselves would even tempt a country to abandon its exchange rate commitment.

There is a real possibility of a 'vicious circle'. Suppose a wide band is announced, but that it is not initially credible for the reasons discussed above. Now let fundamentals - not

[18] The quote is from Obstfeld and Rogoff (1995), p. 91; the rest of the paragraph draws on their discussion on p. 80.

speculators - push the exchange rate to weak the edge of the band. Because the band is not credible, interest rates rise in expectation of further depreciation and perhaps also because of a squabble between policymakers over who tightens monetary policy or who eases. Suppose, plausibly, that the strong currency country can refuse to ease. If the economy (or the banking system) in the weak currency country is fragile enough, the rise in interest rates may convince the central bank to abandon the target zone. Now suppose a wide band is announced, but that it is initially credible. Again, let fundamentals - not speculators - push the exchange rate to the weak edge of the band. Because the band is credible, interest rates *fall* as the currency weakens, in expectation of an appreciation of the exchange rate back to the assumed credible central parity. Moreover, this fall in interest rates as the economy weakens tends to re-affirm the initial market view that the regime is credible.

The previous example may be taken to imply that either a vicious or a virtuous circle is possible. However, there is actually a great deal of empirical evidence on this matter which is well summarized in Svensson (1992) and Bertola and Caballero (1992) and incorporated into the theory of target zones by Bertola and Caballero (1992). The evidence suggests that in target zone systems interest rates tend to *rise* not fall as currencies weaken toward the edge of the band. A 'vicious circle' cannot be ruled out.

Conducting Monetary Policy when Targeting a (Forward Looking) Exchange Rate

Froot and Obstfeld (1991) make an important, but insufficiently appreciated, point about the conduct of monetary policy in a credible target zone system that is relevant to the current topic. They show that, *even if a target zone is credible*, the equilibrium exchange rate is not uniquely defined by a central bank promise to 'do whatever it takes' to preserve the zonal

boundaries. In fact they show that, if the central bank can only commit to 'do whatever it takes' then each point in time, there are at least *three* equilibrium exchange rates: an exchange rate consistent with the exogenous fundamentals as is derived in the basic model (reviewed in Appendix 1), an exchange rate that jumps to the weak edge of the band, and an exchange rate that jumps to the strong edge of the band. How can a *credible* target zone not uniquely define the exchange rate? Simply because doing 'whatever it takes' obligates the central bank to ratify (via endogenous jumps in the money supply) self-fulfilling shifts in market expectation. Multiple equilibria under a credible target zone can be ruled out, but this requires that the central bank specify a monetary policy rule that depends only on exogenous 'state' variables. This is not easy to do in theory (most of the theoretical literature doesn't even try). It certainly cannot be any easier to communicate in practice.

Uncertainty Associated with Estimating the Equilibrium Exchange Rate

All of the proposals (save Wolf (1999)) require an estimate of equilibrium exchange rates to determine the initial central parities and to indicate subsequent adjustments in these parities justified by the fundamentals. McKinnon (1997) is firmly of the view that the only robust basis for this estimate is PPP for tradable goods. Williamson and Henning (1994) and Williamson (1998) are equally firm in their view that equilibrium nominal exchange rates are those that are consistent with real exchange rates that achieve equilibrium current accounts in the medium run. Thus, the uncertainty associated with estimating the equilibrium exchange rate is not just due to *parameter* uncertainty, it is also (perhaps primarily) due to *model* uncertainty. The fundamental equilibrium exchange rates (FEERs) calculated by the IMF and others require estimates of a structural current account model as well as assumptions about domestic and world saving,

investment, and output trends.[19] PPP exchange rates are much easier to calculate, but still require taking a stand on how to resolve the 'base year' problem. The key point is that, given the model uncertainty involved, it is hard, if not impossible to know how large are the standard errors associated with an estimate of the equilibrium exchange rate. Table 2 presents some evidence on the significance of model uncertainty.

Is There a G3 Exchange Rate Problem or a Japan Problem?

Figure 8 presents the post - Louvre history of the nominal trade weighted dollar, the nominal trade weighted dm, and the nominal trade weighted yen. The series are the IMF's nominal effective exchange rates. Also included in each panel are plus and minus 10 percent bands around the *initial* 1988 level of the nominal exchange rate. What is apparent is that a lot of variability that is evident in bilateral nominal exchange rates is not present in the nominal trade weighted dollar or the nominal trade weighted dm.[20] The nominal trade-weighted dollar has, since 1988, rarely (in 1995 and 1998 and then only briefly) departed from a band of plus or minus 10 percent of its 1988:1 level. This is also essentially true for the trade - weighted dm which, following unification, did in late 1994 strengthen for some time to more than 10 percent of its 1998 level. Moreover, these three episodes don't appear to be difficult to understand. Let us take each in turn. In 1994 and 1995, the Fed was concerned that US inflation might rise and

[19] See Cooper (1994) for a perceptive discussion of challenges involved in basing exchange rate policy on FEERs.

[20] This point is emphasized in the February 1999 **Economic Report of The President**. See also the **Financial Times,** February 19, 1999 p. 10, and Dornbusch (1999).

pushed up US interest rates in a preemptive strike (Mishkin (1999); Clarida-Gali-Gertler (1999)). It does not strike us a far-fetched to think that in such a setting the foreign exchange market would also be concerned with US inflation and that the trade weighted dollar would be weakening. In Germany, by 1995 and 1996, the Bundesbank was convinced that its earlier tightening in 1990-1992 had prevented a ratcheting up of inflation, in part because of its effects on the exchange rate. Faced with a weak economy and strong exchange rate, the Bundesbank was easing policy though this 1995-1996 period of the strong mark. Finally, in the US in 1998, the economy was booming, inflation was subdued, and there was a safe haven flight to dollar assets. In this environment, it is not a puzzle that the trade weighted dollar strengthened.

By contrast, the trade - weighted yen has often, persistently, and substantially fluctuated by much more than plus or minus 10 percent of its 1988 level and has closely mimicked the yen-dollar exchange rate. The reason for this is that Japan does a lot of trade not only with the US but also with other countries in Asia that tacitly, if not openly, pegged to the dollar until the onset of the Asia crisis. Currently, Japan is wallowing in deflation and is in the midst of its third recession of the past dozen years. Output is by some measure more than 10 percent below capacity. Nominal interest rates are 0. The Bank of Japan, newly independent, has not articulated a clear monetary policy strategy and appears unwilling or unable - because of the banking crisis - to buy government bonds in substantial enough quantities to reflate the economy and bring inflation up to US and Euroland rates. Moreover, the sheer magnitude of the debt that Japanese government has issued - and likely will continue to issue - is apparently generating significant uncertainty in the global capital markets. Until Japan's banking crisis, deflation, recession, and debt hangover problems are resolved, it the markets may well doubt Japan's

ability to credibly commit to limit a weakening of the yen, in part because of a perception that such a commitment come into conflict with any belated BoJ effort to reflate the economy.

How Much Latitude for National Monetary Policies?

The theory of target zones is clear: if the zone is credible, there can be, especially with wide bands, a great deal of latitude for countries to pursue monetary policies tailored to domestic macroeconomic conditions. Moreover, this latitude does not, under a credible commitment to defend the zonal boundaries, come at the expense of the 'honeymoon bonus' that stabilizes intraband exchange rate volatility relative to the equilibrium that would prevail in the absence of the zone. However, as is discussed in Appendix 1, the theory predicts that the benefit from the honeymoon bonus, even under a credible target zone, is diminished as the width of the band widens (holding constant the extrinsic source of exchange rate volatility). Thus, even if a wide band is credible, the band itself may do little to diminish intraband exchange rate volatility. As Svensson (1994a) argues, it appears that the reduction in volatility that is observed in actual target zone arrangements derives, in a significant way, from leaning against the wind monetary policy that seeks to keep the exchange rate near the central parity, and not from the 'honeymoon bonus'.

Suppose instead, for the reasons outlined above, that initially the target zone is not credible. In this instance, the markets expect the same monetary policies that prevailed before the announcement to continue after the announcement of the zone. Suppose that this expectation is rational so that these policies do continue until the exchange rate reaches a zonal boundary. It is only at this date, and not before, that the markets *can* learn anything about the credibility of the target zone commitment. Whether or not they *do* learn anything on this date is another matter.

As we have just seen, depending on the nature of the shocks hitting the G3 countries, the monetary policy that is called for to meet domestic objectives such as maintaining low inflation and output at potential may also be consistent with reversing an apparent 'misalignment' of the exchange rate relative to the fundamentals. If this is the case as the exchange rate approaches the zonal boundary, the markets will learn nothing about the commitment to the target zone, and no 'honeymoon bonus' can be earned. Now at some point, the zonal boundaries will be approached and defending them will require that monetary policy be devoted to this purpose to the exclusion of domestic objectives. It is at this date, and only at this date, that the markets will learn something about the target zone commitment. It is at this time that the markets can learn if 'the exchange rate is king'. If it is, a honeymoon bonus may begin to be realized; but even after this initial observation, it may take not just one, but several, such observations (separated perhaps by several years) before the zone has full credibility. Thus, building up credibility of a wide band target zone may take longer - much longer - than might be expected, while the benefits derived from a wide band may be modest.

To appreciate why it might be hard for the markets to disentangle 'status quo' monetary policy from a commitment to a wide band target zone, consider the results of Clarida-Gali-Gertler (1998a). They found that the post-1979 monetary policies of the G3 are well described by a parsimonious forward-looking Taylor Rule of the form:

$$R_t = rr + \pi^* + \beta(\pi^e_{t-1,n} - \pi^*) + \gamma y_{t-1}$$

where rr is the equilibrium real interest rate, π^* is the (implicit) inflation target, π^e is expected inflation over the next n periods, and y_{t-1} is the output gap. For example, Clarida-Gali-Gertler (1998b) estimate that $\beta = 2.15$ and $\gamma = 0.93$ using post - 1979 quarterly US data. The CGG framework allows for the central bank to 'look at everything', but puts some structure on this old

idea by requiring that the weights that the central bank places on the individual pieces of information depend upon the influence of this information on the central bank's inflation forecast. Thus, let $Z_{t-1} = [\, z_{t-1},\ \varepsilon_{t-1}\,]$ denote an m+1 element vector of lagged information that the central bank uses to forecast inflation with ε_{t-1} denoting the rate of depreciation the exchange rate (home currency price of foreign exchange) relative to its equilibrium level. Suppose that the inflation forecast is a linear function of Zt_{-1}

$$\pi^{e}_{t-1,\,n} - \pi^{*} = \alpha z_{t-1} + \theta\varepsilon_{t-1}$$

The CGG forward looking Taylor Rule can, after substitution, be written as

$$R_t = rr + \pi^{*} + \beta\theta\varepsilon_{t-1} + \beta\alpha z_{t-1} + \gamma y_{t-1}$$

Now what sort of relationship between the exchange rate and the short-term interest rate would be expected to result from such a status quo monetary policy? This depends on the sign of θ. Under plausible circumstances, we expect θ to be positive, and there is support for this in the data. This means that when a currency depreciates (relative to, say, PPP), expected inflation tends to rise. The important implication of all this is that, even though a central bank may not target the exchange rate, the bank's desire to stabilize the inflation forecast will lead it to raise nominal and real interest rates when the currency is weakening, and to lower nominal and real interest rates when the currency is strengthening. This reaction, in turn, will tend to appreciate the exchange rate when it is weak and to weaken the exchange rate when it is strong (relative to fundamentals). Thus, in practice, a monetary policy aimed at achieving only domestic objectives may also serve to stabilize the exchange rate. Ironically, this means that it may be more difficult for a central bank, which has in the past pursued such a policy to credibly convey to the financial markets that it committed to enforcing a wide band target zone system.

6. CONCLUDING REMARKS

It seems clear that under present circumstances, were a G3 target zone agreement to be put in place, it would initially not be credible. To assume otherwise - and, let us emphasize, the authors of the proposals outlined above do *not* make this assumption - would be folly in light of the historical record and the challenges that could be faced by any such arrangement. The EMS experience reviewed in Appendix 2 has convinced many serious observers that speculative attacks, even on countries that before the attack appeared to be credibly committed to a target zone, can overwhelm the resolve of governments to make the exchange rate king when there is a conflict between domestic and international objectives.

All of this does not mean, however, that over time, a G3 target zone might not become credible, if in fact the G3 finance ministers and central bankers were committed to it (which at this time they do not appear to be, at least in the US and at the ECB). The IMF report drafted soon after the EMS argued that "to build up credibility gradually by showing the markets that whenever there is a potential conflict between the internal and external requirements for monetary policy, the exchange rate is king." There are two aspects of this assertion - and we agree that it is a necessary, but perhaps not a sufficient condition, for credibility - that are worth special mention. First, building credibility would take time, perhaps a lot of time. Second, the only times that credibility can be 'built up' are those times when there is a conflict between 'internal and external' requirements for monetary policy. The markets learn nothing about the commitment to a target zone arrangement when there is no conflict between the monetary policy

consistent with domestic objectives and the policy need to keep the exchange rate inside the band.[21]

The advocates of the proposals for change have made their assessment of the global costs of exchange rate volatility and of (their estimates of) exchange rate misalignments, especially as these apply to the emerging economies through their linkages to the global capital markets. In their view, the status quo is unacceptable, and a sustained effort to limit G3 exchange rate fluctuations would deliver benefits to the *world* economy that would outweigh the value that they, the advocates, place on any loss of monetary autonomy in the G3 that would be required to maintain such a system. The skeptics do not necessarily dispute the benefits to the world economy, but on balance, make a positive, not a normative, judgment that the sorts of proposals that are on the table will not, in practice, get around Krugman's 'dilemma of the global financial architecture'.

[21] See Kenen (1998) for a discussion of the issues involved with setting exchange rate policy in the EMU; Cross (1998) for the US; and Ito, *et. al.* (1997) for Japan.

APPENDIX 1

The proposals that are reviewed in this paper share in common a call on the G3 countries to adopt some form of a target zone system. In this appendix, we review the theoretical case for a target zone. The theoretical case for a target zone was developed originally by Krugman (1991); most of the (vast) body of literature on the subject takes off from Krugman's work and so his is the model we shall review.[22] The original Krugman model and virtually all its successors start with the assumption that the exchange rate is a forward looking asset price that depends upon current fundamentals and as well as expectations of future exchange rates. Holding constant *current* fundamentals, an exchange rate that is expected to appreciate (depreciate) in the future will also tend to appreciate (depreciate) somewhat today. It is assumed that the (log) fundamentals are of two types: one that is exogenous to the central bank (denoted v_t) and one that is under the control of the central bank (denoted m_t). The (log) exchange rate is determined according to

$$e_t = m_t + v_t + \alpha E\Delta e_{t+1}.$$

If expectations are rational and bubbles are assumed away[23], the exchange rate is determined according to a present value relation by the current level and expected future time path of the *composite fundamental* $k_t = m_t + v_t$.[24] Thus by controlling the *expected future time path* of the money supply, and in particular by allowing the bank to 'lean against the wind' in response to exogenous shocks to v_t the central bank can, if it chooses, target the exchange rate. Krugman

---

[22] Our discussion follows closely Svensson's (1992) survey of the subject.
[23] See Frankel (1985) for a discussion of bubbles in the foreign exchange market.
[24] The solution is $e_t = (1+\alpha)^{-1} \Sigma_{j=0,\infty} (\alpha/(1+\alpha))^j Ek_{t+j}$.

made a very particular assumption about the operation of his target zone: as long as the exchange rate is inside the band, the money supply is constant; the only time that the money supply changes is when the exchange rate is at the edge of the band, and then only by enough to keep it at the edge in response to a shock to v that would otherwise push it outside the band. Krugman also assumed that increments to v_t are independent so that the level of v_t is random walk. The solution to the target zone exchange model under these assumptions is shown in Figure 9. The composite fundamental $k_t = m_t + v_t$ is measured along the horizontal axis and the exchange rate along the vertical axis. The free-float exchange rate is just the 45 degree line (note that this also the exchange rate that prevails with static expectations $E\Delta e_{t+1} = 0$ under a target zone).

The main result of the theoretical target zone models is that, under a target zone, the elasticity of the exchange rate with respect to the fundamental - the slope of the S curve in Figure 9 - is less than one (and in fact approaches zero as the exchange rate approaches the edges of the band). Thus, the exchange rate is less volatile than is the fundamental. By contrast, under a free float, the exchange rate and the fundamental are equally volatile. This is the famous 'honeymoon' effect: even in the absence of 'leaning against the wind' monetary policy when the exchange rate is inside the band, the expectation that *in the future* the central bank will lean against the wind to prevent the exchange rate from drifting outside the band will stabilize the exchange rate *in the present*. Or as Svensson (1992) puts is: "[A] target zone means stabilizing the fundamentals... but the exchange rate stabilizes even more - some exchange rate stability is for free (Svensson (1992), p. 124)".

Krugman and Miller (1993) make a different theoretical case for a target zone. They show that if "stop-loss" trading strategies are important in the foreign exchange market, then the exchange rate can be 'excessively' volatile (and more volatile than the fundamentals). This is

because rational speculators that remain after the stop loss traders exit anticipate their exit in advance and bid up the price of foreign exchange 'excessively' as the fundamentals weaken. In such a world, a target zone in which the central bank stands ready to sell the foreign currency that is in excess demand when the stop-loss traders exit can stabilize expectations and eliminate the excess volatility of the exchange rate before the stop-loss traders exit.

An advantage that a credible target zone has compared with a fixed exchange rate is that the target zone allows, in theory, for a degree of monetary independence in a world of unfettered capital mobility (Svennson (1994a)).[25] Indeed, as we argue in Section 5, a great deal of the appeal of the proposals on the table for limiting exchange rate flexibility is derived from their promise to relax the constraint imposed by the 'impossible trinity' of international finance: international capital mobility, stable exchange rates, and independent national monetary policies. How can a credible target zone promise to resolve this conflict? By permitting (in theory) the central bank in a country to adjust, within limits, *short term* interest rates in that country based upon domestic macroeconomic conditions without resorting to capital controls.

To see how this works in theory let the log of the exchange rate be written as $e_t = c_t + x_t$ where c_t is the central parity and x_t is the deviation from central parity. Then uncovered interest parity implies

$$R_{t,n} = R^*_{t,n} + E_t [c_{t+n} - c_t]/n + E_t [x_{t+n} - x_t]/n.$$

Consider first the case of a fully credible target zone in which $E_t [c_{t+n} - c_t] = 0$. Suppose now that the country is hit with a fall in demand for exports that pushes it into recession. Under a target zone, the central bank - by engineering a depreciation of the currency - can drive down the

---

[25] The following discussion follows Svensson (1994), pp. 159-163.

yield to maturity on an n year bond by a maximum of χ/n percent points where χ is the width of the target zone (relative to central parity) and n is the number of years the markets expect that interest rates will stay below world levels for the economy to recover from recession and for the central parity to be restored. If n is equal to 3 and χ is equal to 0.10 - a value that is often suggested as part of the proposals to be discussed below - then the yield on a one year bond can be driven down roughly 3.33 percentage points (333 basis points) per year for each of three years relative to the corresponding yield in the rest of the world. Of course, in practice the instrument of monetary policy is typically a short term interest rate while in many G3 countries it is a longer term interest rate (say on a ten year bond) that influences spending decisions.

Consider next the case of a less than fully credible target zone in which expectations of realignment fluctuate. In the simple - and extreme case - in which these fluctuations are entirely random and independent of domestic monetary policy and the real economy, monetary policy still retains a degree of autonomy. A fall in export demand can still be met with a cut in domestic short-term interest rates and an exchange rate depreciation to the edge of the band. Another source of contraction in domestic demand is introduced with a shift in devaluation expectations. A rise in $E_t c_{t+n}$ puts upward pressure on domestic interest rates (short and long) which, for empirically plausible central bank reaction functions (such as those estimated by Clarida-Gali-Gertler (1998)), will tend to encourage the central bank to lean against the wind, and stem the rise in domestic interest rates by allowing the exchange rate to depreciate towards (or to) the edge of the band. What happens if both of these events - a contraction in aggregate demand and a (chance) rise in expected devaluation - occur at the same time? Then monetary autonomy can be significantly compromised or indeed eliminated.

Consider next the more realistic case in which fluctuations in expected devaluation depend, at least in part, on the stance of domestic monetary policy and the state of the real economy. To focus attention, consider the hypothesis studied by Svensson (1994)

$$E_t [c_{t+n} - c_t] = \gamma x_t$$

According to this specification, the central bank faces a tradeoff. If it meets a fall in aggregate demand with a temporary depreciation of the exchange rate to the edge of the band, this effort to lower the domestic interest rate will be frustrated by the upward revision in devaluation expectations it causes. In particular, we have $R_{t,n} = R^*_{t,n} + E_t [x_{t+n} - (1 - \gamma)x_t]/n$. Consider, as does Svensson (1994) the case in which $\gamma = 0.7$. Continuing with the earlier example with n equal to 3 and χ equal to 0.10, when $\gamma = 0.7$, the yield on a one year bond can be driven down a just 1 percentage point (100 basis points) per year for each of three years relative to the corresponding yield in the rest of the world, and the ten year yield can be driven down only 30 basis points.

APPENDIX 2

In this appendix, we review how the most well known target zone arrangement, the European Monetary System, operated in practice during the 1990s. The collapse of the original, 'narrow band', EMS in 1992-1993 made even many of the original EMS supporters (see Svensson (1994b)) and certainly most of the skeptics (see Obstfeld and Rogoff (1995)) doubtful about the sustainability in practice of a target zone system in a world of international capital mobility and divergent macroeconomic cycles (due perhaps in part, but not entirely to, to asymmetric shocks). Some proponents of the new 'wide band' proposals for limiting exchange rate volatility (proposals that we discuss in detail in Section 4) sometimes argue that there is little to learn from the Bundesbank centered, narrow band EMS because the new proposals are

designed to avoid its fundamentals flaws. These design changes include wider bands and more frequent and systematic adjustment of central parities. The wider bands, which are a feature of all the proposals (if we think of the Wolf proposal as featuring an infinitely wide band with a finite lower support on the euro/dollar and yen/dollar exchange rates), are designed to provide greater leeway for countries to pursue monetary policies that are tailored to local circumstances. The adjustable central parities, which are a feature of the Volcker and Williamson proposals but not of the McKinnon proposal, are designed to prevent countries from getting into a position of having to defend 'disequilibrium' exchange rates.

While we appreciate the motivation for the design changes built in to the new proposals, we argue that there is a great deal to be learned from the EMS experience of the 1990s that is relevant for informing our views about future G3 exchange rate arrangements. The ERM experience of the 1990s, both under the original narrow bands that prevailed until August 1993 and under the wide (plus or minus 15 percent bands) that prevailed afterward, can shed light on the two issues that are central to the present discussion: the degree of monetary autonomy that is available *in practice* in a target zone system and the extent to which otherwise equilibrium exchange rates can become disequilibrium exchange rates as a result of a self-fulfilling speculative run.

Monetary Policy Autonomy under the ERM: 1990-1993

As discussed in Appendix 1, an advantage that a credible target zone has compared with a fixed exchange rate is that the target zone allows, *in theory*, for a degree of monetary policy independence in a world of unfettered capital mobility. Under a credible target zone, one in which re-alignment risk is either zero or fluctuates modestly but in a way that is unrelated to the

interest differential, a central bank facing a recession at home can, for example, drive down short term interest rates relative to those prevailing in the rest of the world and yet still maintain exchange rate fluctuations within the target zone bands. Was this leeway to conduct monetary policy attuned to domestic conditions actually available to the countries participating in the ERM? There are reasons to think not. Consider for example, the following quote from the Bank of England Quarterly Bulletin published in November 1992 just weeks after the September 1992 ERM crisis

> Against a backdrop of sluggish activity and stable or falling inflation, a number of countries in Europe have experienced a growing conflict between the monetary policy required to maintain the exchange rate, and the policy that would be appropriate given domestic cyclical conditions. In a number of cases, nominal interest rates might have been lower but for the ERM. This was particularly the case for those countries . . . which were . . . in a different cyclical position.

The empirical findings of Clarida-Gali-Gertler (1998) highlight the extent to which the ERM commitments in practice precluded the member central banks from tailoring in any way their monetary polices to domestic cyclical conditions. First, they simply document the well-known fact that, in the months leading up to the September 1992 crisis, there was *never* a month in which the average short term interest rate in Britain, France, or Italy was driven below the rate prevailing in Germany. Much of the literature has focused instead on the fact these countries' interest differentials with Germany were declining during this period leading up to the crisis (except in Italy where the lira-dm interest differentials began to rise steeply in August 1992). While this observation is certainly true, the fact remains that these interest differentials were always positive. Second, CGG document the equally well-known fact that certainly Britain and Italy, and to a lesser extent France were in "different cyclical positions" during the months

leading up to the crisis than was Germany. Both Britain and Italy had larger measured output gaps than Germany's (while France's measured output gap was roughly comparable). Britain's inflation had, by mid 1992, converged to Germany's, while inflation in France was somewhat lower and inflation in Italy was somewhat higher. Combining these facts, we conclude that, during an episode in which monetary policy, untethered by commitments to the ERM, would have been pushing interest rates in Italy, France, and Britain *below* those in prevailing in Germany, the ERM commitments (and in particular the policies need to counter the re-alignment expectations of speculators) forced interest rates in these countries to remain *above* those in prevailing in Germany. Thus, under the narrow band ERM, there was in practice *no* leeway for countries other than Germany to conduct monetary policies that were in any way attuned to domestic cyclical positions. If any further evidence is required, we also note that in the days and weeks following the exit of sterling and the lira from the ERM in September 1992, short term interest rates in Britain and Italy fell sharply.

CGG attempt to quantify the stresses that emerged in France, Italy, and Britain in the months leading up to the ERM crisis. They define $stress_t^{Britain}$ as the difference between the short-term interest rate that prevailed in Britain in month t and the short-term interest rate that would have prevailed had Britain not been committed to the ERM. This *but for* interest rate is calculated as the rate consistent with a Taylor Rule using data on inflation and the estimated output gap for Britain.[26] Their findings are displayed in the top panels of Figures 10, 11, and 12. There are several things to note about the information contained in these figures. First, in all three countries, the stresses that emerged in the months leading up to the crisis are estimated to

have been substantial, roughly 300 basis points in Britain, 500 basis points in France, and 1000 basis points in Italy. That is, the CGG stress index indicates that short-term interest rates in Britain at the time of the September 1992 crisis were 300 basis points higher than they would have been (and than they were just several weeks later) without the commitment to remain in the ERM. Second, these magnitude of each these stress indicators exceeds the leeway for monetary policy under the narrow bands of the ERM that would have been available even in the absence of re-alignment risk. Third, it is nonetheless still the case that none of these central banks was able or willing to push its interest rates below those in Germany even though it is clear that domestic macroeconomic conditions warranted such a move.[27] Fourth, the sources of the stresses that emerged differed from country to country. In Britain, the most important source was the divergence between German and British business cycles (as shown in the fourth panel of Figure 10); in Italy, is was a sudden adverse shift in market expectations that the lira could remain in the ERM (as shown in the fifth panel of Figure 12); in France, it was a shift in market sentiment as well as a tightening of German monetary policy (as shown in panels two and five in Figure 11).

The Wide Band ERM: 1993 - 1998

After August 1993, those countries remaining in the ERM (except the Netherlands) widened the width of the target zone from plus or minus 2.5 percent to plus or minus 15 percent.

---

[26] CGG's (1988) forward-looking Taylor rule takes the form $R_t = rr + \pi^* + \beta(\pi^e_{t,n} - \pi^*) + \gamma y_t$ where rr is the equilibrium real interest rate, π^* is the (implicit) inflation target, π^e is expected inflation, and y_t is the output gap.

[27] We do not suggest that, given their revealed preference for exchange rate stability, these countries were making a mistake in trying to maintain their ERM parities. Rather, we are saying that these commitments did, *in practice*, foreclose the option to lower short rates below those in Germany that was, *in theory*, supposed to be available to them. See Kenen (1996) for a useful discussion of this point.

As shown in Figure 13, fluctuation in the franc-dm exchange rate did not in fact approach the wide bands that were permitted after 1993. Shown for comparison, is the franc-dollar exchange rate. The difference in the volatility of the two exchange rates is apparent. Some observers have argued that the ERM experience with wide bands lends credence to the view that such an arrangement is not "meaningless" but rather, by anchoring expectations, can contribute to exchange rate stability even if, 'most of the time', the bands are not tested. It is clear *something* stabilized the franc-dm exchange rate after August 1993 and it was not the narrow bands of the original ERM. But was it the 'anchoring of expectations' provided by a credible, wide band ERM? There are several reasons to think not.

The very fact that the franc-dm exchange rate spent most of the time within the original 'discarded' narrow bands of plus or minus 2.5 percent indicates that "France, having been given the leeway for a somewhat weaker franc, chose not to use it (Krugman (1997), p. 11))." Recall that, in theory, the honeymoon bonus from a target zone derives from the fact that, absent infra-marginal interventions, the expectation that the exchange rate cannot wander beyond the (wide) bands stabilizes the exchange rate within these bands. However, if honeymoon bonus was the source of stability in the franc-dm exchange rate after 1993, then the theory also would also predict that the exchange rate would have spent 'most of the time' near the edges of these wide bands. This of course was not the case. Rather, it seems clear that after 1993, just as before, French monetary policy was directed at the goal of stabilizing the exchange rate in anticipation of joining - and advancing the creation of - the EMU. This appears to be yet another example of the Svensson's (1994a) observation that *in practice*, if not in theory, successful target zone systems entail the obligation that the central bank engage in systematic, sustained, and infra-marginal *non-sterilized* intervention operations so as to keep the exchange rate well within the official

bands.[28] Figure 14 (top panel) plots an estimate of the expected realignment in the franc-dm exchange rate using the drift-adjustment method outlined in Svesson (1992). The expected re-alignment is the product of the probability of a re-alignment in the next month and the magnitude of that re-alignment should it happen. We notice that, notwithstanding the widening of the band in August 1993, re-alignment expectations did not settle down until late 1997 as the prospects for EMU were becoming more certain. Figure 14 (bottom panel) plots the French-German interest differential over this period. It is clear that France did not exploit the leeway the theory says it could have had to push its interest rates substantially below those in Germany. Indeed, French interest rate differentials seem to follow the shifts in re-alignment expectations documented in the top panel.

What we learn from the wide band ERM experience of France is that monetary policy, when devoted to a single goal, can maintain the exchange rate within a target zone. We do not learn much about the extent to which the wide band ERM provided an anchor to expectations or granted leeway to pursue independent monetary policies.

Was the ERM Collapse a Self-Fulfilling Crisis?

---

[28] Indeed, Svennson's (1994) model of monetary policy in a target zone specifies a leaning-against- the- wind reaction function for non-sterilized central bank intervention (monetary policy) that keeps the exchange rate, most of the time, near the central parity. One of the motivations for this reaction function is that re-alignment expectations may be increasing in the deviation from central parity which appears to be the case in the data.

In his recent survey paper on currency crises, Krugman (1997) outlines the three ingredients that, in retrospect, led to the ERM crisis. First, there was a cost of staying in the ERM; countries like Britain and Italy had a reason to abandon the constraints imposed by ERM membership. This was the "unemployment due to inadequate demand, and the resulting pressure on monetary authorities to engage in expansionary policies, policies that could not be pursued as long as countries remained committed to [the narrow band ERM] (Krugman (1997), p. 4)." Second, there was a 'political' cost to withdrawing from the ERM, perhaps encouraged by the perception *ex ante* that a devaluation would have inflationary consequences. Third, the cost of staying in the ERM (in terms of ongoing recession and unemployment) was increasing as the markets revised upward their expectation of devaluation which in turn pushed up short term interest rates (clearly evident in the Italian data and also true, very briefly, in Britain).

Now, these ingredients, appear to be present in many recent currency crises. However, as Krugman, Obstfeld and Rogoff (1996) and others have pointed out, they do not necessarily imply that a crisis that results from them is self-fulfilling. Krugman (1997) argues that

> [I]t is possible to combine these elements to produce a general story about currency crises that is quite similar to that in the [traditional] model. Suppose that a country's fundamental tradeoff between the costs of maintaining the current parity and the costs of abandoning it is predictably deteriorating, so that at some future date the country would be likely to devalue evening the absence of a speculative attack. Then speculators would surely try to get out of the currency ahead of the devaluation - but in so doing they would worsen the government's trade-off, leading to an earlier devaluation...[T]he end result will therefore be a crisis that ends the fixed exchange rate regime well before the fundamentals would appear to make devaluation necessary...[Note that] the crisis is driven by economic fundamentals. Yet, that is not the way it might seem when the crisis actually strikes: the government of the target country would feel that it was fully prepared to maintain the exchange rate for a long time, and would in fact have done so, yet was forced to abandon it by a speculative attack that made defending the rate simply too expensive.

While the joint presence of the three aforementioned ingredients in the ERM crisis is not sufficient to identify it as self-fulfilling in origin, self-fulfilling crises cannot be ruled out as a matter of theory (Obstfeld and Rogoff (1997); Krugman (1997)). Suppose, following the argument presented in Krugman (1997), that an eventual end to the target zone is not "preordained." Unemployment in the periphery may be rising because of recession and banks balance sheets may be weakening, but so long as short term interest rates remain at the level set by the center country, the central bank is prepared to 'tough it out,' perhaps by tolerating disinflation. Now, suppose for some reason, that the markets sharply revise upward their assessment of a devaluation. This will feed into higher short-term interest rates (and to a lesser extent long-term interest rates). The central bank now has a harder decision to make. Toughing it out when the markets don't expect a central bank to do so may well mean a longer recession, more unemployment, and more bank failures (or rescues) than would otherwise be the case. A 'hang tough' policy which makes sense in the absence of devaluation expectations, may very well not be 'worth the cost' when short term interest rates are pushed up 300, 400, or 500 basis points as a result of 'arbitrary' devaluation expectations. Under certain circumstances, these arbitrary devaluation expectations can become self-fulfilling as the central bank chooses to devalue in the face of a spike in interest rates caused by them.

This argument has been emphasized by Eichengreen, Rose, and Wyplosz:

> Self-fulfilling attacks rest on a bet by markets that governments will not [sustain] tough policy action. The conditions under which governments hesitate to [maintain] such steps turn out to be obvious: they include recession, high unemployment, past or impending elections, and finance ministers on thin ice. This is why markets are more likely to trigger attacks when a country is in a delicate economic or political situation.
>
> (Eichengreen, Rose, Wyplosz (1995), p. 295)

Or, consider the ERM post-mortem offered by Svensson (1994b)

> [M]ultiple equilibria are possible. In one equilibrium no speculative attack occurs, the exchange rate remains fixed, and monetary policy remains tight. In the other equilibrium a speculative attack occurs, a realignment or free float follows, a monetary policy switches to become more expansionary, ex post rationalizing the speculative attack. The Danish 'no' and the uncertainty about the French referendum contributed to make the EMU more uncertain and to make [multiple] equilibri[a] more likely. The multiple-equilibria explanation seems relevant for Italy, Britain, and perhaps France.
>
> (Svensson (1994b), pp. 456-457)

There is by no means common agreement that the ERM crisis was driven by a self-fulfilling attack (Williamson and Henning (1994) certainly dissent from such an interpretation). Moreover, the recent 'second generation' models of currency crises imply that "there is a range of fundamentals in which a crisis cannot happen, and a range of fundamentals in which it must happen; at most, self-fulfilling crisis models say that there is an intermediate range in which a crisis can happen, but need not...Since the logic of predictable crises [driven only by fundamentals] is that they happen well before the fundamentals have reached the point at which the exchange rate would have collapsed in the absence of [an] attack ...it will always seem at the time that the crisis has been provoked by a speculative attack not justified by current fundamentals (Krugman (1997), p. 7)."

REFERENCES

Bergsten, C. Fred, "How to Target Exchange Rates," **Financial Times**, November 20, 1998.

Bertola, G. and R. Caballero, "Target Zones and Realignments," **American Economic Review**, June 1992, pp. 520 - 536.

Bhagwati, J., "Yes to Free Trade, Maybe to Capital Controls," **Wall Street Journal**, November 16, 1998.

Calomiris, C., "Blueprints for a New Global Financial Architecture," mimeo, Graduate School of Business, Columbia University, October 1998.

Catte, P., and G. Galli and S. Rebecchini, "Exchange Markets Can be Managed!" **International Economic Insights**, September 1992, pp. 17 - 21.

Clarida, R. and J. Gali, "Sources of Real Exchange Rate Fluctuations: How Important are Nominal Shocks?" **Carnegie - Rochester Conference Series on Public Policy**, December 1994, pp. 1 - 56.

Clarida, R. and M. Gertler, "How the Bundesbank Conducts Monetary Policy," in C. Romer and D. Romer, eds., **Reducing Inflation**, Chicago: University of Chicago Press, 1997.

Clarida, R. and J. Gali and M. Gertler, "Monetary Policy Rules in Practice: Some International Evidence," **European Economic Review**, June 1998, pp. 1033-1067.

----------, "The Science of Monetary Policy: A New Keynesian Perspective," **Journal of Economic Literature**, forthcoming 1999.

----------, "Monetary Policy Rules and Macroeconomic Stability," mimeo, New York University, 1999.

Cooper, R., "Comment on Williamson and Henning," in P. Kenen, ed., 1994.

Cross, S., **All About the Foreign Exchange Market in the United States**, New York: FRB New York, 1998.

Cumby, R. and J. Huizinga, "The Predictability of Real Exchange Rates in the Short Run and the Long Run," NBER Working Paper No. 3468, 1990.

Dominguez, K. and J. Frankel, **Does Foreign Exchange Intervention Work?**, Washington: Institute for International Economics, 1993.

Dornbusch, R., "Expectations and Exchange Rate Dynamics," **Journal of Political Economy**, December 1976, pp. 1161 - 1176.

----------, "Flexible Exchange Rates and Excess Capital Mobility," **Brookings Papers on Economic Activity**, 1: 1986, pp. 209-226.

----------, "After Asia: New Directions for the International Financial System," mimeo, Department of Economics, MIT, July 1998.

Dornbusch, R. and C. Favero and F. Giavazzi, "Immediate Challenges for the European central Bank," **Economic Policy**, 1998, pp. 17-64.

"Off Target," **The Economist**, November 28 1998, p. 82.

"No More Peso," **The Economist**, January 23 1999, p. 69.

"Who Prints the Yen?" **The Economist**, February 20 1999, p. 67.

"Survey of Global Finance," **The Economist**, February 5 1999, p. 67.

Edison, H., "The Effects of Central Bank Intervention: A Survey of the Literature Since 1982," Princeton Special Papers in International Finance, 1993.

Eichenbaum, M. and C. Evans, "Some Empirical Evidence on the Effects of Monetary Policy Shocks on Real Exchange Rates," **Quarterly Journal of Economics**, November 1995, pp. 975 - 1009.

Eichengreen, B., **Towards a New International Financial Architecture**, Washington: Institute for International Economics, 1999.

----------, and P. Kenen, "Managing the World Economy Under the Bretton Woods System," in P. Kenen, ed., 1994.

----------, A. Rose and C. Wyplosz, "Exchange Market Mayhem," **Economic Policy**, 1995, pp. 251-312.

Feldstein, M., "Self Protection for Emerging Market Economies," NBER Working Paper No. 6907, January 1999.

Frankel, J., "The Dazzling Dollar," **Brookings Papers on Economic Activity**, 1985 (1).

Frankel, J. and A. Rose, "A Panel Project on PPP," **Journal of International Economics**, (40) 1996, pp. 209-224.

Froot, K. and M. Obstfeld, "Exchange Rate Dynamics Under Stochastic Regime Shifts," **Journal of International Economics**, November 1991, pp. 203-229.

Goldstein, M., D. Folkerts-Landau, P. Garber, L. Rojas-Suarez, and M. Spencer, "International Capital Markets Report," Washington: IMF, April 1993.

Henderson, D., and S. Sampson, "Intervention in Foreign Exchange Markets: A Summary of Ten Staff Studies," **Federal Reserve Bulletin**, November 1983, pp. 830-836.

Ito, T., T. Cargill and M. Hutchison, **The Political Economy of Japanese Monetary Policy**, Cambridge: MIT Press, 1997.

Kenen, P., ed., **Managing the World Economy: Fifty Years After Bretton Woods**, Washington: Institute for International Economics, 1994.

----------, "Sorting Out Some EMU Issues," Princeton Reprints in International Finance No. 29, 1996.

----------, "EMU and Transatlantic Economic Relations," HWWA Discussion Paper No. 60, May 1998.

----------, "Monetary Policy In Stage Three," **International Journal of Finance and Economics**, (3) 1998, pp. 3- 12.

Portes, R. and H. Rey, "The Emergence of the Euro as an International Currency," **Economic Policy**, 1998, pp. 307-343.

Henning, R. and J. Williamson, "Managing the Monetary System," in P. Kenen, ed., 1994.

Krugman, P., "Currency Crises," mimeo, Department of Economics, MIT, 1997.

----------, "The Euro: Beware of What You Wish For," mimeo, Department of Economics, MIT, 1998a.

----------, "The Eternal Triangle," mimeo, Department of Economics, MIT, 1998b.

----------, and M. Miller, "Why Have a Target Zone?" **Carnegie - Rochester Conference Series on Public Policy**, December 1993, pp. 279-314 .

Mark, N., "Exchange Rates and Fundamentals: Evidence on Long Horizon Predictability," **American Economic Review**, March 1995, pp. 201-218.

McKinnon, R., "**The Rules of The Game**," Cambridge: MIT Press, 1997.

----------, "International Money: Dollars, Euros, or Yen?" mimeo, Department of Economics, Stanford University, 1998.

----------, and K. Ohno, **Dollar and Yen**, Cambridge: MIT Press, 1997.

Mishkin, F., "International Experience with Different Monetary Policy Regimes," NBER Working Paper No. 7044, 1999.
Mussa, M., "A Model of Exchange Rate Dynamics," **Journal of Political Economy**, February 1982, pp. 74 - 104.

Obstfeld, M., "International Currency Experience," **Brookings Papers on Economic Activity**, 1: 1995.

----------, "The Global Capital Market: Benefactor or Menace?" **Journal of Economic Perspectives**, fall 1998, pp. 9 - 30.

----------, and K. Rogoff, "The Mirage of Fixed Exchange Rates," **Journal of Economics Perspectives**, Fall 1995, pp. 73-96.

----------, **Foundations of International Macroeconomics**, Cambridge: MIT Press, 1997.

Svensson, L., "Why Exchange Rate Bands?" **Journal of Monetary Economics**, (33) 1994a, pp. 157-199.

----------, "An Interpretation of Recent Research on Exchange Rate Target Zones," **Journal of Economics Perspectives**, Fall 1992, pp. 119-144.

----------, "Fixed Exchange Rates as a Means to Price Stability," **Journal of Monetary Economics** (33) 1994b, pp. 447-468.

Volcker, P., "The Quest for Exchange Rate Stability," mimeo, Institute for International Economics, 1995, p. 1.

----------, "Emerging Economies in a Sea of Global Finance," mimeo, Institute for International Economics, 1996, p. 1.

Williamson, J., "Target Zones and the Management of the Dollar," **Brookings Papers on Economic Activity**, 1: 1986.

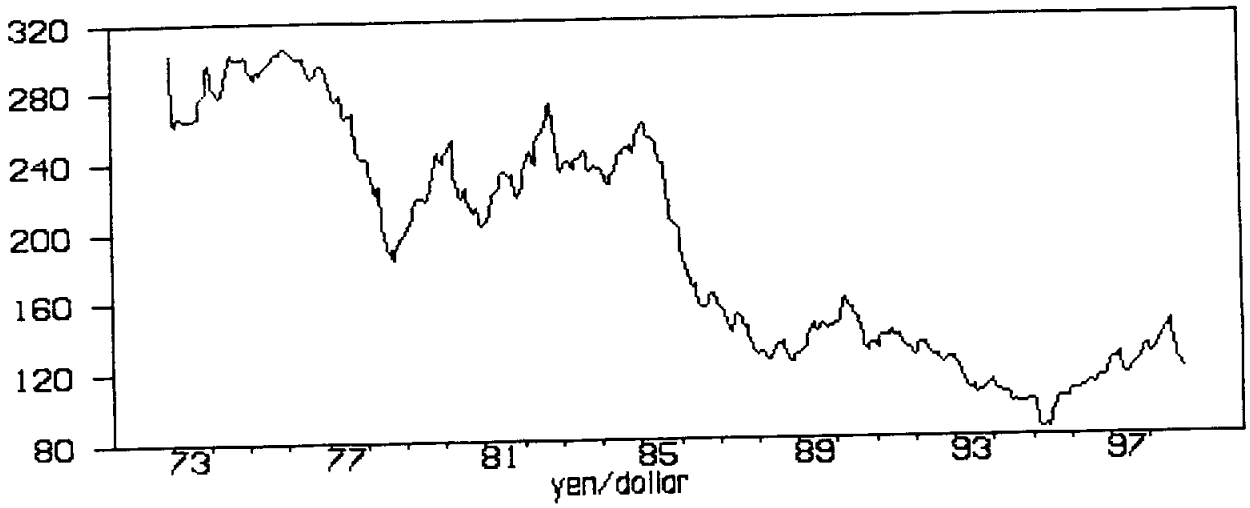
----------, **Estimating Equilibrium Exchange Rates**, Washington: Institute for International Economics, 1994.

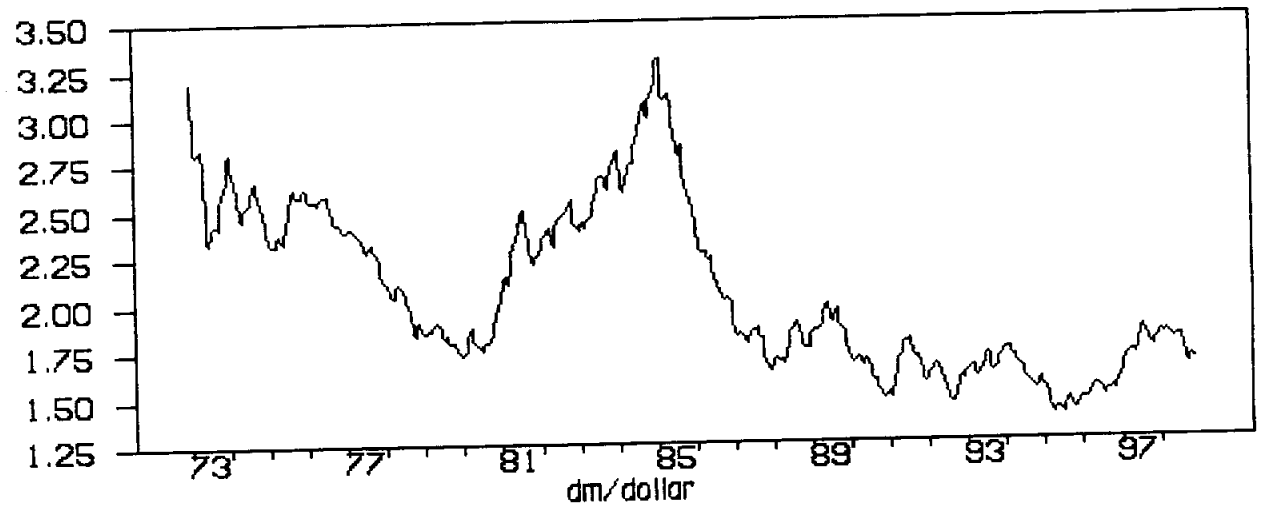
----------, "Crawling Bands or Monitoring Bands," **International Finance**, (1) 1998, pp. 1-24.

Wolf, M., "Off Target," **Financial Times**, January 30, 1999, p, 11.

Figure 1

G3 Exchange Rates Since 1973





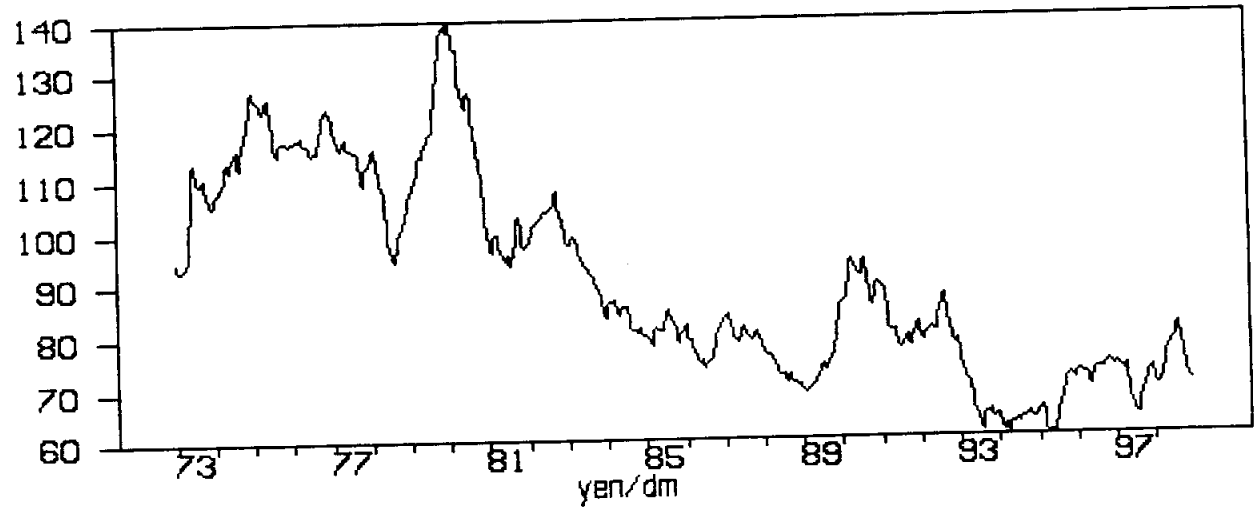
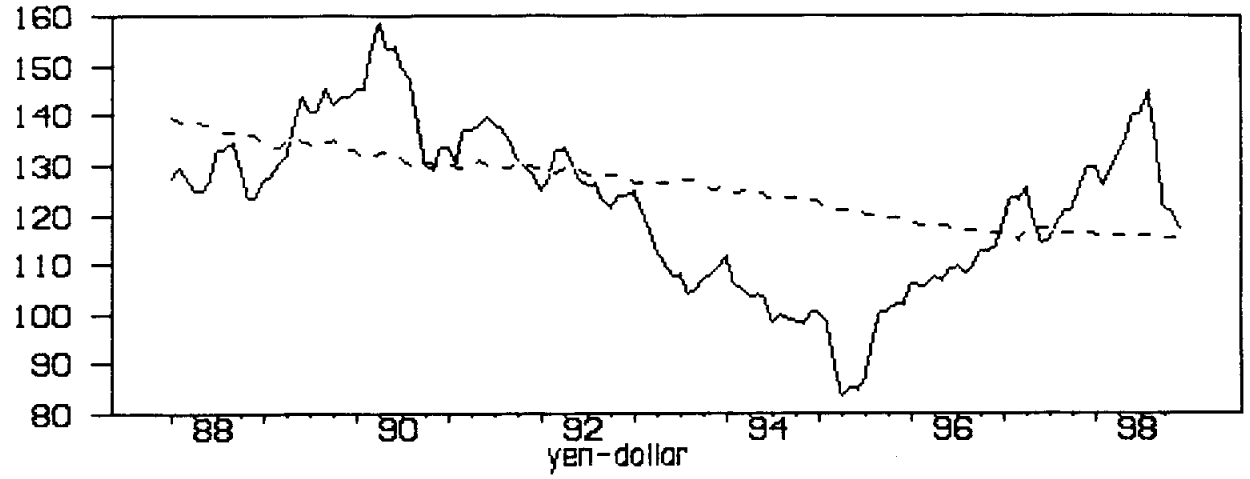
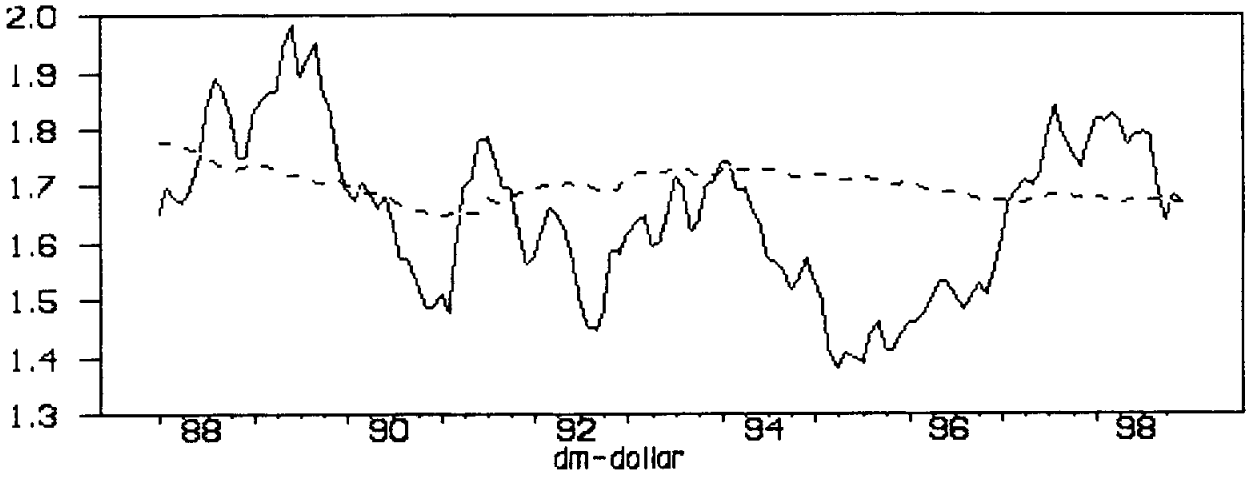


Figure 2

G3 Exchange Rates Since 1988

relative to PPP





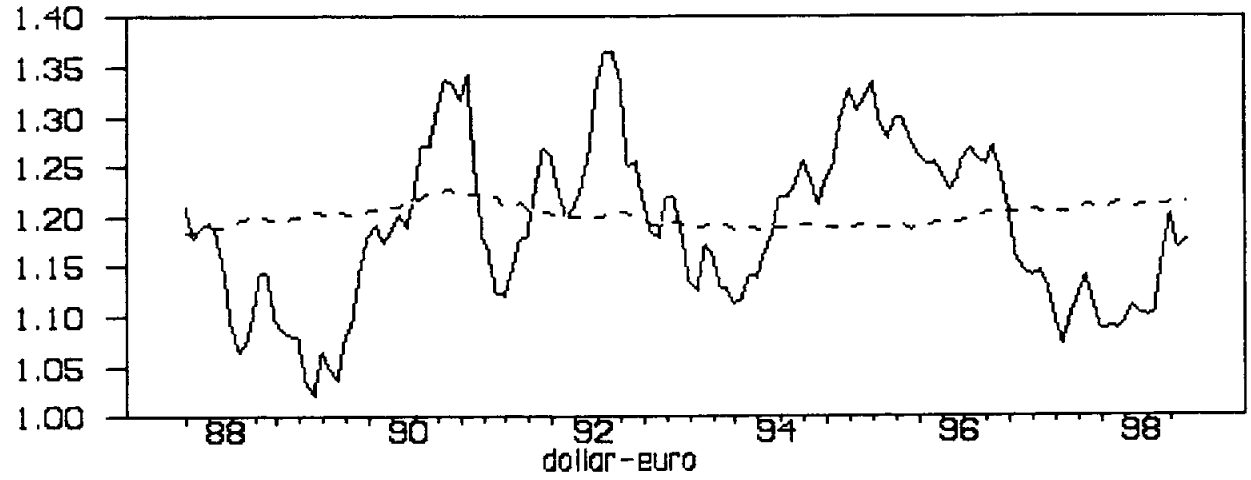
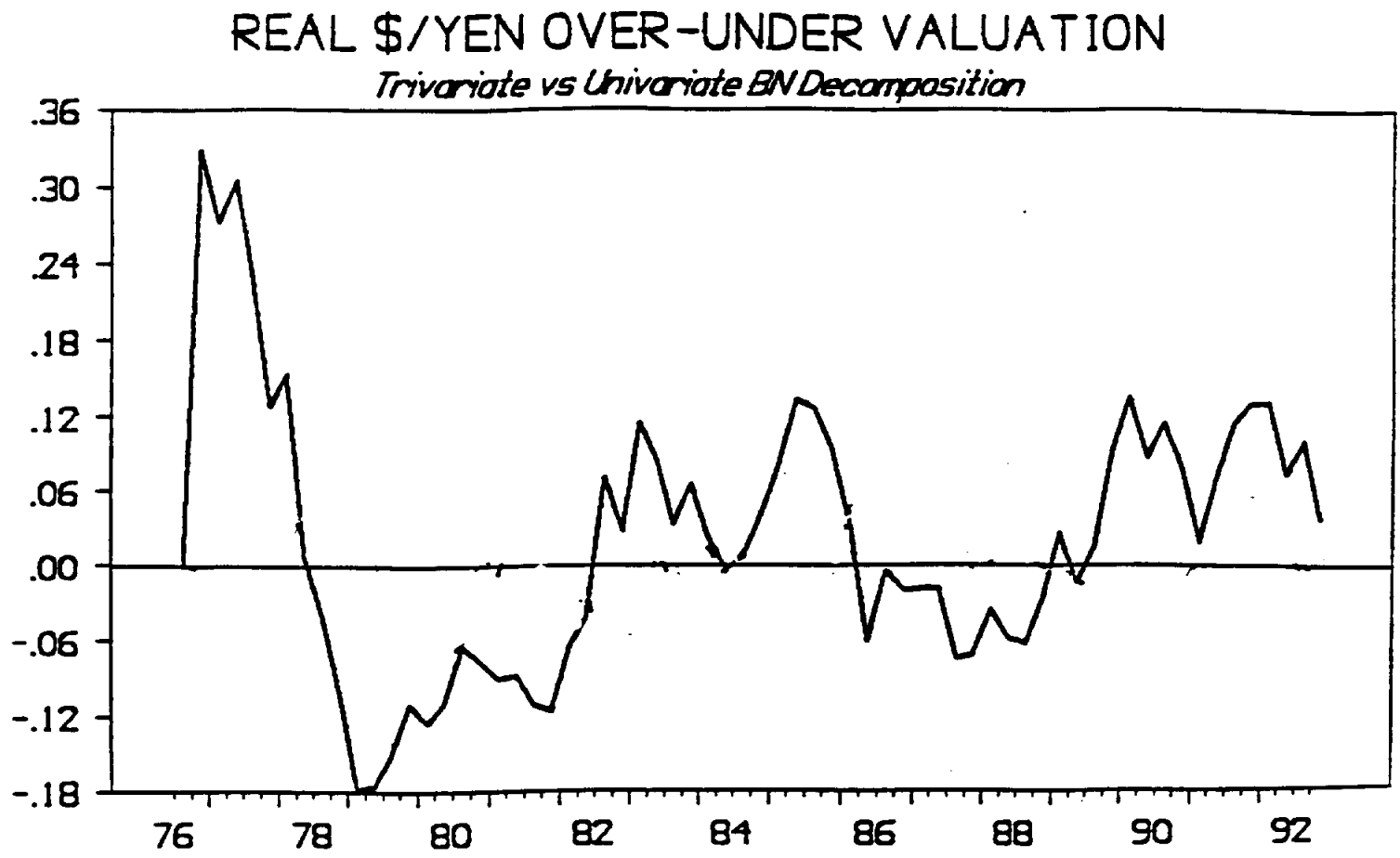


Figure 3


REAL $/YEN OVER-UNDER VALUATION
Trivariate vs Univariate BN Decomposition
.36
.30
.24
.18
.12
.06
.00
-.06
-.12
-.18
76
78
80
82
84
86
88
90
92

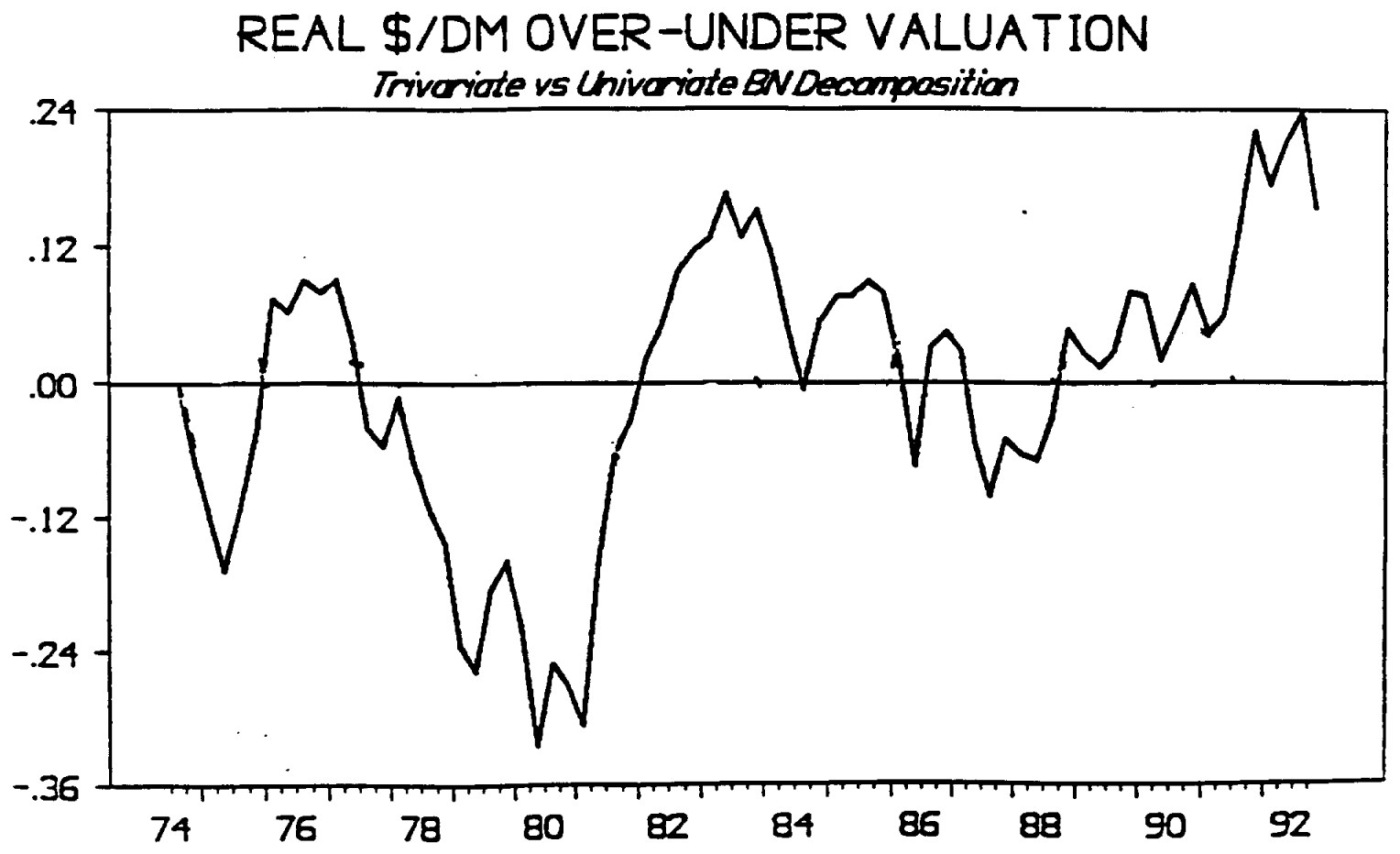

REAL $/DM OVER-UNDER VALUATION
Trivariate vs Univariate BN Decomposition
.24
.12
.00
-.12
-.24
-.36
74
76
78
80
82
84
86
88
90
92

Figure 4

G3 Exchange Rate Volatility

Rolling SD of Monthly Changes

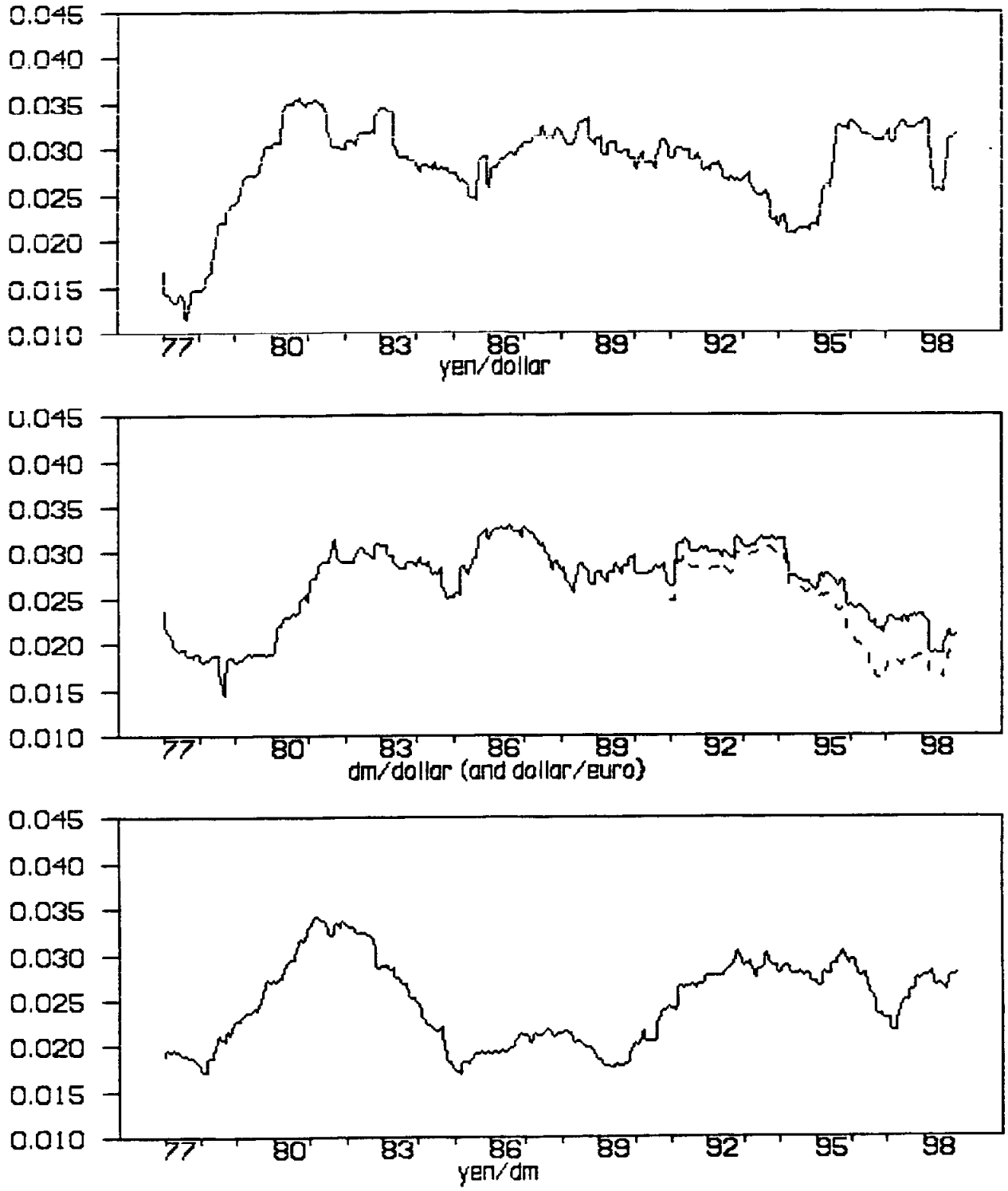


Figure 5

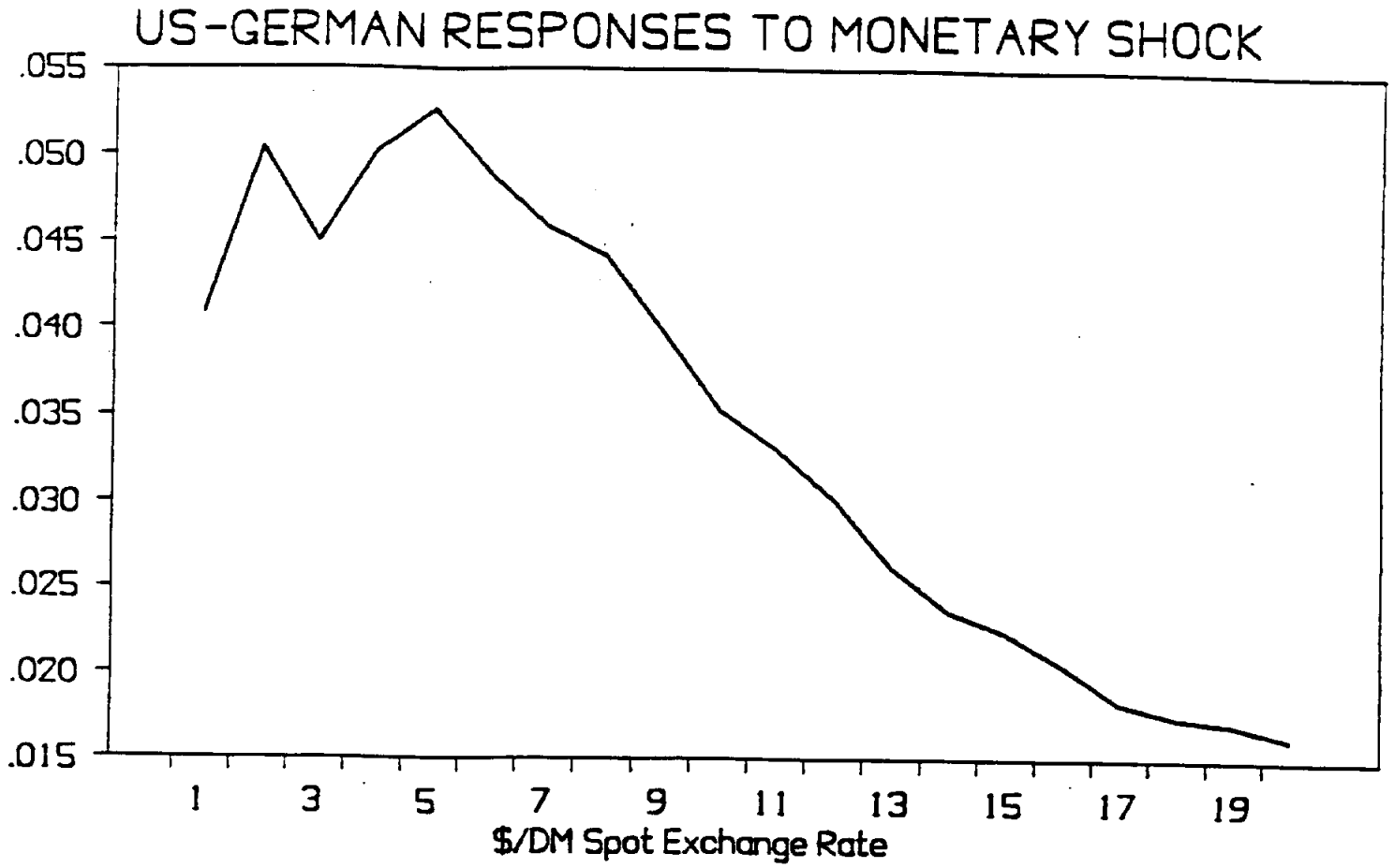

US-GERMAN RESPONSES TO MONETARY SHOCK
.055
.050
.045
.040
.035
.030
.025
.020
.015
1
3
5
7
9
11
13
15
17
19
$/DM Spot Exchange Rate

Figure 6

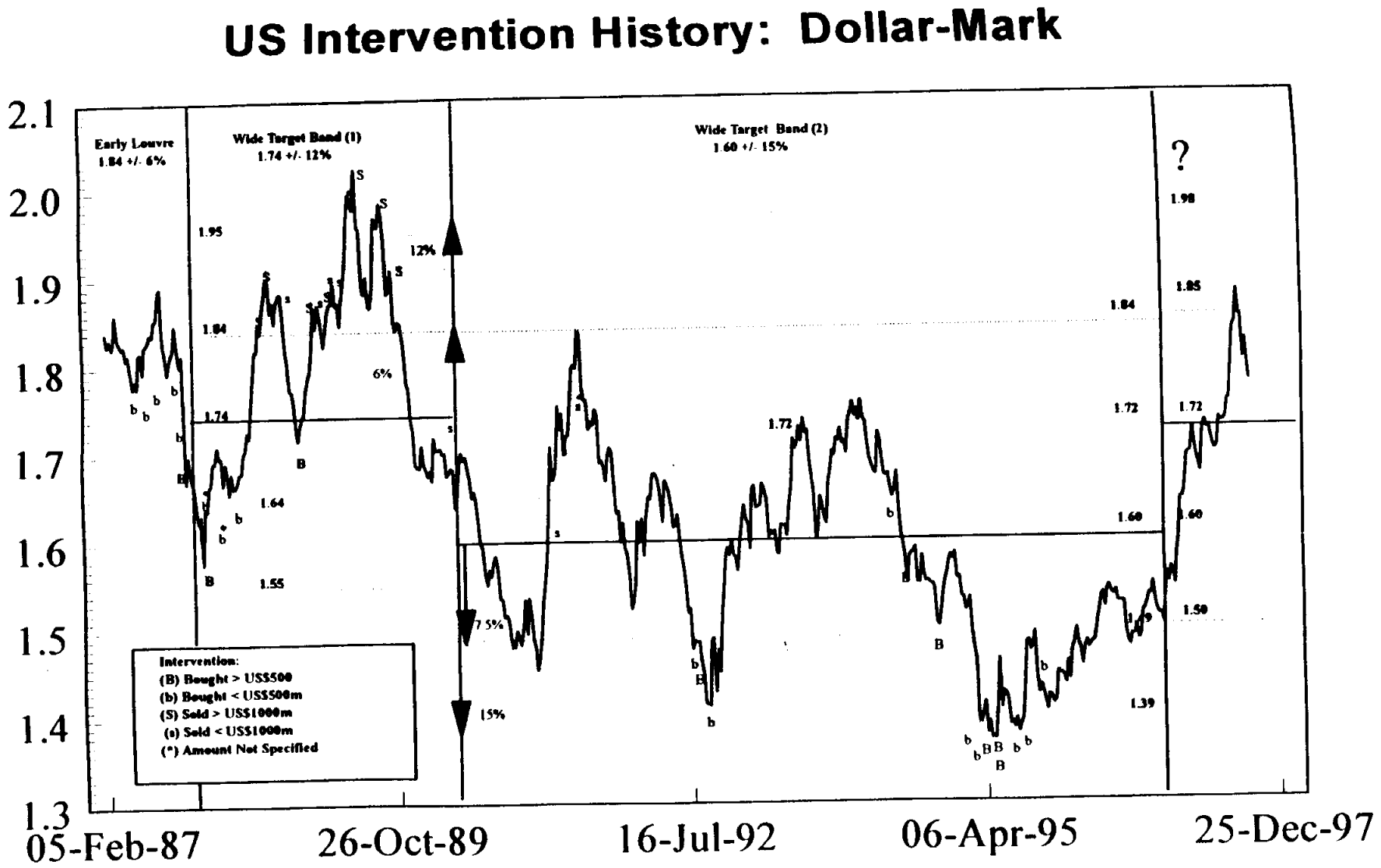

US Intervention History: Dollar-Mark
Early Louvre
1.84 +/- 6%
Wide Target Band (1)
1.74 +/- 12%
Wide Target Band (2)
1.60 +/- 15%
?
1.98
1.85
1.84
1.72
1.60
1.50
1.39
1.95
1.74
1.64
1.55
12%
6%
7.5%
15%
1.72
Intervention:
(B) Bought > US$500
(b) Bought < US$500m
(S) Sold > US$1000m
(s) Sold < US$1000m
(*) Amount Not Specified
2.1
2.0
1.9
1.8
1.7
1.6
1.5
1.4
1.3
05-Feb-87
26-Oct-89
16-Jul-92
06-Apr-95
25-Dec-97

Figure 7

US Intervention History: Dollar-yen

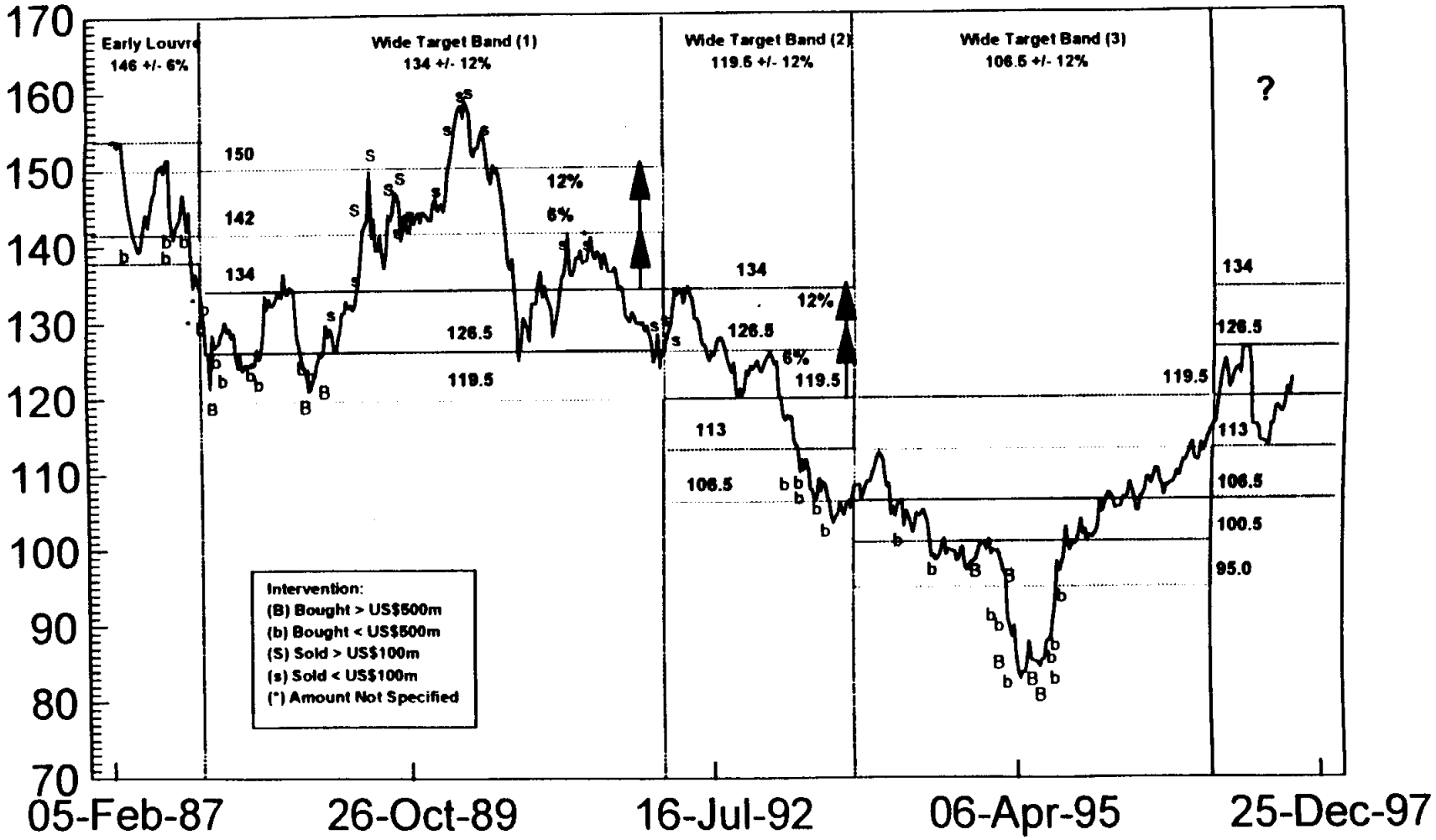


Figure 8

G3 Nominal Effective Exchange Rates Since 1988

plus or minus 10 percent of 1988:1 level

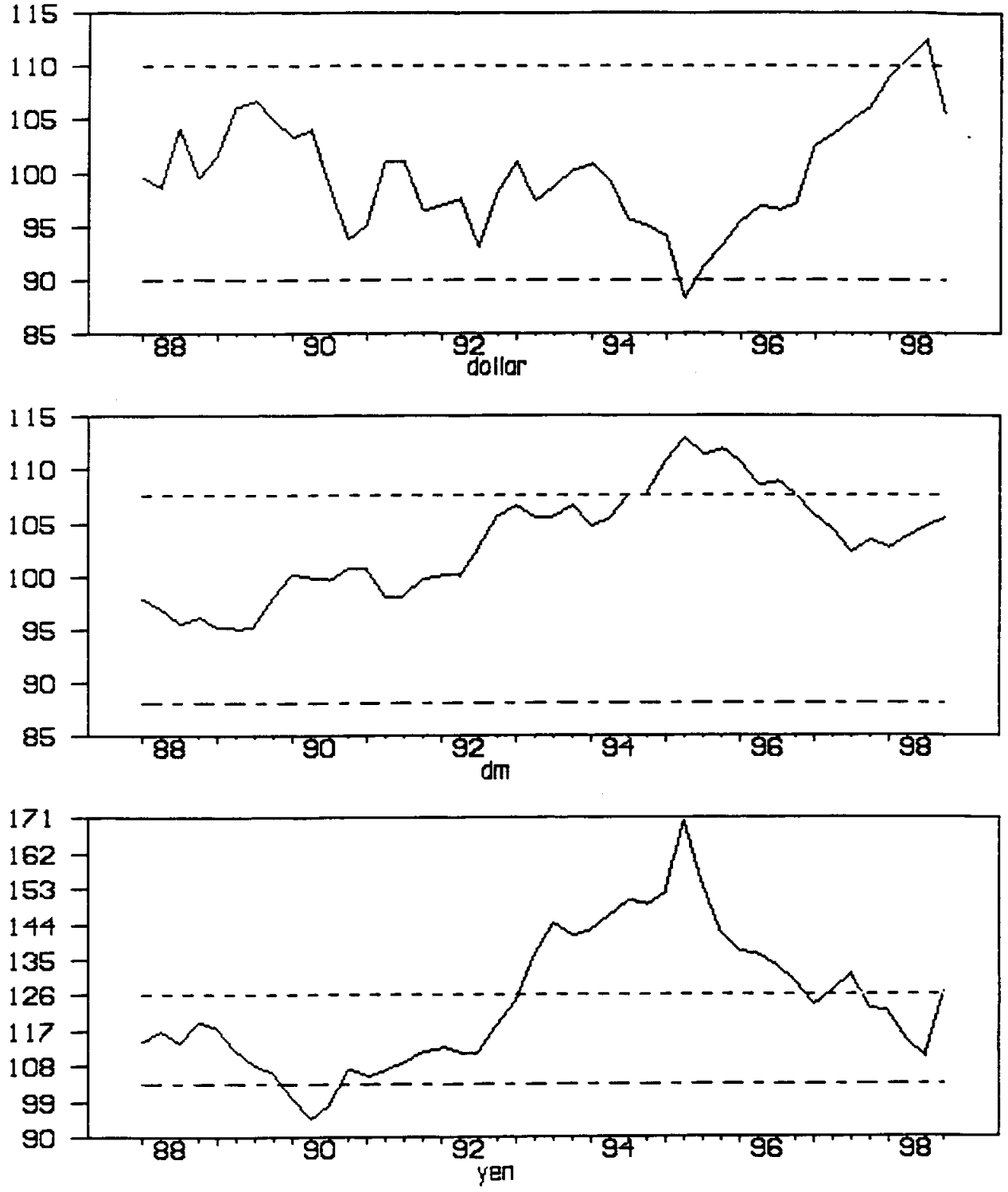


Figure 9

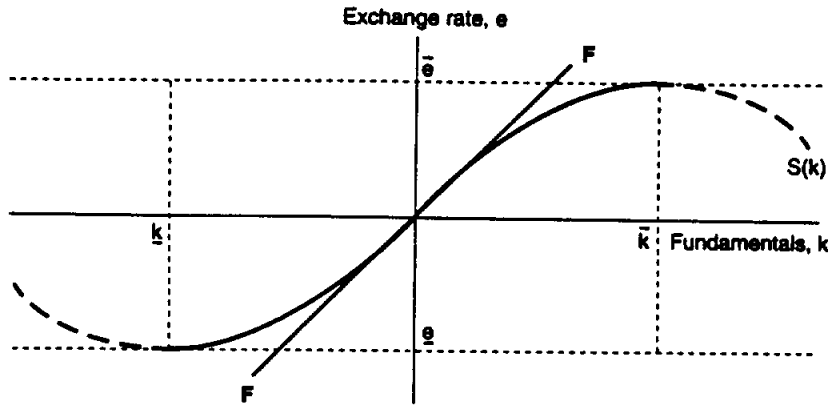
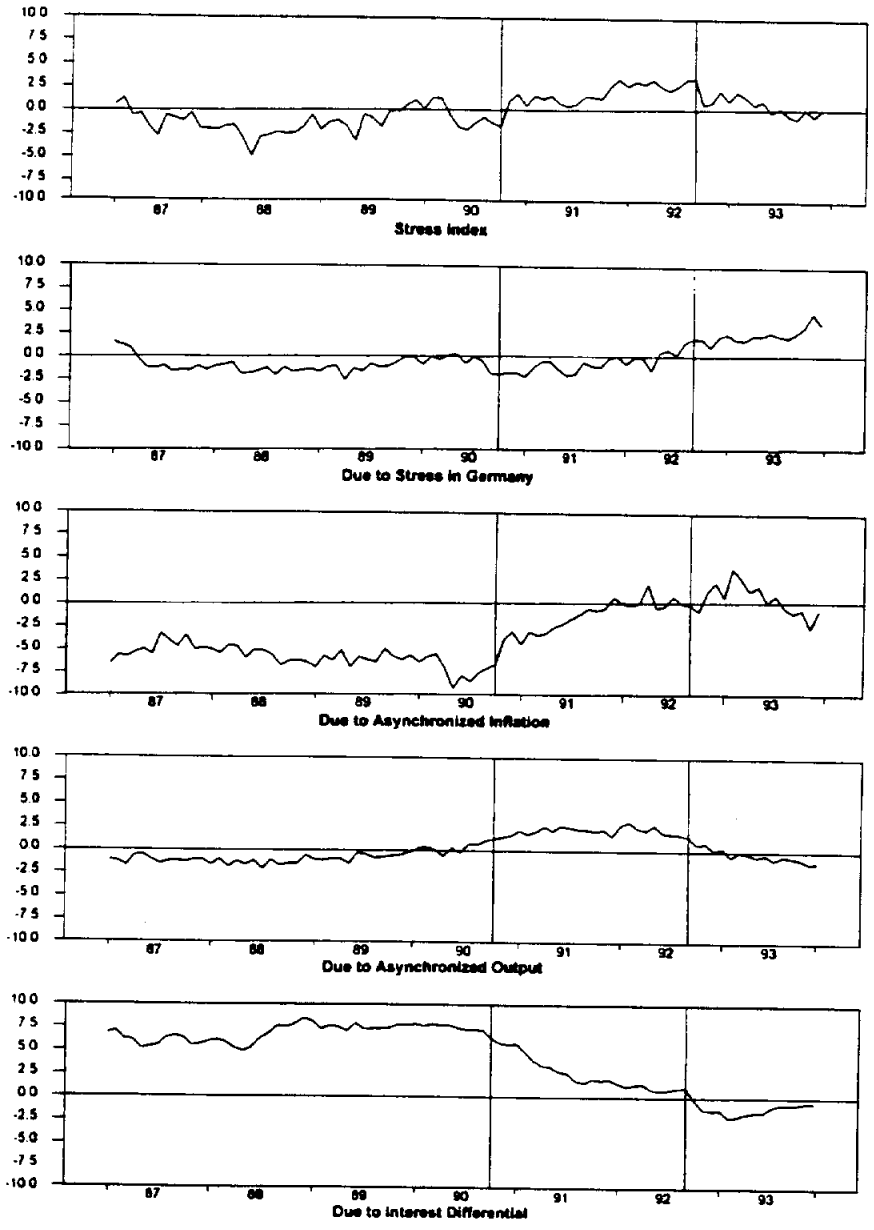
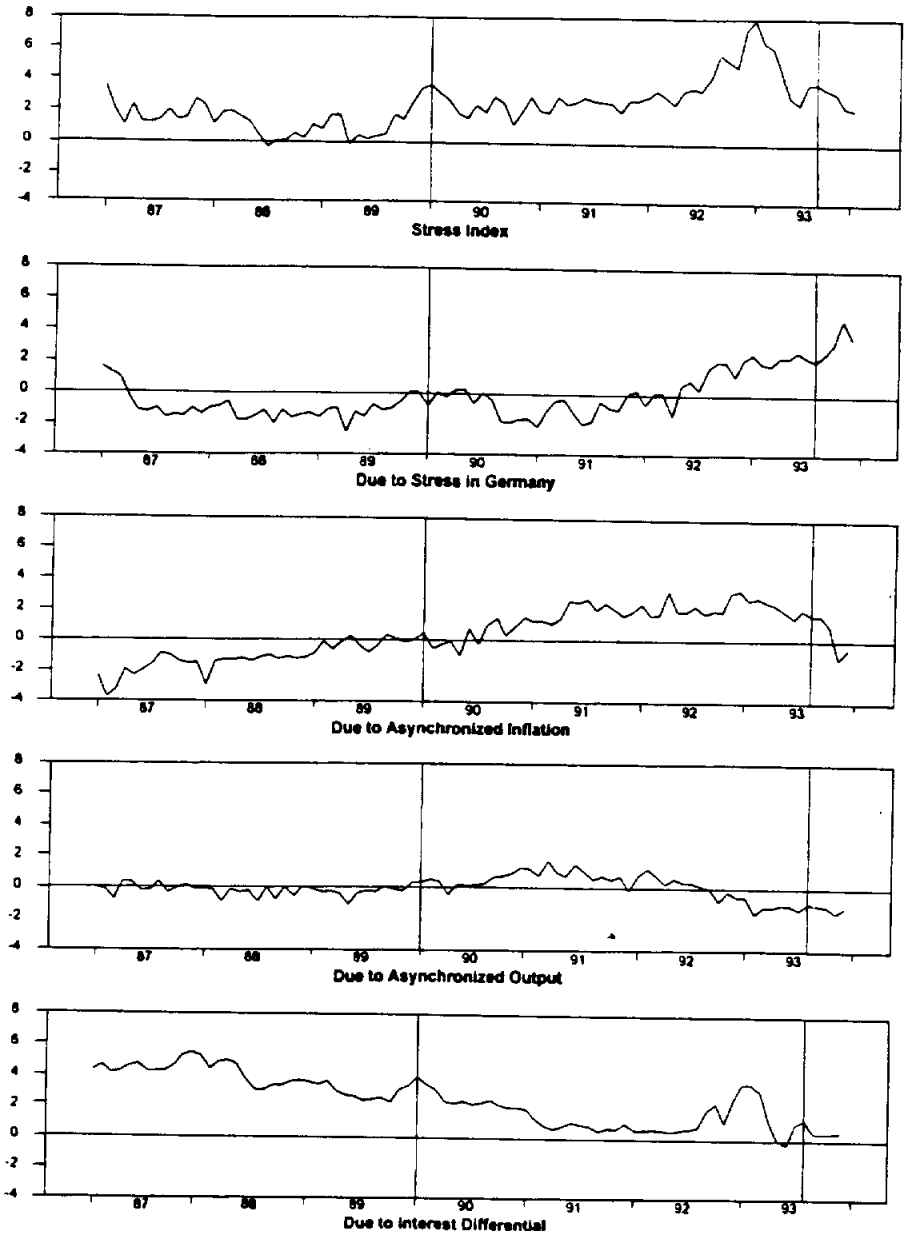

Exchange rate, e
$\bar{e}$
F
S(k)
$\underline{k}$
$\bar{k}$
Fundamentals, k
$\underline{e}$
F

Figure 10



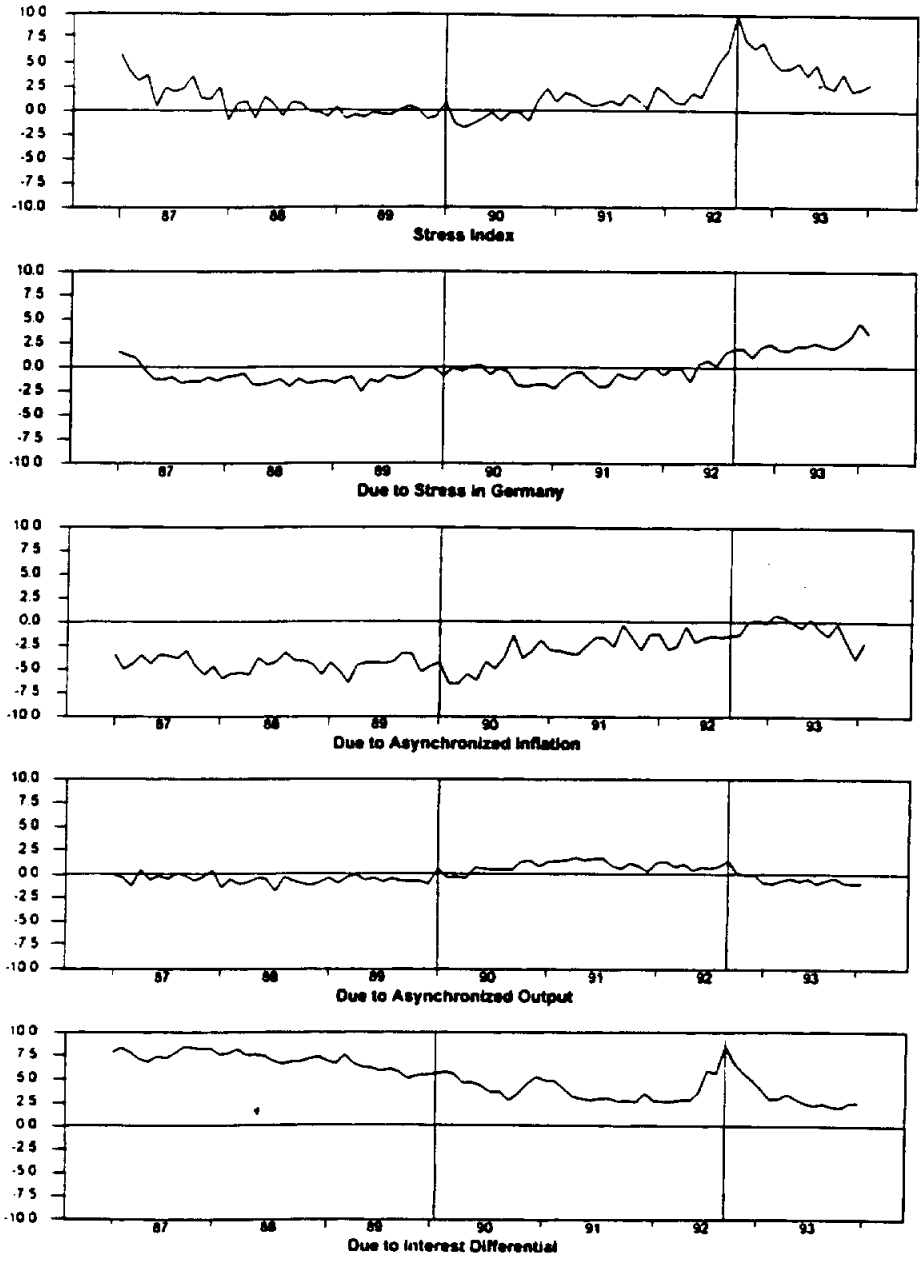
Stress in Britain.

Figure 11



Stress in France.

Figure 12



Stress in Italy.

Figure 13

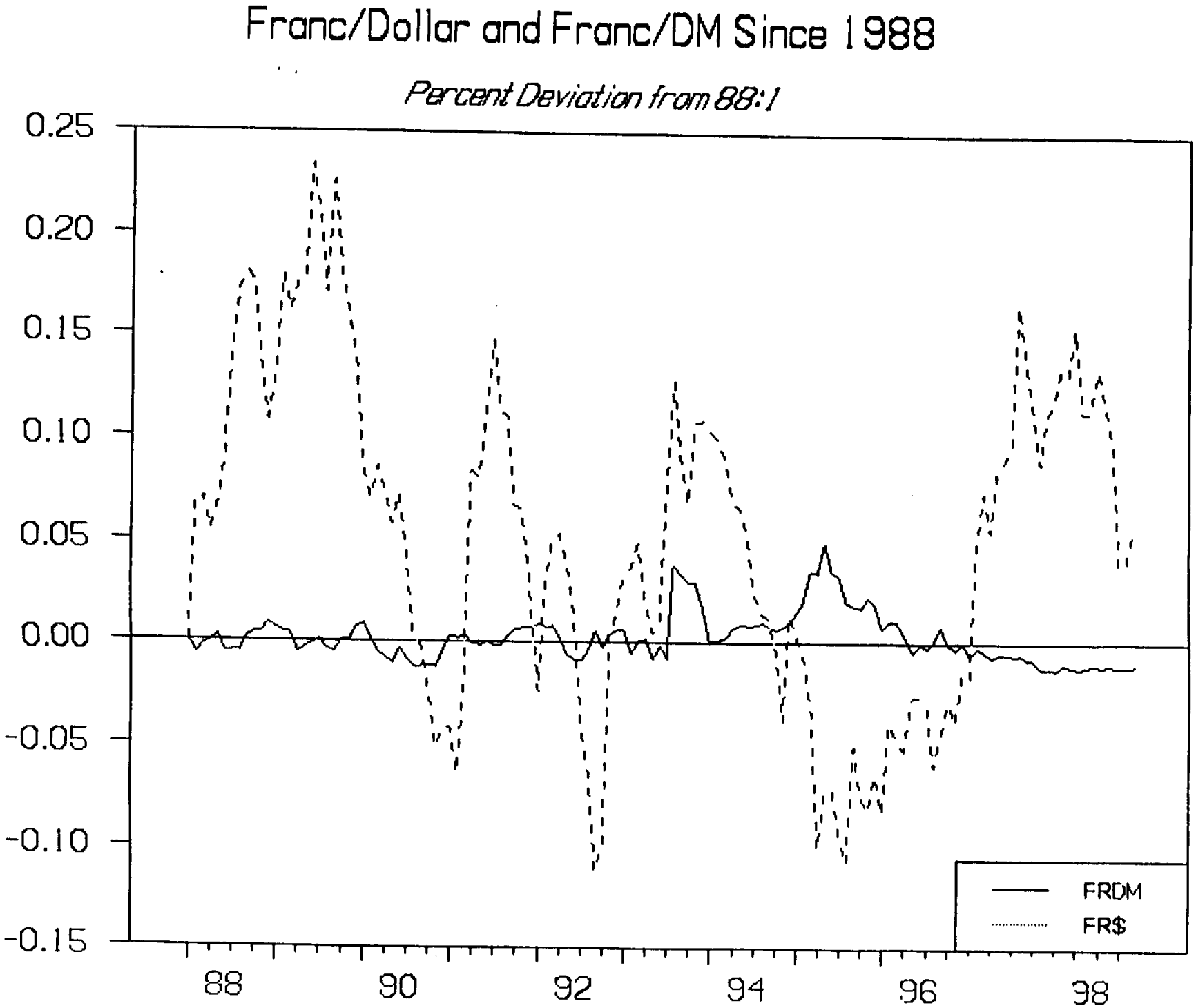
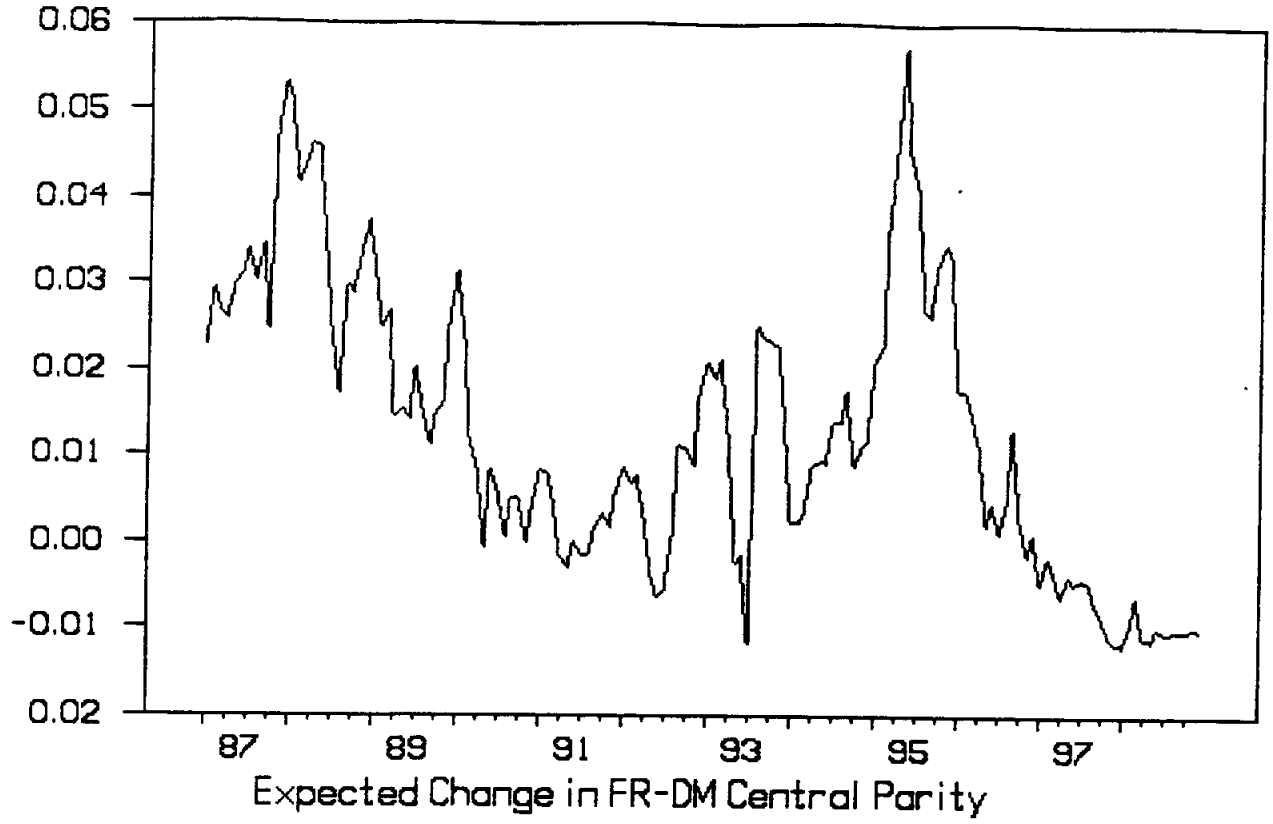

Franc/Dollar and Franc/DM Since 1988
Percent Deviation from 88:1
0.25
0.20
0.15
0.10
0.05
0.00
-0.05
-0.10
-0.15
88
90
92
94
96
98
FRDM
FR$

Figure 14


0.06
0.05
0.04
0.03
0.02
0.01
0.00
-0.01
0.02
87
89
91
93
95
97
Expected Change in FR-DM Central Parity

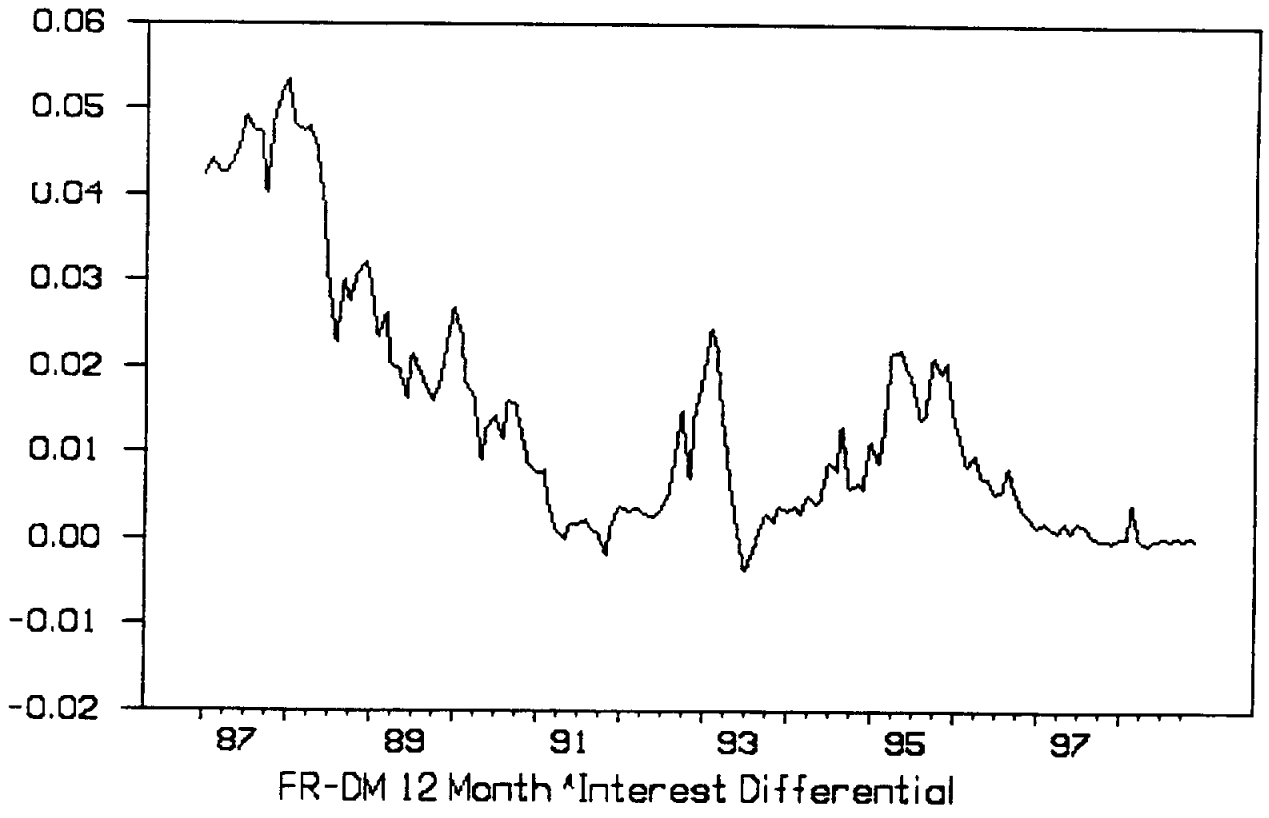

0.06
0.05
0.04
0.03
0.02
0.01
0.00
-0.01
-0.02
87
89
91
93
95
97
FR-DM 12 Month Interest Differential

Table 4:
Variance Decomposition - Δq_t

	Germany			Japan		
	fraction of variance due to			fraction of variance due to		
Horizon	Supply	Demand	Money	Supply	Demand	Money
1	0.007	0.518	0.474	0.009	0.631	0.359
	(0.097)	(0.285)	(0.286)	(0.134)	(0.231)	(0.203)
2	0.035	0.497	0.468	0.028	0.630	0.341
	(0.102)	(0.253)	(0.256)	(0.119)	(0.216)	(0.188)
3	0.046	0.487	0.467	0.031	0.630	0.338
	(0.098)	(0.212)	(0.248)	(0.114)	(0.202)	(0.177)
4	0.046	0.503	0.450	0.034	0.627	0.339
	(0.094)	(0.229)	(0.234)	(0.116)	(0.298)	(0.172)
8	0.096	0.500	0.404	0.035	0.617	0.347
	(0.084)	(0.187)	(0.191)	(0.113)	(0.167)	(0.145)
12	0.103	0.489	0.407	0.036	0.612	0.352
	(0.082)	(0.173)	(0.179)	(0.114)	(0.167)	(0.144)
16	0.104	0.485	0.411	0.036	0.612	0.352
	(0.080)	(0.168)	(0.174)	(0.117)	(0.167)	(0.144)
20	0.104	0.485	0.411	0.036	0.612	0.352
	(0.080)	(0.166)	(0.172)	(0.119)	(0.167)	(0.144)

Table 2

(continued from page 111)

Estimates of the U.S. Dollar's Purchasing Power and Fundamental Equilibrium Value

	Market Rate[1] Against the Dollar	PPP Purchasing Power Parity (PPP)		PPP Adjusted for Productivity	Equilibrium Exchange Rates	
		OECD[2]	Penn[3]	Goldman Sachs[4]	IIE	SBC4
Deutsche mark	1.77	2.02	2.12	1.51	1.45-1.50	1.40
Japanese yen	132	169	188	124	100	95

1 On May 11, 1998
2 1997 average
3 1997
4 Early 1998

Sources: Bank for International Settlements Annual Report 1998; OECD; Penn World Tables [illegible] Estimating equilibrium exchange rates, Institute for International Economics [illegible] September 1994 [illegible] Swiss Bank Corporation (SBC).