

The Role of Sterilized Intervention in Exchange Rate Stabilization Policy

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1. Introduction

The objective of official intervention in foreign exchange markets is to influence currency values in the broad context of stabilization policy. A key distinction between types of intervention, however, is whether or not it is allowed to influence bank reserves and the monetary aggregates. To have a role in stabilization policy *distinct* from monetary policy, the effects of intervention must be “sterilized” from the monetary base and not accommodated or reinforced by interest rate changes or other policy measures. If sterilized intervention proves to be effective in influencing exchange rate values, it could be a valuable instrument of stabilization policy. Having an additional independent instrument that is directed to the exchange rate target would in principle provide more flexibility in the design of monetary policy and fiscal policy in attaining other macroeconomic objectives.

Intervention with monetary effects is little different than using the monetary instrument for stabilization policy and this will normally have a large effect on the exchange rate. By contrast, the effectiveness of sterilized foreign exchange intervention has been the focus of an ongoing and unresolved dispute since the so-called Jurgensen report (Jurgensen (1983)). While empirical research often finds only weak evidence in favor of a systematic and predictable link between sterilized intervention and associated movements of exchange rates, policy makers nevertheless seem to view sterilized intervention as an instrument for policy and frequently intervene in foreign exchange

markets.¹ Over the April 1991 - December 2000 period, for example, the Bank of Japan bought (sold) US dollars on 168 (33) occasions for a cumulative amount of \$304 billion (\$38 billion) (Fatum and Hutchison, 2002b). With similar frequency but smaller scale, the Bundesbank bought (sold) US dollars on 65 (169) occasions for a cumulative amount of \$9.6 (\$18.1 billion) over the September 1985 to December 1995 period (Fatum and Hutchison, 2001).

This may not be irrational behavior on the part of policymakers; rather, it could be that they are not convinced by the academic skepticism over the effectiveness of sterilized intervention. Moreover, central banks may be willing to engage in a low probability event (effective intervention) if the cost is low or the payoff large. For example, to the extent that exchange rates are subject to possible multiple equilibrium values—each consistent with the same set of “fundamentals” but with different sets of private market expectations-- intervention might provide the impetus to move market expectations towards the desired equilibrium. There is usually no explanation of the coordination mechanism in theoretical multiple equilibrium models and the onset of a speculative attack typically appeals to an *ad hoc* shift in everyone’s expectations (Obstfeld, 1994, 1996; Flood and Marion, 2000). Playing a coordination role by focusing expectations on the desired equilibrium could have a large policy payoff, and may be low risk, but not always effective. Similarly, Sarno and Taylor (2001) suggest that official intervention may remedy a coordination failure when the foreign exchange market is subject to irrational speculative bubbles brought on by non-economic factors such as chartist or technical analysis (Frankel and Froot, 1990; Taylor and Allen, 1992). They

¹ “In any event, governments plainly believe that sterilized intervention has its uses, for they continue to practice it despite the lack of any hard evidence that it is consistently and predictably effective”, Obstfeld

suggest that publicly announced intervention might fulfill a coordinating role by organizing rational agents to enter the market at the same time.

In these circumstances it would seem that sterilized intervention might play a particularly important role—cases where economic fundamentals could establish several equilibrium values but official intervention (without changing fundamentals such as monetary policy) is able to move the market toward the desired point. Consistent with this interpretation, of course, is that widespread speculative attacks on exchange rates in emerging markets, especially East Asia in 1997, were not justified by economic fundamentals-- and that perhaps even larger and coordinated sterilized interventions may have helped better to defend exchange rate values.

Reliance on sterilized intervention seems at the core of the Chiang Mai Initiative, agreed in May 2000, where the major substantive component was to strengthen the long-standing ASEAN Swap Agreement and to introduce bilateral swap arrangements (BSAs) for the ASEAN+3 members (including China, Japan and Korea). These swap agreements, of course, increase the volume of reserves that participating Asian central banks could draw upon on short notice to support their intervention operations. Clearly, understanding whether intervention is an effective policy instrument seems critical in this context.

This article reviews the effectiveness of sterilized intervention, focusing on studies using “event study” or related methodology. This methodology, it is argued, is more apt to capture the effectiveness of sporadic intervention operations of varying intensity and where these operations could play an important “coordinating function” in the foreign exchange market. We also consider the role that sterilized intervention might play in regional currency arrangements. This discussion is motivated by the emphasis on

swap arrangements in the Chiang Mai Initiative, and in this context the experience with coordinated intervention and swap arrangements in the European Monetary System is analyzed.

We find that recent evidence using event study methodologies is more supportive of the effectiveness of intervention than most other work based on time-series methods. This suggests a fruitful role for sterilized intervention in short-run stabilization policy. The evidence is not clear on how long the effects of intervention last, however. Moreover, large-scale sterilized intervention, coordinated intervention and substantial currency swap arrangements may not be enough to stabilize an exchange rate parity in the face of a speculative attack in the absence of a strong and credible political commitment by the affected central banks and, ultimately, coordinated monetary policy. A strong political commitment, in turn, is usually more easily sustained when economic fundamentals are broadly in line both with the desired exchange rate parity *and* other macroeconomic objectives.

Section 2 reviews recent evidence on the effectiveness of sterilized intervention, concluding that event studies do find a role for intervention in short-run exchange rate stabilization policy. This suggests that occasional and targeted intervention may help to defend the exchange rate parity or move the exchange rate in the desired direction. Section 3 considers the role of regional currency arrangements based on swap arrangements and coordinated intervention policy. The concrete example of the Chiang Mai arrangement is discussed, and compared to operational problems of the European Monetary System that showed up in September 1992 and again in August 1993. It is concluded that the resources for sterilized intervention provided by the Chiang Mai

Initiative (CMI) are relatively small, and that the terms and borrowing conditions involved with the associated bilateral swap agreements are quite stringent. The CMI as it stands will probably have very limited effect in helping to stabilize exchange rates in the region. Section 4 concludes the article.

2. Evidence on the Effectiveness of Sterilized Intervention

Portfolio Balance and Signaling Channels

Most literature investigating sterilized intervention focuses on two channels of transmission-- the "portfolio balance" channel and the "signaling" channel. The theoretical justification offered by the portfolio balance channel, through which sterilized intervention changes the currency denomination of relative asset supplies and thereby the exchange risk premium if assets are imperfect substitutes, has received mixed empirical support (Dominguez and Frankel (1993a,b), Edison (1993), Rogoff (1984)). Even if it were effective, however, it would presumably take huge amounts of intervention to materially change the relative supplies of outside assets (e.g. government issued assets) denominated in various currencies (Hutchison, 1984). Furthermore, the rise of international capital mobility will likely make assets of different currencies closer substitutes in investor portfolios, and make it necessary to change even larger amounts of relative asset supplies to effectively influence risk premia and the exchange rate (Sarno and Taylor, 2001). The portfolio balance channel would therefore not seemingly be a key transmission mechanism through which sterilized intervention is likely to influence the exchange rate.

The traditional interpretation of the signaling channel focuses on the way sterilized intervention may provide new information about policy intentions and future fundamentals, especially monetary policy. The empirical evidence supporting this channel of sterilized intervention is also mixed. Kaminsky and Lewis (1996), for example, find that US intervention sometimes signals monetary policy indicators in the opposite direction of that predicted by the conventional signaling hypothesis. Fatum and Hutchison (1999), using daily data and a GARCH specification, find that intervention does not systematically signal future monetary policy (proxied by changes in the federal funds rate), but instead increases the uncertainty over the direction of the policy. Dominguez and Frankel (1993a,b), by contrast, find support for the signaling channel.

Even if it were effective, sterilized intervention working through the traditional signaling channel does not indicate that intervention provides a completely independent channel for monetary policy. If the intervention is indeed signaling future monetary stimulus or contraction, at some point this would need to be realized for this channel of transmission to continue to be operative. This may provide some leverage for short-term stabilization policy independent of monetary policy, but not over a sustained period.

Alternative Channels of Transmission

Specific channels of transmission such as portfolio balance and the traditional interpretation of signaling (as providing information about future policy) have been difficult to identify. Moreover, there are conceptual problems with both channels as instruments of policy—the magnitude of intervention that would need to be committed for the portfolio balance channel and the fact that signaling future monetary policy is not

really providing authorities with an additional independent stabilization policy instrument.

On this basis, it would seem that the other channels of transmission discussed in the introduction might be more plausible. Multiple equilibrium solutions, each consistent with the same set of fundamentals, and coordinating failures in the foreign exchange market appear consistent with recent currency crises. Some recent work also suggests that central banks may at times possess private information about future fundamentals and target values of foreign currencies. Accordingly, intervention might reveal such information and, depending on the prevailing market sentiment, influence market expectations and affect current exchange rates.² This “information signaling channel hypothesis” can be seen as nesting the “classical” signaling channel, through which sterilized intervention is effective in providing new information about monetary policy intentions and, if credible, information about future fundamentals.³ Further, the observation that intervention is occasionally successful may be consistent with the noise trader channel (Hung, 1997). That is, central bank interventions may work in the presence of so-called “chartists”, where positive feedback traders may support a bandwagon movement initially started by central bank intervention.

² See, for example, Baillie, Humpage and Osterberg (2000) and Humpage (1999).

³ See Fatum and Hutchison (1999) for a direct test of the “classical” signaling channel. The theoretical justification offered by the “portfolio balance” channel, through which sterilized intervention changes the currency denomination of relative asset supplies and thereby the exchange risk premium if assets are imperfect substitutes, has received little empirical support (see, for example, Edison (1993)).

These channels of transmission have not been adequately tested. Moreover, formal tests of these models are likely to be extremely difficult because they would require tests of expectations, commitment and intentions of officials and private market participants. The empirical evidence based on event studies, presented in the next subsection, provides support for sterilized intervention that is consistent with this set of models but does not rule out other explanations.

Empirical Evidence Based on Event Studies

Although there is some support for the effectiveness of sterilized intervention using time-series studies (see Sarno and Taylor, 2001), empirical work based on case studies, specific episodes or event study methodologies generally yield even stronger results. These studies have simply attempted to measure a reduced form link between intervention and exchange rates and not attempted to identify a particular model structure or channel of transmission.

Perhaps this is not surprising. As Fatum and Hutchison (2001) point out, standard time-series techniques (the standard for most studies in this area) may not be well suited when dealing with the analysis of intervention vis-à-vis the behavior of exchange rates. Exchange rates are typically highly volatile on a day-to-day basis, while intervention tends to come in sporadic clusters – viewed in this light it may seem less surprising that time-series based studies tend not to find strong evidence for a systematic link between exchange rate movements and intervention operations.

Although standard time-series techniques are problematic when dealing with data on exchange rates and intervention, the event study approach used in the finance

literature seems to fit well. Event studies are essentially case studies or studies of specific episodes, but done in a formal and structured way to allow statistical inferences to be drawn. Specifically, a cluster of intervention operations constitutes a natural candidate for identification as a single event.

In a descriptive study by Catte, Galli and Rebecchini (1994), 17 episodes of concerted intervention are extracted, all of which are deemed either “definitely” or “temporarily” successful.⁴ Similarly, Dominguez and Frankel (1993a) in one part of an extensive study look at eight major episodes of intervention activity and find that in each case the exchange rate moved during the subsequent month in the same direction as the intervention. (This may be termed the ‘direction’ criterion for intervention success). Extending this line of investigation, Fatum and Hutchison (2001, 2002b) undertake formal event studies for Bundesbank / Federal Reserve intervention and Bank of Japan / Federal Reserve intervention, respectively.

By construction, an event study is a very general test of a specific hypothesis and does not rely on a structural model of exchange rate determination. This may be desirable feature given the lack of consensus over the appropriate structural exchange rate model, but it does not shed light on the particular channel of transmission through which intervention affects the exchange rate.

Fatum and Hutchison (2001, 2002b) identify events as clusters of daily intervention activity. A cluster of intervention operations constitutes a natural candidate for identification as a single event (e.g. the \$11 billion purchase of USD by the Bank of

⁴ As pointed out by Dominguez and Frankel (1993a), the variable length of the “success criterion” seems problematic and it seems plausible that sterilized intervention is less potent than suggested by the three authors.

Japan on November 29-30, 1999). The issue of endogeneity arises in these studies, and almost all intervention, studies, since the central bank usually takes its queue to intervene on the basis of observed exchange rate movements. Since Fatum and Hutchison (and Catta et al 1994.) define intervention events as a "cluster" of related days of intervention activity, the final date of which is essentially the manifestation of when the central bank chooses to stop intervening. This approach may make intervention appear more effective. However, they argue that the appropriate measure of successful intervention is not the daily instantaneous impact on the exchange rate while the intervention activity is ongoing, but the cumulative effect after its completion

Fatum and Hutchison consider several alternative measures of intervention success (the "direction", "reversal" and "smoothing" criteria for success), and use non-parametric sign and matched sample tests to formally test whether intervention is effective in moving the exchange rate in the desired way. They find strong evidence in favor of the short-term effectiveness of sterilized intervention.⁵

In particular, their baseline non-parametric sign tests for Bundesbank and the Fed intervention events (i.e.. 2-day windows, with daily data over the 1985-95) show that 27 of 32 events are successful based on the "direction" criteria (i.e. cases where the subsequent movement in the exchange rate is consistent with the purchase or sale of foreign exchange by the central bank), 24 of 26 cases are successful based on the "reversal" criteria (i.e. cases where the exchange rate moved in the opposite direction conditional upon a leading against the wind policy was being followed), and 26 of 26 cases were successful based on the "smoothing" criteria (i.e. cases where the exchange

⁵ Short-term refers to the two, five, ten and fifteen day post-event periods during which the exchange rate movement is examined.

movement was either slowed or reversed conditional upon a leading against the wind policy was being followed). All of these results are highly statistically significant—it is extremely unlikely that repeated intervention success is a series of random events.

They find similar results are found for Japan (daily data over 1991-2000; 2 day event windows)-- 31 of 43 cases were successful using the direction criterion; 24 of 34 for the reversal criterion, and 29 of 34 cases for the smoothing criterion. Although only a few cases are available for the ECB, all cases of intervention that they have followed were also successful based on these criteria for success (Fatum and Hutchison, 2002a).

As a robustness check, they also investigate alternative event definitions (e.g. definition of intervention “clusters”) and vary event window length (e.g. period prior and after the intervention event). Moreover, they also consider cases of coordinated intervention and cases where intervention is supported by interest rate changes (monetary policy), and whether or not it is “secret” or reported in the newswires. Their findings are not sensitive to the various robust checks and model extensions undertaken, except in the case where the event window length is extended to 30 days. They argue, however, that the event study approach is not well suited to longer window lengths—too many observations dropped from the analysis when the window-lengths are extended to 30-days to give meaningful results. On balance, this body of work finds strong support for the short-run success of sterilized intervention in moving exchange rate values.

The event studies reviewed (Fatum and Hutchison, 2001, 2002b) and similar studies of intervention episodes (Dominguez and Frankel, 1993a; Catte et al., 1994) represent strong evidence on the short run effectiveness of sterilized intervention. These results are consistent with some earlier (e.g. Dominguez and Frankel, 1993a,b) and recent

work based on time-series methods (e.g. Fatum, 2000; and Ito, 2002). Sarno and Taylor (2001) conclude a recent survey by stating that the "...more recent literature [1990s] does suggest a significant effect of official intervention on both the level and the change of the exchange rates." (p. 862). It seems that the most recent literature provides even more support, even if it is short run in nature. But, as Dominguez and Frankel (1993a) emphasize, short-run effects can be very powerful if they play the role of bursting a speculative bubble. Intervention may also play a coordinating function in helping to influence private market expectations and move markets to a socially desirably equilibrium when several possible points are consistent with economic fundamentals.

3. Coordinated Intervention, Swaps, and Exchange Rate Arrangements

Most studies find that coordinated intervention has a stronger effect on exchange rate values than unilateral intervention efforts. In the study of Fed and Bundesbank intervention by Fatum and Hutchison (2001), for example, the limited sample of joint intervention operations (21 episodes using daily data) over the 1985-95 period were almost always successful (significant at the 99 percent confidence level despite the small sample). Catta et al. (1984) find that eight out of nine turning points coincide exactly with episodes of concerted intervention operations. They conclude: "The evidence surveyed in this chapter leaves little doubt about the importance of concerted intervention in explaining the behavior of the dollar from 1985 onwards" (p. 217). Dominguez and Frankel (1993a) conclude that intervention is more likely to be effective if it is publicly announced and concerted. Sarno and Taylor (2001) survey the literature on intervention and argue that the consensus appears to be that coordinated intervention operations are

especially effective. This result is intuitive since it indicates that both central banks are engaged in supporting the exchange rate and, if continued with full support, potentially unlimited reserves (one of the countries' domestic currency) could be committed to the intervention effort.

The empirical support for the effectiveness would seem to support recent efforts toward regional currency arrangements, especially to the extent that they also involve a commitment to "pooled" foreign exchange funds, bilateral swap agreements and other support mechanisms to ease financing constraints for intervention operations (see Kawai and Takagi, 2002). However, there are also some notable cases where even very large-scale coordinated intervention either did not work or only worked when it was both extremely large in magnitude and supported by unwavering political and economic commitment by *both* central banks (and governments) involved (of the appreciating and depreciating currencies).

The case of the disruption in the European Monetary System's ERM in September 1992 and again in July 1993 is instructive and demonstrates the limits to sterilized intervention in the short run even if coordinated with explicit exchange rate target values, and supported by bilateral swap agreements and short-term borrowing facilities. There were two types of interventions in the ERM: those at the margin and those conducted before the currency reached the margin. In the ERM, interventions at the margin were supposed to be compulsory for *all central banks in the system* and for unlimited amounts. The central bank of the country whose currency appreciated sold its own currency against the ERM member-currency at the margin exchange rate. The opposite was done by the central bank of the country whose currency was at the lowest part of the band. If the latter

central bank had no reserves, it could in principle borrow them from the issuer central bank through a swap arrangement. Precise terms for swaps were set, normally three months, and extensions were possible. Concerning the reserves acquired by the central bank of the strong currency, there was no obligation to hold them. The central bank could ask the issuer central bank to exchange them with its own currency. (See Smaghi and Ferri, 2001).

In practice, however, the system did not function seamlessly because the country with the weak currency had to repay the reserves borrowed through the swap arrangement. This essentially sterilized the effect of sterilization on the strong currency. And the intervention was not in practice unlimited since much of the intervention was based on swap agreements. The central bank of the weak currency expected that it would recover part of the reserves it sold on the market once the immediate pressure on the exchange rate subsided.

Smaghi and Ferri (2001) of the Italian Ministry of the Treasury, make the case that the interventions are not unlimited because the central bank of the strong currency can put pressure on the other central bank to devalue. They view greater Bundesbank support for the French Franc as opposed to the Italian Lire and British pound in 1992 as essential to the outcome:

Without the support of the central bank of the strong currency, the defense against a speculative attack can hardly be won. For instance, the survival of the French Franc in the September 1992 speculative attack was largely due to the support given by the Bundesbank to the Banque de France. The Banca d'Italia and the Bank of England did not instead enjoy such a support. We will not dwell on the reasons behind such a choice but just note that this decision was fundamental in determining the outcome: the Lira and the Sterling were devalued; the French Franc was not. The experience also confirms the fact that interventions at the margin are compulsory mainly for the central bank of the weak currency. (p. 12)

The view that the French Franc was given greater support by the Bundesbank, perhaps reflecting the strong political ties between Bonn and Paris, is supported by many sources at the time. The Bank for International Settlements, for example, wrote "...both the French and German authorities made it clear, by deeds as well as words, that they were adamant that the franc's parity was wholly the correct one. In particular, as was only later made public, a total of Fr.fr 160 billion (about \$32 billion) was spent on the currency's defense during the seven days up to 23rd September." (BIS, 1993; p. 188). Supporting the intervention operations, on September 23rd the central banks and finance ministries of France and Germany issued a rare joint statement stressing that there was no justification for an EMS parity change between the franc and D-Mark. (The Financial Times (London), September 24th, 1992; p. 1)⁶

Words and political commitment were apparently important, since the Bank of England and the Bank of Italy spent much larger amounts (\$160 billion for the Bank of England and \$200 million for the Bank of Italy) than France trying to defend their currencies in the four-month period ending in September 1992 but were forced to devalue (BIS, 1993; p.188). They did not enjoy as strong as public support from the Bundesbank or the German government to maintain their currency parities. The Bundesbank did initially intervene in large volume to support the Italian lira, but on only the second day of this activity (September 11, 1992) the Bundesbank invited Chancellor Kohl to Frankfurt to discuss intervention and asked for the application of the 'Emminger letter' of 1978

⁶ The French Finance Minister, Michel Sapin, expressed his defense of the Franc and animosity toward those selling the currency in no uncertain terms: "During the (French) revolution, such people were known as speculators and they were beheaded. We must

which stated that in circumstances where external stability had become a threat to domestic price stability, intervention could be suspending and a realignment sought.

Bundesbank officials at the time tried to initiate realignment in the ERM. (Gros and Thygesen, 1998; p. 96). In this context, Collignon et al. (1994) conclude that:

Although the Bundesbank never stopped adhering to the letter of its obligations, it made it perfectly clear that it was not prepared to finance interventions of unlimited amount in favor of countries whose fundamental exchange rate misalignment required adjustment. In doing so, the Bundesbank was able to refer to a non-specified agreement with the German government whereby the German government will safeguard the Bundesbank from its intervention obligations, if they would threaten the stability of the German currency...In legal terms the German government had committed its monetary authority and signed the EMS agreements under international law, but in practical terms it had provided an opt-out by simultaneously making the application of the agreement condition on domestic considerations...In 1992, the double binding message about the EMS was a source of confusion for capital markets and fueled speculation. (pp. 23-4).

Ultimately, of course, the French franc and other currencies again came under pressure and a decision was made to widen the bands of the ERM to +/- 15 percent of the central parity values on 1st August 1993. With margins as wide as 15 percent, however, the ERM essentially moved to a *de facto* flexible rate system. The existing exchange rate alignments within the ERM were seemingly not sustainable, even with substantial intervention, because political support for the system was waning. The BIS (1994) summed up the problem as follows:

For it was the Bundesbank alone which could provide the necessary volume of resources for intervention, but only by risking an unacceptable rise in the German money supply and imposing onerous repayment obligations on countries borrowing under the very short-term financing facility (VSTF) of the EMS and bilateral credit facilities. (p. 168)

make the speculators pay...hit them where it hurts—in their wallets.” (The Financial Times (London), September 24th, 1992; p. 1).

The basic problem in the ERM was clear. Countries eventually chose domestic macroeconomic stabilization over exchange rate stabilization. Germany and the Bundesbank were not willing to substantially ease policy in the face of rising inflationary pressure. The other key countries involved (i.e Italy, the UK, and France) were willing to expend large amounts of international reserves on intervention, but ultimately not willing (or at least not perceived by market participants not to be willing) to sufficiently tighten monetary policy to stabilize exchange rates. These countries raised interest rates in defense of the ERM parity values, but their commitment to this policy course was limited and the devaluation option was taken. The Bundesbank also did not alter policy sufficiently to maintain currency values, and from the beginning (at least for the UK and Italy) it lobbied for realignments in the ERM to relieve economic and political pressure from its own policy. ERM parities could only have been maintained by greater efforts at policy coordination; unsterilized intervention rather than sterilized intervention would have contributed to that objective.

Swaps Arrangements and the Chiang Mai Initiative

A key element of the May 2000 Chiang Mai Initiative (CMI) is to build a regional financing facility by strengthening the long-standing ASEAN Swap Arrangement (ASA) and introducing bilateral swap and repurchase arrangements for the ASEAN+3 members (China, Japan and Korea). Extensive swap arrangements, of course, are commonplace even in the absence of regional currency arrangements or the commitment to a

coordinated intervention policy.⁷ Following the CMI agreement, the ASA was expanded from \$200 million to \$1 billion in November 2000. The regional network of swap arrangements is presently being developed and in principle will create a new set of bilateral swap arrangements among Japan, China and Korea as well as between each of these and any one of the ASEAN countries. As of May 2002, bilateral swap arrangements between Japan, on one side, and Korea (\$7 billion), Thailand (\$3 billion), Philippines (\$3 billion), Malaysia (\$3.5 billion), and China (\$3 billion equivalent) had been signed. China has also a \$3 billion swap agreement with Thailand. (See Kawai and Takagi, 2002, for a detailed discussion of regional currency arrangements and the CMI).

Several interesting features of the CMI agreement stand out. First, the swap amounts are relatively small relative to aggregate reserves, both for Japan and the other countries. Korea, for example, had \$102 billion foreign exchange reserves at year-end 2001 (22 percent of GDP) and its swap agreement with Japan amounted to only \$7 billion. The swap with Japan augments the foreign exchange that the Bank of Korea could immediately draw upon by only 7 percent. Further, the amounts appear small in

⁷ For example, the United States rarely intervenes in foreign exchange markets and presently has no commitment to particular bilateral exchange rate values. Nonetheless, the United States in 2002 had swap arrangements with Mexico and Canada. And, after September 11th of 2001, the European Central Bank (ECB) signed a swap arrangement with the United States (\$50 billion in effect on September 12th and used in the following two days). Similarly, although not participating in the ERM, the Norwegian central bank (Norges Bank) had swap arrangements with members of the system. Until the end of 2001, Norges Bank also had a swap arrangement with the ECB and the Bank of England. Its swap agreements were not renewed, however, because "...the krone no longer had any defined relationship with the European currencies" after the monetary policy regime changed in March 2001. (Norges Bank Annual Report 2001, p. 41).

relation to the foreign exchange reserves expended in the 1997 Asian currency crisis or other currency attacks. International reserves in Korea, for example, fell by \$31 billion in the currency crisis of 1997 (IMF Staff Country Report 1998/73, August 1998, Republic of Korea Statistical Appendix, p. 28). The amount of concerted intervention involved in defense of the ERM currencies in 1992-93, ultimately unsuccessfully, was on the order of hundreds of billions of dollars.

Second, the USD and the domestic currency are the swap currencies in every case except Japan-China. That is, the Bank of Japan (Bank of China) is agreeing to supply USD in the swap agreements, not the yen (yuan). These arrangements would seem to be more a case of “pooling reserves” than a commitment to bilateral intervention to stabilize regional bilateral currency values (such as the former ERM).

Third, reserve pooling is not an apt description of the CMI since it clear that the Bank of Japan would bear the burden of supplying hard currency (USD) reserves to the system. Japan may be a beneficiary of a rise in regional currency stability that might result from the CMI, but the agreement was not designed to be symmetrical in terms of mutually beneficial currency swap arrangements. This is clear in the press statement issued by the People’s Bank of China, following its agreement with the Bank of Japan where the yen and yuan were the swap currencies:

Japan has already concluded similar currency swap agreements—which help countries deal with short-term cash problems—with South Korea, Malaysia, Thailand and the Philippines. Under those accords, Japan is expected to provide U.S. dollars to the other countries’ central banks if their currencies plunge. China, however, has large holdings of U.S. currency—so under Thursday’s agreement, Japan is expected to supply the Chinese central bank with Japanese yen if Beijing needs to defend it currency by selling yen for Chinese yuan. (People’s Online Daily, March 29, 2002).

Fourth, financial support under the CMI initiative includes linkages to IMF and spells out conditions for maturity and interest rate structure. Drawings from the BSA could be continuously renewed, but penalty interest rates would eventually be imposed. Most restrictive, however, is that only the first 10 percent of the BSA facility could be obtained immediately. Thereafter, disbursements would only be provided in conjunction with an IMF program or an activity Contingent Credit Line (Kawai and Takagi, 2001; p 54). That is, CMI is essentially an additional source of funds to supplement IMF and other credit facilities and would be subject to macroeconomic conditions and surveillance associated with IMF programs.

The Role and Effectiveness of Intervention and Swap Agreements in the CMI

Little progress has been made in the area of exchange rate coordination in East Asia. The CMI has a very limited set of objectives, and upon inspection, access to funds for intervention purposes is quite limited. In this sense, it amounts to only a modest step toward a regional financing facility for Asia. The limited size of the ASA and the BSAs, as well as the conditions attached to drawing on the facilities and repayment, would not seemingly provide much support for central banks in the region attempting to fend off currency speculation.

Limited resources, and the limits to sterilized intervention generally, suggest that the CMI will not have much effect on exchange rate stability in Asia. A more effective approach perhaps is Korea's rapid buildup of international reserves, combined with her resolve to avoid future currency crises and emergency international financing packages.

Moreover, the lack of political commitment to regional exchange rate stabilization or coordinated intervention in the Chiang Mai Initiative is noteworthy. Japan, for example, has only committed a small fraction of its international reserves (US \$ 420 billion as of May 31, 2002) to the Chiang Mai Initiative (a total of USD 16.5 billion or 4 percent of its total international reserves committed to new BSAs). Moreover, Japan has not made other commitments to purchase large amounts of ASEAN, Korean or Chinese domestic currencies against either USD or Yen to support their exchange rates were they to come under pressure. And, of course, the Asian countries agreeing to the CMI have not agreed to coordinate monetary policies if needed to stabilize exchange rates.

4. Conclusion

Empirical work based on event study methodologies is much more supportive of the effectiveness of sterilized intervention than most work base on time-series methodologies. This may be because time-series methodologies are not particularly well suited to study data characterized by sporadic, infrequent (daily) and intense “clusters” of official intervention juxtaposed against highly volatile and continuous movements in daily exchange rates. By contrast, the event study methodology works well with these data characteristics. Event studies do not allow structural tests of models, however, and therefore do not explicitly shed light on the particular channel of transmission through which intervention may affect the exchange rate. Identifying specific channels of transmission is desirable, but a very ambitious task in the absence of reliable and empirically verifiable models of exchange rate determination.

The event studies reviewed in this article, combined with other evidence reviewed in Sarno and Taylor (2002)—especially the work of Dominguez and Frankel (1993a,b)—and other recent work (e.g. Fatum, 2000; and Ito, 2002) suggests a limited role for sterilized intervention and that it should play a part in short-run stabilization policy. An even stronger case may be made for concerted or coordinated sterilized intervention operations.

Although sterilized intervention may be effective, the event studies reviewed in this article only find a short-run effect on exchange rates. This is not evidence against longer-term effects, only that the event study methodology is not well suited to measuring exchange rate effects over longer periods due to data limitations, i.e. overlapping intervention episodes reduce the number of observations. Moreover, short run effectiveness may itself be considered a substantial success if it “...includes the bursting of a nine-month bubble earlier than it otherwise would have burst, then such an effect may be all that is needed.” (Dominguez and Frankel, 1993; p. 140).

Nonetheless, the limits to sterilized intervention in fixing exchange rate parities were clearly demonstrated by the experience of the European Monetary System in 1992-93. Large reserves, a commitment to coordinated (and, in principle, unlimited) sterilized intervention, swap agreements, short-term borrowing facilities and even a long-standing political commitment were not enough to sustain the ERM in the face of uncoordinated monetary policy and large speculative capital flows. In this instance, huge sums of foreign exchange were expended intervening in the market in a futile attempt to maintain the ERM parity grid. The French franc was supported successfully in the currency turbulence in September 1992, but not the Italian lira and British pound, in large part due

to both the economic and political commitments of the central banks and governments of France and Germany. But this commitment did not extend to materially changing domestic monetary stances in the two countries, i.e. allowing intervention operations to be unsterilized. The French franc again came under pressure the following summer and the ERM in practice stopped functioning. Sterilized intervention was effective in the short run when it was backed by political commitments, but exchange rate stability in the ERM over a longer period also would have necessitated a coordinated monetary policy or the acceptance of German policy by other ERM members.

In this light, the potential of the Chiang Mai Initiative in stabilizing exchange rates in Asia may be questioned. The CMI consists mainly of bilateral swap agreements between Japan and other Asian countries whereby the Bank of Japan would provide USD liquidity to help these countries intervene in foreign exchange markets. These swap agreements are limited in size and impose strict conditions on borrowing and repayment, e.g. 90 percent of the swap amounts would normally only be disbursed in conjunction with an IMF program. The CMI may be a first step towards a regional financing facility and greater currency stability in the region, but a very small step. The evidence on the effectiveness of sterilized intervention reviewed in this article indicates that a much greater economic and political commitment the CMI—including both concerted intervention and monetary policy coordination- would need to be taken by Japan *and* the other countries in the region to attain greater exchange rate stability in Asian. The limited additional resources for unilateral sterilized intervention provided by the CMI will not play a significant role in exchange rate stability in the region.

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