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CENTER FOR INTERNATIONAL AND DEVELOPMENT ECONOMICS RESEARCH
Working Paper No. C95-047

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Barry Eichengreen, Andrew K. Rose, and Charles Wyplosz

January 1995

Department of Economics

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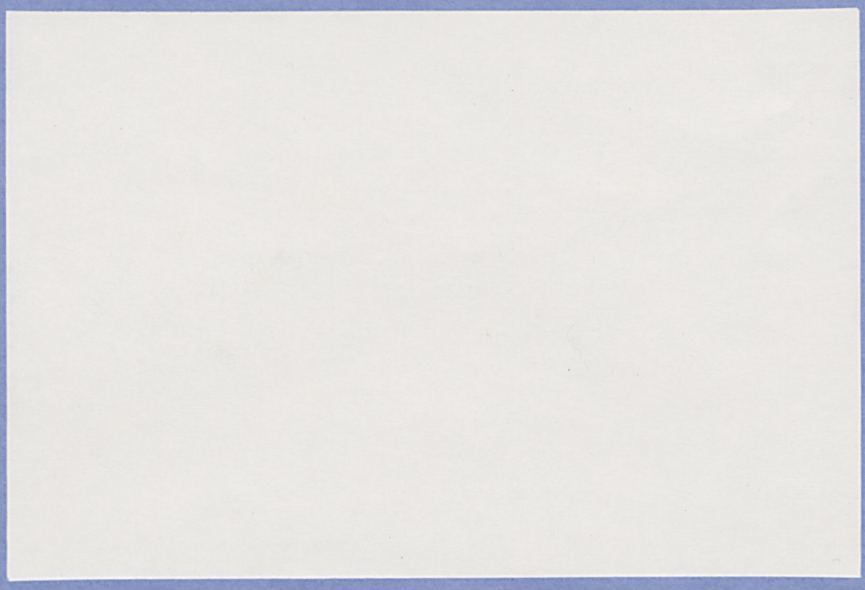

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UNIVERSITY OF CALIFORNIA AT BERKELEY

Department of Economics

Berkeley, California 94720-3880

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Key words: speculative attacks; EMS; exchange rates; exchange rate crisis

JEL Classification: F31, F32

Barry Eichengreen is John L. Simpson Professor of Economics and Professor of Political Science at the University of California, Berkeley, Research Fellow of the CEPR and Research Associate of the NBER. Andrew Rose is Associate Professor at the Haas School of Business, University of California, Berkeley, Research Fellow of the CEPR and Research Associate of the NBER. Charles Wyplosz is Professor of Business at INSEAD and Research Fellow of the CEPR. For comments and suggestions we thank, without implicating, Javier Alonso, Vittorio Grilli, Assar Lindbeck, Luis Linde, Jorge de Macedo, Philippe Moutot, William Perraudin, Torsten Persson, Lars Svensson, Jose Vinals, and seminar participants at the Institute for International Economic Studies at the University of Stockholm and the NBER/CEPR/Bank of Italy Conference on Foreign Exchange Market Micro-Structure. Assistance was provided by Florence Béranger and Luis Freitas de Oliveira.

Abstract

This paper provides evidence on the effects of capital controls. We show that controls have been associated with significant differences in macroeconomic behavior, especially in monetary policy. While they have not prevented speculative attacks, they have provided the breathing space needed to organized orderly realignments. We also provide evidence on the channels through which speculative attacks operate, showing that bank lending to nonresidents is a key transmission mechanism. We conclude with a discussion of measures that mimic some of the effects of controls as a way of easing the transition to European Monetary Union. Non-interest-bearing deposit requirements on lending to nonresidents are proposed as a third-best route to monetary union.

Barry Eichengreen
CEPR, NBER and
Department of Economics
U.C. Berkeley
603 Evans Hall
Berkeley, CA 94720
Tel: (510) 642-2772
Fax: (510) 642-0926
eichengr@econ.berkeley.edu

Andrew K. Rose
CEPR, NBER and
School of Business
U.C. Berkeley
350 Barrows Hall
Berkeley, CA 94720
Tel: (510) 642-6609
Fax: (510) 642-5018
arose@haas.berkeley.edu

Charles Wyplosz
CEPR, and
INSEAD
Boulevard de Constance
Fontainebleau
77305 France
Tel: +33 (1) 60724234
Fax: +33 (1) 60724242
wyplosz@insead.fr

I. Introduction

The 1992 and 1993 crises in the European Monetary System redirected attention toward proposals for regulating the foreign exchange market. Academics (including two authors of this paper) argued for a Tobin tax on foreign exchange transactions or the imposition of non-interest bearing deposit requirements on banks with open positions in foreign exchange as a way of smoothing the transition to European Monetary Union (EMU).[1] European Commission President Jacques Delors mooted the idea of reimposing capital controls. The Monetary Subcommittee of the Committee on Economic and Monetary Affairs of the European Parliament called on the European Commission to submit detailed proposals for regulating foreign exchange transactions (European Parliament 1993). Others (Goldstein et al. 1993, Mussa and Goldstein 1994) voiced skepticism about the desirability and effectiveness of such measures.

This controversy rekindled interest in the role played by capital controls in the operation of pegged-exchange-rate systems. Some authors (e.g. Wyplosz 1986, Giovannini 1989) have argued that controls played an important role in virtually all systems of pegged exchange rates since World War II. In this view, controls reconciled a modicum of policy autonomy with the commitment to pegged exchange rates, provided the authorities breathing space to organize orderly realignments, and made it easier to rebuff speculative attacks not grounded in fundamentals. Others (e.g. Gros 1987, Gros and Thygesen 1992, Truman 1994) have argued that capital controls were always easy to evade and never played a major role in limiting exchange rate flexibility.

In this paper we seek to advance this debate. Using data for 22 countries over 25 years, we show that capital controls have been associated with significant differences in the

behavior of such macroeconomic variables as budget deficits and money growth rates. This supports the view that, historically, controls have made a difference.

This evidence provides the point of departure for the second half of the paper, where we argue the case for measures, specifically non-interest-bearing deposit requirements on lending to nonresidents, which mimic some of the effects of capital controls as a way of easing the transition to European Monetary Union (EMU). Our focus here is on temporary measures and on Europe, rather than on the case for regulating foreign exchange transactions in general. It is motivated by the problem of how to complete the transition to EMU. We take this objective as given and ask whether non-interest-bearing deposit requirements are needed to achieve it.

The argument for deposit requirements runs as follows. The Maastricht Treaty on Economic Union and the Single European Act to which it is a successor mandate the removal of capital controls by EU countries and their maintenance of exchange rate stability for an extended period as prerequisites for participating in EMU. The removal of controls and the extended period of exchange rate stability may be incompatible, however, for the absence of controls increases the cost borne by monetary authorities seeking to defend themselves against speculative attacks of the sort that buffeted the EMS in 1992-93.[2] It is therefore necessary to alleviate this predicament. We provide evidence on the channels through which speculative pressures are transmitted and therefore on the appropriate nexus for intervention. We discuss political constraints associated with the Treaty and suggest that they provide a justification for the selective use of deposit requirements.

The rest of the paper is organized as follows. In Section II we present evidence on the effects of controls. Section III discusses the transmission of speculative pressure and the feasibility of alleviating it through the imposition of non-interest-bearing deposit requirements on bank lending to nonresidents. Section IV draws out the implications for the Maastricht Treaty and the 1996 Intergovernmental Conference (IGC). Section V is a brief conclusion.

II. Historical Evidence on the Operation of Capital Controls

In this section we compare the behavior of macroeconomic variables during periods of tranquility and speculative pressure. We ask whether there are differences in the behavior of such variables when capital controls are in place. A negative answer is consistent with the view that controls are an ineffectual policy instrument. Evidence that the behavior of macroeconomic variables differs significantly when controls are present does not *establish* that controls are responsible for those differences, of course; a government might prefer both controls and certain macroeconomic policies even if the two are causally unrelated. But a finding of differences in the stance of macroeconomic variables is at least consistent with the view that capital controls are a policy tool of economic significance.

To analyze the behavior of economic variables around the time of speculative attacks, it is necessary to have a selection criterion for attacks that does not bias one toward finding certain patterns in the data. Large exchange rate changes are not the same thing as speculative attacks on pegged rates. For one thing, not all attacks succeed. In addition, large month-to-month changes in exchange rates are sometimes observed when rates are floating freely and it is impossible to launch an attack on the official reserves because the

authorities are not intervening. When exchange rates are pegged, attacks can be rebuffed by raising interest rates (relative to those prevailing abroad) and/or by committing international reserves. Examining only successful attacks might bias one toward a particular characterization of why attacks occur. In particular, considering only attacks that succeed is likely to lead one to conclude that controls are ineffective.

An alternative is to construct an index of speculative pressure comprised of a combination of exchange rate changes, reserve changes and interest rate changes, as we did in Eichengreen, Rose and Wyplosz (1994).[3] Changes in exchange rates will be observed when the authorities are unwilling or unable to resist pressure to realign. (We consider only countries and periods when currencies were pegged under the provisions of explicit bands such as the Bretton Woods System, the Snake and the EMS.) Increases in interest rates and declines in reserves will be observed when the authorities seek to defend the exchange rate against attack.

We weight the three components of our index so that their conditional volatilities are equal.[4] We construct this measure using monthly data for the OECD countries and selected other economies drawn from the cd-rom version of *International Financial Statistics*. We supplement this with information on capital controls from the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* volumes from 1967 through 1992.[5]

We take Germany as the reference country, computing changes in exchange rates, interest rates, international reserves, etc., relative to their German values. We specify a threshold for the index of speculative pressure (typically two standard deviations from the sample mean) and categorize as attacks all months in which its value exceeds that threshold.

To avoid treating successive months when a currency came under attack as separate episodes, we define an exclusion window (typically plus or minus six months) and disregard crises other than the first that fall within the window. As a control group of non-crises against which our crises can be compared, we take all other non-overlapping periods that are left once the episodes of speculative attack are removed.[6]

These data have a number of limitations. First, published series on international reserves are imperfect. Central banks sometimes report only the gross foreign assets of the monetary authorities. Since a standard procedure is to arrange for stand-by credits in foreign currency, this is a potentially serious problem. When the authorities intervene, they draw on their credit lines without having to sell reported foreign assets. Even countries which provide data on foreign liabilities omit a number of operations which are typically undertaken during periods of speculative pressure, such as off-balance-sheet transactions like swaps and forward market intervention.[7]

Moreover, intervention by foreign central banks may be hard to detect. Because we analyze changes in the reserves of each country relative to changes in German reserves, we will pick up intervention by the Bundesbank in support of foreign currencies. Intervention by third countries will not be detected, however. Insofar as Germany has been the strong-currency country on which the bulk of foreign intervention obligations have fallen (especially within the EMS), this will not be a serious problem. But even in the EMS, intervention has been undertaken by third countries (by the Netherlands, for example), which we will not capture.

Moreover, monthly data may not be of a sufficiently fine periodicity to identify every attack (especially unsuccessful ones). Pressure against pegged currencies can mount quickly and be repelled within the month through interest-rate increases or foreign-exchange-market intervention. If an attack is launched and repelled in a matter of days, the average behavior of interest rates and international reserves over the month may not reveal its intensity.

Finally, the available measures of controls provide only blunt indicators of their prevalence. Here we use the IMF's binary indicator of the presence of restrictions on capital transactions.[8] This crude measure provides minimal information about the intensity of controls. Given the scope for measurement error, we would not be surprised if the variable had little explanatory power; correspondingly, we take seriously any positive results.

The list of speculative crises that results from the application of this methodology to data for post-1966 exchange rate pegs in the 22 countries is discussed in Eichengreen, Rose and Wyplosz (1994). It includes prominent devaluations and realignments of OECD currencies but also a number of episodes in which interest rates were increased significantly and/or international reserves were run down.

We start by considering the distributions of macroeconomic variables. We first examine crises and ask whether the behavior of these variables when there were capital controls in place differs significantly from their behavior in the absence of controls. Given the limited sample size, we provide two non-parametric tests of the equality of distributions; the Kolmogorov-Smirnov test, which considers the entire distribution, and the Kruskal-Wallis test, which focuses on the median. We provide a t-test for the equality of the sample means in the presence and absence of controls. We then compute identical test statistics for periods

of tranquility (i.e. non-crises). Finally, we provide an analogous set of statistics for actual realignments and changes in exchange rate regime, which we dub "events" to distinguish them from crises.

Table 1 reports the basic results. The left-most panel considers attacks ("crises"), while the right-most panel refers to tranquil periods ("non-crises"). Using the Kolmogorov-Smirnov statistic, we cannot reject except at the 26% confidence level the null that the distribution of fiscal ratios (the ratio of the budget balance to GDP) is identical for crises that took place in the presence and absence of capital controls. The same is true for the level of the real exchange rate, for the level of the interest rate differential and for the differential rate of growth of foreign exchange reserves. On the other hand, we can reject the null that the inflation differential, the smoothed trade balance (the ratio of exports over imports), domestic credit and money growth are distributed equally for crises that took place in the presence and absence of capital controls.[9]

Parametric tests reject the null of equal means for inflation, the trade balance and money growth. The differential rate of money growth was 1.9 per cent (annualized) for speculative crises with controls in place and -6.6 per cent for crises where controls were absent. Similarly, the rate of growth of domestic credit (relative to Germany) was faster and trade deficits were larger when controls were in place, while inflation rates were higher and more variable.

The role of capital controls is more striking still when we consider the non-crisis observations in the right-hand panel of Table 1. We are able to reject the null of equal distributions and equal means for each variable except reserves and possibly budget deficits.

Rates of growth of money and credit are faster, real overvaluation is greater, and budget and trade deficits are larger for countries not experiencing speculative attacks but with capital controls in place.

This evidence is consistent with the view that controls made a difference. Countries with controls in place followed more expansionary monetary policies, as manifest in faster growth of money and credit and higher rates of inflation. One might expect to see the strongest evidence of the effectiveness of controls in the behavior of interest rate differentials and the growth of foreign exchange reserves, with countries applying controls enjoying lower interest rates and smaller reserve loss. In fact, interest rates appear to have been higher rather than lower, which may be explicable in terms of the existence of a political risk premium in countries with controls in place.

We cannot reject the null that the level of foreign exchange reserves was unaffected by the presence of controls. This may provide the key to understanding how countries utilize the instrument. Controls do not allow countries which pursue policies inconsistent with a peg to keep their exchange rate unchanged forever. They do not prevent attacks, nor do they permit countries to avoid reserve losses or interest rate increases when attacks occur.[10] Controls merely render expansionary monetary policies viable for a longer period by attenuating the link between crises and exchange rate regime collapse.[11]

This characterization is corroborated by Table 2. It reports the percentage of periods (for crises and non-crises) when controls were in place. It shows that the incidence of crises was proportionally *higher* when controls were present. A chi-square test confirms that this difference is statistically significant.

In Table 3 we shift our focus from "crises" to "events." "Crises" are identified by our index of speculative pressure irrespective of whether there has been a change in the exchange rate. An "event," in contrast, corresponds to a realignment or a change in exchange rate regime.[12] The analysis of events in Table 3 confirms the findings of Table 1, strengthening the case that controls have a clear effect.

Table 4 is an analog to Tables 1 and 3. It too reports a series of tests of the null hypothesis of equality of distributions of macroeconomic variables in the presence and absence of controls. But unlike Tables 1 and 3, which examine crises and events, Table 4 looks at successful and unsuccessful attacks. A successful attack is a crisis which coincides with an event (precisely, with the absence of a non-event); an unsuccessful attack is a crisis which is not an event. The impression conveyed by Table 4 is similar to that of Table 1; capital controls are associated with significant differences in macroeconomic behavior, especially looser monetary policy.

Table 5 is analogous to Tables 1, 3, and 4 but *conditions* on the presence or absence of capital controls rather than *testing* for differences in distributions. Whereas Tables 1, 3, and 4 condition on crises, events, and successful attacks, Table 5 conditions on the presence or absence of controls. It tests null hypotheses such as "successful attacks (crises, events) are different from unsuccessful attacks (crises, events) in the presence of controls." Controls again appear to make a difference in the sense that their presence is associated with statistically significant differences in the distributions of a number of macroeconomic variables. By comparison, differences in macroeconomic behavior are more unusual in the absence of controls.

This body of evidence, taken together, is difficult to reconcile with the view that capital controls were ineffectual—that they were too easily evaded to provide authorities with significant policy autonomy in periods when exchange rates were pegged.

III. The Mechanics of Speculative Attacks

In the last section we reported evidence that capital controls make a difference. Here we examine the channels of speculative activity in more detail in order to identify forms of intervention that are most likely to be effective in influencing the development of speculative attacks.

A. An Illustration

The mechanics of currency speculation are described in Goldstein et al. (1993). Most transactions take the form of forward contracts—swaps and options, for example—rather than spot purchases and sales. As soon as one moves beyond partial equilibrium, however, it becomes obvious that virtually all such transactions involve the spot sale of the currency under attack coupled with borrowing in that currency.

Consider an attack against the French franc. A firm or fund manager contracts with Bank A to sell the franc against the DM forward. This transaction is shown in the balance sheet in Table 6 for a forward rate of 3 F/DM. Bank A now has a long open position in francs which it typically does not wish to take. It therefore sells forward to another bank (Bank B) the francs it purchased from its customer, at the same time buying forward the DM it is obliged to deliver. While Bank A is now hedged, Bank B is in the same position as

Bank A at the previous step.[13] Bank B will now attempt to cover its position by undertaking a similar transaction with another bank.

There may be a series of such transactions. But the bank at the end of the chain (Bank B, to keep matters simple) will still have to sell francs spot against DM. Since Bank B must find the francs that it will sell spot, it must borrow them. (Typically, Bank B will simultaneously borrow the francs and lend DM for one month to cover the maturity mismatch, but this is not essential to the argument.) As shown in Table 6, Bank B is hedged; it now holds in its portfolio the DM that it has contracted to sell to Bank A and owes the francs it is committed to buy.

In this example, it makes no difference whether traders deal in derivatives and whether they are residents or nonresidents, aside from the fact that derivatives can be off balance sheet. Imagine that Monsieur Dupont, a French fund manager, buys on June 15th from his bank a F 100,000 European put option on the franc, to mature on September 1st. He can now sell francs and receive dollars. The bank selling this option is in the same position as Bank A in the preceding example; it is committed to buying francs (normally against dollars) on September 1st. Hedging will therefore take the same form as before, with the bank borrowing F 100,000. Similarly, a swap is a combination of a spot and reverse forward transaction; Monsieur Dupont sells francs spot and buys them forward. His bank in effect lends him francs during that period and earns the rate of interest implicit in the forward discount.

For present purposes, then, currency speculation can be described as being comprised of the following elements. An agent takes an open position, usually against a bank. That

position will have associated with it a spot sale of the currency under attack, forcing the central bank defending its currency peg to draw down its reserves. While the chain of subsequent transactions may involve different agents and financial instruments, it necessarily entails a loan of domestic currency originating in the home country. There are two places where currency can be obtained: from the banking system of the country in question (including its central bank) and from domestic-currency-denominated assets held abroad.

This becomes apparent when it is acknowledged that any speculative attack necessarily entails the following transactions. Speculators first obtain from banks the currency which is to be sold on the spot market. Banks then borrow that currency on the money market. The only agent buying the currency in such periods is the central bank, which, in so doing, drains liquidity from the market.[14] If, to prevent interest rates from rising to politically unsupportable levels, the central bank sterilizes its exchange market operations and lends the domestic currency, it fuels additional speculation.

Consolidating these transactions (canceling, among other items, interbank loans) reveals that what is left is domestic currency lending by the banking system to the rest of the world. The central bank lends on domestic markets to resident commercial banks, which lend to non-residents.

B. Evidence

The importance of these transactions during periods of speculative activity is documented by Table 7, which presents data for France and the U.K. during the 1992 ERM crisis. It is apparent that the net asset position in francs of French commercial banks

increased by amounts broadly comparable to the reported foreign exchange losses of the Bank of France.[15]

The role of banks as key players in periods of speculative crisis can be further documented by tracing the evolution of their portfolios. As episodes of speculative pressure, we again use the "crises" identified above. Figure 1 presents histograms depicting gross and net bank lending to nonresidents, distinguishing banks from non-banks and gross from net lending.[16] We compare the rate of change of assets and liabilities during "crisis" and "non-crisis" periods. In the upper left corner, for example, we present the distribution of growth rates of gross bank assets during tranquil periods and directly below during speculative attacks. Variability appears to be higher during attacks. Analogous differences are evident in the behavior of net assets but not gross liabilities. This is consistent with the view that banks are engaged in domestic-currency lending to non-residents during periods of speculative attack, since when we distinguish the position vis-à-vis non-resident banks and non-banks we see that the higher variability is attributable entirely to the gross asset positions of domestic banks vis-à-vis non-resident banks.[17]

Table 8 provides Kolmogorov-Smirnov, Kruskal-Wallis and t-tests of the null that the variables depicted in Figure 1 are identically distributed during crises and non-crises. The results indicate that total and net assets and liabilities have significantly different distributions during crises and non-crises. This is not true, however, of either bank or non-bank assets (or bank liabilities) separately.

Figure 2 provides additional evidence for Spain and France during the 1992-1993 EMS crises. The thick line shows the foreign exchange losses of the Bank of Spain. The

various speculative episodes are evident, as is the reflux of reserves following each realignment. The thin line depicts foreign lending by banks—the increase in their net asset position vis-à-vis the rest of the world. It shows that reserve losses have as a counterpart commercial bank transactions. The figure for France presents Bank of France data which separates out bank loans according to their currency of denomination (francs versus others). The co-movement of commercial bank net lending in francs and foreign exchange reserve losses is unmistakable.

We conclude that bank lending is a major channel through which currency traders obtain the assets they sell during speculative attacks. It might be objected that there exists another source of these holdings, namely those of non-bank agents, including households and firms. But households and firms require much of the money they hold for transactions purposes and lack the specialized knowledge of professional currency traders. The available data do not indicate much change in the money holdings of households and firms around the time of speculative attacks.

What can be sold quickly, in principle, are the assets of pension funds and other institutional investors. It is difficult to ascertain the amounts held in different currencies by these entities. Table 9 provides the total value of non-local assets held by these funds. This $220 billion total is probably held mostly in U.S. dollars and German marks. Assume that ten per cent is held in French francs. If pension funds were to liquidate all of their franc-denominated assets, this would represent sales of $22 billion. While this is a large amount, the assets of pension funds, once liquidated, cannot play a further role in speculative dynamics. Lending in domestic currency by banks, in contrast, can continue indefinitely so

long as the central bank sterilizes its foreign exchange intervention. This is the distinction between an unlimited source of speculative capital and a one-time sale of assets.

IV. Alleviating Speculative Pressure During the Transition to EMU

In earlier work we argued that macroeconomic convergence was not a sufficient condition to preclude speculative crises affecting EMS currencies because of the possibility of self-fulfilling speculative attacks. Here we have provided evidence consistent with the notion that capital controls are important for the timing and incidence of balance-of-payments crises. We have identified the channels which must be affected in order to contain speculative pressure. This section brings these elements together and draws out their policy implications. It analyzes the feasibility of restrictions on domestic-currency lending to non-residents as a device for containing speculative pressure in the final stages of the transition to EMU.

A. The Problem of Self-Fulfilling Attacks

The Maastricht Treaty specifies conditions under which a country will qualify for participation in Europe's monetary union. One is that its exchange rate must remain within the "normal" ERM bands without being devalued for at least two years prior to entry. This means that during the last two years of the transition, a balance of payments crisis which forces a country to devalue or to suspend its membership in the ERM effectively precludes its participation in EMU.

To these worries, officials respond that countries need only adopt policies of convergence sufficient to insure that their exchange rates are held within the normal ERM

bands for the requisite period. The problem is that a commitment to policies of convergence and policy harmonization may not suffice to hold the exchange rate stable. This will be the case when there exists scope for self-fulfilling speculative attacks of the sort analyzed by Flood and Garber (1984b) and Obstfeld (1986). In their models, even countries which are fully committed to exchange rate stability and have pursued policies consistent with the maintenance of stable rates may fall prey to speculative crises.[18]

In theory, a central bank can discourage banks from lending to domestic or foreign residents by using the traditional instruments of monetary policy. It can limit the supply of loans relative to demand if it is willing to allow interest rates to rise. But given the large capital gains available in short order in the event of a realignment, it may be necessary to allow interest rates to rise to very high levels, as illustrated by the case of Sweden in October-November 1992 and by Greece in May 1994. This may prove politically unsupportable and render a speculative attack self-fulfilling. The interest-rate defense will therefore fail because the markets know that it is too costly to maintain.

Consider a country willing to endure high interest rates and other forms of austerity now in return for qualifying for EMU later. Its past and current policies may be entirely consistent with the maintenance of exchange rate stability. If a speculative attack occurs, however, it will be forced to raise interest rates. The costs of austerity now rise relative to the benefits of EMU membership later, which may lead the government to conclude that the cost of qualifying for EMU is suddenly too high. Once it forsakes the lure of EMU membership, it has no reason to resist shifting policy in a less austere direction; and the markets, aware of its incentives, have reason to attack.

Note that the shift in policy in a more expansionary direction is contingent; there is no reason for it to occur in the absence of the attack. In this setting, in other words, speculative attacks can be rational and self-fulfilling. Eichengreen and Wyplosz (1993) show that there is some evidence of these dynamics in 1992-93.

The implication is that the Treaty of Maastricht may fail even if countries intend to follow macroeconomic policies fully consistent with its letter and spirit. The question, to which we now turn, is whether it might be possible to reduce the odds of this happening by throwing sand in the wheels of international finance.

B. A Proposal

The analysis of Section 3 can be summarized by the observation that speculative attacks start with the opening of a position and end with a loan denominated in the currency under attack. Discouraging position taking might appear to be a promising approach to dealing with the problems that result. But positions can be booked anywhere in the world so long as domestic currency transfers are possible at low cost. If France were to impose a tax on foreign exchange transactions in Paris, for example, it would be easy to shift francs to London and carry out the same transactions there.

A solution is to make use of the fact that all speculative sales must be matched by fresh provision of the currency under attack. Except for francs made available by the liquidation of existing offshore asset positions, which are by definition of limited size, the rest comes from new lending by French financial institutions. Hence the idea to impose an explicit or implicit tax on domestic-currency lending to non-residents.

The interest-rate defense discourages speculation by making it expensive. This can equally be done by imposing a deposit requirement on domestic loans to non-residents in domestic currency. The deposit could be proportional to the loan and would have to be maintained interest-free at the central bank for the duration of the loan or for a fixed period. While the cost, in the first instance, is borne by the lending bank, part of it will be passed along to potential borrowers.

A useful feature of this measure is that the opportunity cost of the non-interest-bearing deposit increases with the interest rate, which will rise during periods of speculative pressure. The interest-rate defense will now be more powerful, since it will not only increase the traditional interest parity threshold (at which the expected devaluation matches the interest differential) but also impose a cost on position taking.

This proposal is open to obvious criticisms. For one, any disruption to the free flow of capital has allocative and distributional costs. In the present case, however, these are likely to small because long-term capital flows will be little affected. While lending to non-residents will become more expensive, the additional cost, when spread over a long maturity, will be limited.[19]

Non-interest-bearing deposit requirements on bank lending to non-residents are equivalent to an implicit widening of the exchange rate band. To illustrate, assume that the lower end of the French franc/DM band is at a rate of 1 (100 French francs per 100 DM).[20] But if the cost of the non-interest-bearing deposit requirement passed along to the customer is 10 francs per DM, this shifts the lower edge of the band to 90. If the cost of the non-

interest bearing deposit is the equivalent of widening the band, why then not simply widen the band and avoid interfering with the operation of capital markets?

The answer is that non-interest-bearing deposit requirements, by altering the incentives for the authorities to defend the currency peg, increase the exchange-rate-stabilizing effect featured in models of exchange rate target zones. Because deposit requirements introduce a wedge between on- and offshore rates, they reduce the cost to the authorities of using the interest rate to defend the peg. The knowledge that the authorities are more likely to defend the edge of the band reduces the incentive for speculators to test it.

One might object that a policy which discriminates against loans to nonresidents runs counter to Article 73f of the Maastricht Treaty. Foreigners could protest an implicit tax not also levied on domestic borrowers. There is ambiguity about the proper interpretation of Article 73f, however, since the treaty allows temporary measures in case of emergency.[21] Nevertheless, the best response would be to explicitly authorize such a measure during the remainder of Stage II. The Treaty provides for an Inter-Governmental Conference in 1996 to modify provisions which have proven undesirable. The IGC could provide the amendments required for the temporary establishment of deposit requirements when and where needed to protect the ERM and therefore insure that the goals of the Maastricht process are achieved.

Then there is the question of coverage. Could the measure be rendered ineffective by the diversion of domestic-currency loans to channels not covered by the deposit requirement? Recent Spanish experience illustrates the danger.[22] Between September and November 1992, the Bank of Spain imposed a measure similar to the one contemplated here. It applied

a deposit requirement on new lending by banks to non-residents through swaps. Swaps are the normal vehicle for short-term speculative lending; exempting lending for other purposes was meant to shield non-speculative activity. The measure succeeded in discouraging speculation for a few days but then lost its effectiveness. Figure 3 shows the differential between domestic and off-shore interest rates on swaps in pesetas during this period. Within a week of the imposition of the deposit requirement, the differential fell to less than 100 basis points, too small to deter speculation given the magnitude of the depreciation that was anticipated. Conversations with regulators and traders in Madrid and London have convinced us that there never was a scarcity of pesetas because Spanish banks sent pesetas to their London subsidiaries to circumvent the deposit requirement.[23]

Thus, limiting the measure to lending to finance transactions in one instrument, even if the latter is the most widely used under normal circumstances, will prove futile, since currency traders will shift to other instruments in response to the policy. Accordingly, deposit requirements must be applied to all domestic-currency loans to all non-residents.

Finally there is the question of avoidance. Even if the measure applies to all bank lending to nonresidents, new non-bank mechanisms for channeling domestic currency offshore may be established in response to the imposition of a deposit requirement on lending to nonresidents. A French bank required to make non-interest-bearing deposits when lending francs to nonresidents could lend francs to French corporations, which in turn could lend them to nonresidents (including their own nonresident operations or nonresident branches of the initiating French bank). This raises the possibility that a scheme that started out as a deposit requirement on loans to nonresidents would be broadened into a deposit requirement

on all loans extended through certain windows and, if lending was diverted to other windows, on all bank lending, which is surely undesirable.

The extent of evasion is likely to depend on the length of the period for which the deposit requirement remains in effect. If that period is short, it may not pay to set up the back channels required for evasion. Firms may be unwilling to incur the costs of avoidance if the benefits are transitory; as Dixit (1991) has shown, even relatively small fixed costs can have potentially large effects on real and financial behavior. Hence, non-interest bearing deposit requirements are most likely to be effective if their imposition is limited to the last two years of the transition to EMU.

Clearly, no measure of the sort we describe here is ever 100 percent effective. It is important to note, however, that to slow down speculative activity and provide time for orderly realignments it is not necessary for the measure to be water-tight.[24] The historical record indicates that capital controls have had measurable effects on macroeconomic activity even when they were less than totally effective.

V. Conclusion

Retrospective evidence on capital controls in Section II verified that these measures affected the course of macroeconomic developments, contrary to the presumption that they were too easily evaded to have discernible effect. Prospective analysis in Section IV suggested that it might be possible to simulate their effects for a transitional period by imposing non-interest-bearing deposit requirements on bank lending to non-residents.

We cannot emphasize too strongly that we conceive of this device as a temporary measure to be applied during the transition to monetary union in Europe. It is a third-best

solution to which one is driven only if first- and second-best responses are ruled out and the goal of EMU is taken as given. In Europe, where pegging exchange rates within normal bands for at least two years is a prerequisite for completing the transition to monetary union, such measures may be justified by the considerable efficiency advantages of the Single Market Program, whose political viability appears to hinge in turn on the establishment of a single currency. One of the "convergence criteria" of the Maastricht Treaty mandates that countries hold their exchange rates within their normal fluctuation bands for two years without experiencing "exceptional tensions." Even if this provision is interpreted as allowing countries to realign in response to speculative pressures not of their own making without being disqualified from participating in EMU, measures like those described here would be needed to provide time for the multilateral consultations that must precede orderly realignments and to prevent self-fulfilling attacks from driving currencies out of the ERM.[25]

Non-interest-bearing deposit requirements on lending to non-residents are *not* the first-best mechanism for completing the transition. The smoothest way of reaching that goal is to move there directly. Suppose that financial market participants awoke one Monday to the news that a subset of EU countries had formed a monetary union over the weekend, that the European Monetary Institute had been transformed into the European Central Bank, and that the latter would henceforth be the sole issuer of the participating countries' currencies, which it stood ready to exchange for one another at par. Transitional problems would be ruled out by ruling out the transition. In practice, however, this outcome is unlikely for political reasons. Germany insisted on the three-stage transition process of the Maastricht Treaty and

the convergence criteria embedded in its protocol on monetary union precisely in order to rule out abrupt action.

The second-best solution is to declare wide bands like those of the post-July 1993 EMS the "normal bands" referred to in the protocol, and to move to monetary union after a subset of EU countries have held their currencies within bands of plus or minus 15 per cent for two years. This assumes, of course, that the difficulty of holding exchange rates within 15 per cent bands is qualitatively different from holding them within 2 1/4 per cent bands. The longer the ERM's new fluctuation bands have gone untested, the more confident European policy-makers have become of this assumption. But there is reason to think that their confidence is unfounded—that an oil shock, a recession or an electoral surprise could quickly cause wide bands to bind. Experience with floating exchange rates in the 1970s and 1980s showed that cumulative bilateral nominal exchange rate movements of 15 per cent over a period of two years are not uncommon.

The implication is that the Treaty of Maastricht can fail even if countries adopt macroeconomic policies consistent with its letter and spirit. And these dangers will certainly intensify in the run-up to Stage III. Political brinkmanship will grow as the deadline nears, heightening doubts that exchange rates are really locked.[26] The markets will have good reason to anticipate last-minute realignments motivated by attempts to boost competitiveness before parities are locked in (Froot and Rogoff 1991). Any of these factors could defeat efforts to hold ERM currencies within 15 per cent bands.

Furthermore, German officials (who insisted on the convergence criteria to force their potential EMU partners to demonstrate their willingness to live with the consequences for

macroeconomic policy of monetary union) are unlikely to regard 15 per cent bands as a sufficiently stringent test of policymakers' resolve.[27] One might raise the same objection to the imposition of non-interest-bearing deposit requirements on bank lending to nonresidents; these measures are tantamount to an implicit widening of the band in that they relax the external constraint on domestic policy. The difference is that non-interest-bearing deposit requirements bind only in periods of speculative pressure. The rest of the time, governments will have ample opportunity to demonstrate their commitment to the policies mandated by the Maastricht Treaty.

A final objection to the proposal is that deposit requirements will weaken monetary discipline. Governments insulated from the discipline imposed by international financial markets may embark on policies which further destabilize exchange rates. That there exists the potential of moral hazard is clear from the analogy between our proposal and the standard argument for insurance: deposit requirements could insure the EU against policy mistakes that would otherwise derail Stage II of the Maastricht process. If one thinks that the costs of failure are high, then an investment in insurance is justified. But just as any sensible insurance company should monitor the behavior of its policy holders, the EU should monitor the behavior of governments receiving "deposit [requirement] insurance." Fortunately, it already has the appropriate mechanisms in place: the European Monetary Institute and the Monetary Committee, which are authorized to surveil the policies of EU countries, recommend corrective action, and levy penalties against governments which fail to comply.

European policy-makers will be inclined to shy away from any recommendation that entails amending the treaty. This "don't open the Pandora's Box" mentality fails to come to

grips with the lack of viability of the current Maastricht blueprint for completing the transition to monetary union. If, as we argue, an extended period of exchange rate stability within narrow bands is not feasible, then *some* provision of the treaty must be changed for the goal of monetary union to be achieved. One option is to add further safeguards sufficient for Germany and other reluctant participants to commence with monetary union immediately. Another is to accept the wide bands of the post-1993 EMS as the normal bands referred to in one protocol on monetary union, although gaining the agreement of these same reluctant countries will again require additional safeguards. Still another option is to authorize the temporary imposition of deposit requirements on lending to nonresidents. One way or another, the treaty will have to be revised.

Of course, one can insist on a policy of "none of the above." But the implication is that the goal of European monetary unification will never be achieved.

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Table 1: Evidence on Capital Controls during Speculative Attacks (Crises)

	Crises			Non-Crises		
	K-S	K-W	t	K-S	K-W	t
Fiscal Ratio	.26	.68	-0.59	.05	.04	-1.71
Real Rate	.63	.38	0.78	.00	.00	2.14
Inflation	.01	.05	-3.13	.00	.00	-4.10
X/M	.00	.00	6.65	.00	.00	6.63
Credit Growth	.17	.10	-1.47	.00	.00	-3.19
Money Growth	.00	.00	-4.98	.00	.00	-4.35
Interest Rate	.81	.56	-0.78	.00	.00	-3.31
Reserve Growth	.65	.68	0.17	.25	.41	0.77

"K-S" denotes probability of rejection of null hypothesis (of equality of distribution across controls and absence of controls), using the non-parametric Kolomogorov-Smirnov test; a low value is inconsistent with the null hypothesis. "K-W" denotes probability of rejection of null hypothesis (of equality of distribution across controls and absence of controls), using the non-parametric Kruskal-Wallis test. "t" denotes a t-test of the null hypothesis of equality of first-moments across controls and absence of controls; a positive number indicates that the sample mean in the absence of capital controls is higher than the sample mean in the presence of capital controls. Throughout, a six-month exclusion window and a two-standard deviation event delimiter are used.

Table 2: Joint Probabilities of Crises and Capital Controls

	No Controls	Controls	Total
Non-Crises	165 (24%)	345 (49%)	510 (73%)
Crises	21 (3%)	171 (24%)	192 (27%)
Total	186 (27%)	516 (73%)	702 (100%)

Chi-Square Test (1) Test of Independence = 33 (Pr=.00)

Table 3: Evidence on Capital Controls: Events and Non-Events

	Events			Non-Events		
	K-S	K-W	t	K-S	K-W	t
Fiscal Ratio	.01	.01	-2.11	.38	.13	-1.39
Real Ex. Rate	.04	.06	1.65	.00	.03	1.38
Inflation	.08	.01	-3.19	.00	.00	-4.33
X/M	.00	.00	4.56	.00	.00	8.16
Credit Growth	.12	.15	-1.53	.00	.01	-2.59
Money Growth	.01	.00	-3.77	.00	.00	-4.03
Interest Rate	.07	.50	-.40	.00	.00	-3.60
Reserve Growth	.38	.41	0.30	.38	.70	0.68

"K-S" denotes probability of rejection of null hypothesis (of equality of distribution across controls and absence of controls), using the non-parametric Kolomogorov-Smirnov test; a low value is inconsistent with the null hypothesis. "K-W" denotes probability of rejection of null hypothesis (of equality of distribution across controls and absence of controls), using the non-parametric Kruskal-Wallis test. "t" denotes a t-test of the null hypothesis of equality of first-moments across controls and absence of controls. "t" denotes a t-test of the null hypothesis of equality of first-moments across events and non-events; a positive number indicates that the sample mean in the absence of capital controls is higher than the sample mean in the presence of capital controls. Throughout, a six-month exclusion window and a two-standard deviation event delimiter are used.

Table 4: Capital Controls and Successful and Unsuccessful Attacks

	----------Successful Attacks----------			———UnsuccessfulAttacks——		
	K-S	K-W	t	K-S	K-W	t
Fiscal Ratio	.02	.04	-1.75	.43	.46	-83
Real Rate	.07	.11	1.26	.84	.81	04
Inflation	.17	.04	-2.79	.01	.06	324
X/M	.00	.00	4.46	.00	.00	571
Credit Growth	.13	.16	-1.48	.14	.06	212
Money Growth	.01	.00	-3.46	.01	.01	349
Interest Rate	.13	.60	-.26	.29	.18	198
Reserve Growth	.30	.39	.33	.73	.65	-32

"K-S" denotes probability of rejection of null hypothesis (of equality of distribution across controls and absence of controls), using the non-parametric Kolomogorov-Smirnov test; a low value is inconsistent with the null hypothesis. "K-W" denotes probability of rejection of null hypothesis (of equality of distribution across controls and absence of controls), using the non-parametric Kruskal-Wallis test. "t" denotes a t-test of the null hypothesis of equality of first-moments across controls and absence of controls; a positive number indicates that the sample mean in the absence of capital controls is higher than the sample mean in the presence of capital controls.

Table 5: More on Capital Controls

Successful vs Unsuccessful Attacks

	Capital Controls			No Capital Controls		
	K-S	K-W	t	K-S	K-W	t
Fiscal Ratio	.08	.04	2.18	.21	.17	.96
Real Rate	.65	.71	-.16	.57	.73	-.60
Inflation	.00	.02	-2.74	.15	.47	-1.03
X/M	.06	.03	-2.12	.01	.04	1.92
Credit Growth	.00	.00	-3.60	.23	.13	-1.85
Money Growth	.87	.66	-.51	.80	.09	-1.92
Interest Rate	.00	.18	-.79	.18	.09	-1.92
Reserve Growth	.10	.93	-.77	.99	.81	-.85

Crises vs Non-Crises

	Capital Controls			No Capital Controls		
	K-S	K-W	t	K-S	K-W	t
Fiscal Ratio	.00	.01	-2.55	.03	.06	-1.38
Real Rate	.14	.28	-.90	.11	.15	-1.02
Inflation	.17	.87	.86	.03	.24	.14
X/M	.00	.00	3.43	.25	.19	-1.49
Credit Growth	.04	.03	2.16	.26	.21	.97
Money Growth	.87	.97	.01	.00	.01	2.79
Interest Rate	.39	.41	.01	.80	.88	-.39
Reserve Growth	.11	.72	1.96	.17	.99	.66

Events vs Non-Events

	Capital Controls			No Capital Controls		
	K-S	K-W	t	K-S	K-W	t
Fiscal Ratio	.99	.95	.56	.10	.05	1.93
Real Rate	.07	.17	-.74	.24	.25	-1.39
Inflation	.00	.00	-3.05	.13	.16	-1.23
X/M	.92	.99	-.05	.03	.06	1.77
Credit Growth	.02	.02	-2.74	.66	.64	-.75
Money Growth	.04	.11	-2.09	.98	.95	-.20
Interest Rate	.00	.02	-1.63	.00	.01	-2.03
Reserve Growth	.00	.09	.23	.21	.93	.13

"K-S" denotes probability of rejection of null hypothesis (of equality of distribution across e.g., successful and unsuccessful attacks), using the non-parametric Kolomogorov-Smirnov test; a low value is inconsistent with the null hypothesis. "K-W" denotes probability of rejection of null hypothesis of equality of distribution using the non-parametric Kruskal-Wallis test. "t" denotes a t-test of the null hypothesis of equality of first-moments across e.g., successful and unsuccessful attacks; a positive number indicates that the sample mean in the case of an unsuccessful attack is higher than the sample mean in the presence of a successful attack.

Table 6: Speculation

A. First Step

	Customer		Bank A	
	Assets	Liabilities	Assets	Liabilities
Now	-	-	-	-
1 month	DM 100	FF 300	FF 300	DM 100

B. Second Step

	Customer		Bank A	
	Assets	Liabilities	Assets	Liabilities
Now	-	-	-	-
1 month	DM 100	FF 300	FF 300	DM 100
			DM 100	FF 300

	Bank B	
	Assets	Liabilities
Now	-	-
1 month	FF 300	DM 100

C. Last Step

	Bank B	
	Assets	Liabilities
Now	DM 100	FF 300
1 month	FF 300	DM 100

Table 7: Bank Lending and Reserve Movements

		+ Net Bank Position	+ Net Bank Position (Foreign Exchange Losses)
France	May-Aug. 1992	+ 28.7	- 37.9
France	Sept.-Oct 1992	+ 28.6	- 21.0
UK	July-Sept. 1992	+ 13.0	- 3.6

"Net Bank Position" refers to foreign lending of domestic currency by domestic banks during period of speculative attacks (IFS line 11-16c). "Foreign Exchange Losses" refers to changes in net changes in foreign asset position of exchange reserves for commercial banks (sources: for France, Changes in net position refers to short term assets/liabilities and is from Banque de France, Bulletin Trimestriel, various issues; for UK, Bank of England, Quarterly Bulletin).

All figures are in billions of US $.

Table 8: The Behavior of International Liquidity During Crises

	Gross			Net		
	K-S	K-W	t	K-S	K-W	t
Total System	.01	.01	-2.33	.01	.02	-1.65
Banks	.74	.94	.76	.56	.38	1.20
Non-Banks	.23	.47	.59	.98	.92	.73
Total Liabilities	.00	.08	2.12			
Bank Liabilities	.49	.61	-.25			

"K-S" denotes probability of rejection of null hypothesis (of equality of distribution across crises and non-crises) using the non-parametric Kolomogorov-Smirnov test; a low value is inconsistent with the null hypothesis. "K-W" denotes probability of rejection of null hypothesis using the non-parametric test. "t" denotes a t-test of the null hypothesis of equality of first-moments across crises and non-crises; a positive number indicates that the sample mean in the absence of crises is higher than the sample mean during crises.

Table 9: Pension Funds International Investments

Country	Value	% of total portfolio
Australia	11.8	24
Belgium	0.7	29
Canada	7.4	10
France	5.1	5
Germany	3.7	3
Hong Kong	4.4	63
Ireland	2.2	35
Japan	108.1	14
Netherlands	1.5	17
Switzerland	5.1	6
UK	71.3	24
US	54.4	4

Source: Pension Fund Indicators, UBS Asset Management, London, April 1994.

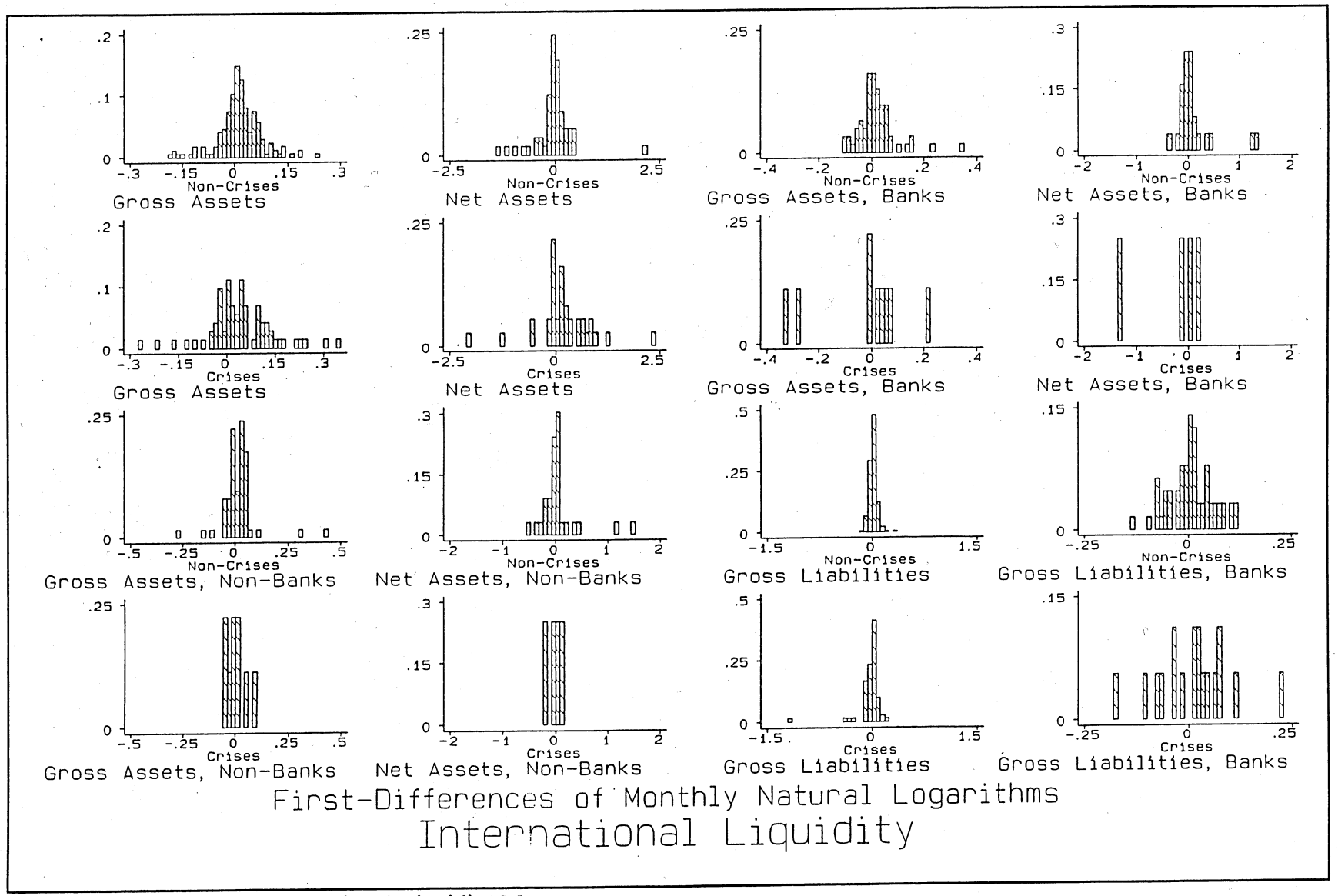
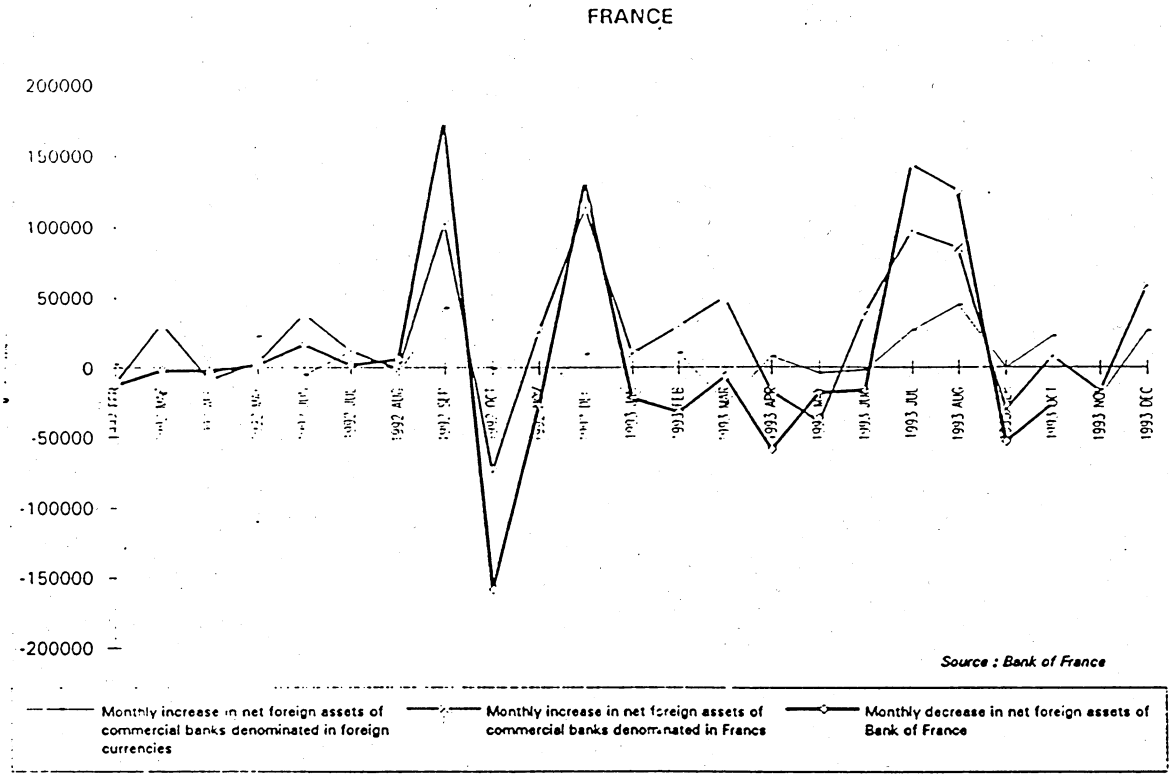


Figure 1: Histograms of International Liquidity Movements

Figure 2. Bank Lending in France and Spain



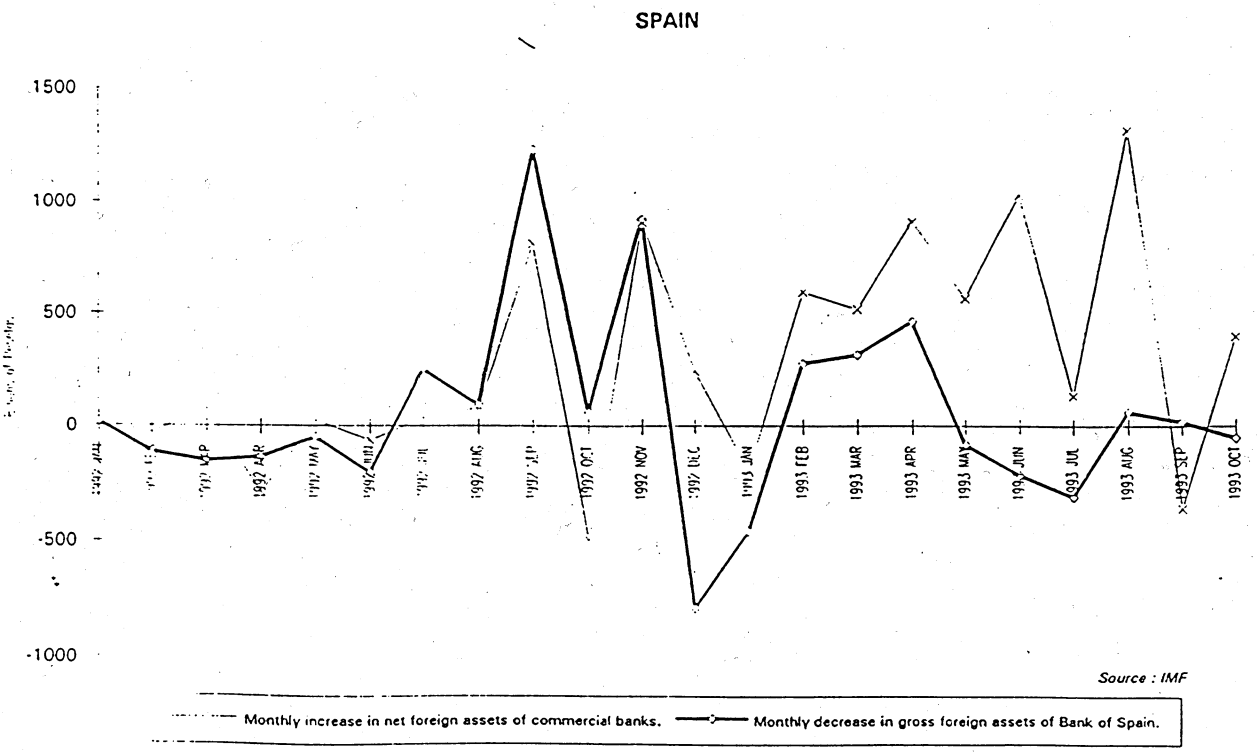
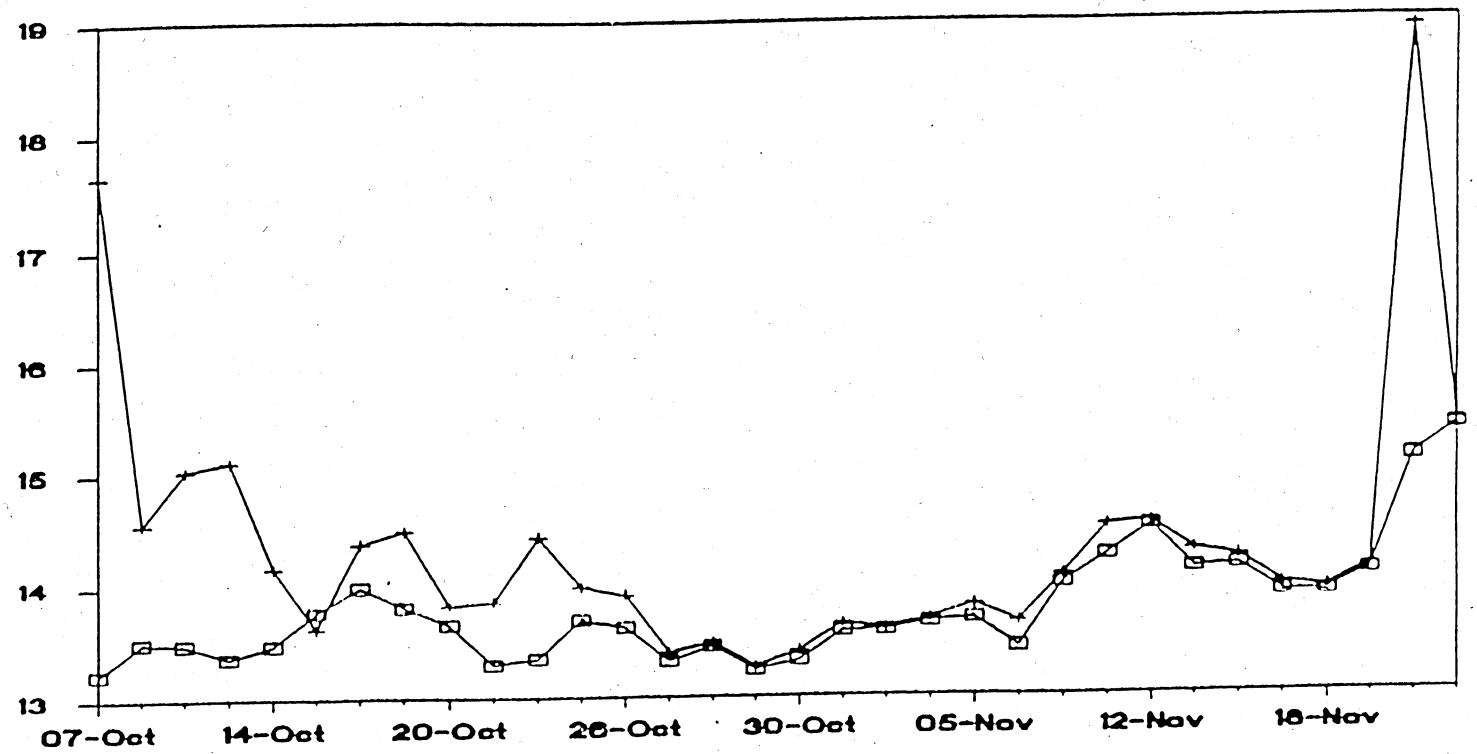


Figure 3. Spain: Internal and External Swap (1 day) Interest Rates
(October 7 - November 22, 1993)



Source: Linde (1993)

Endnotes

1. See Eichengreen and Wyplosz (1993).

2. Our discussion builds on recent theoretical contributions to the literature on speculative attacks such as Ozkan and Sutherland (1994) and Obstfeld (1994).

3. The present discussion of data and methodology is much abbreviated; interested readers are referred to this previous paper.

4. In our earlier paper we conducted sensitivity analysis to gauge how much difference different weighting schemes made. Theory can be used to pin down the weights only if one adopts an empirical model of the connection between macroeconomic fundamentals and the exchange rate. The professional consensus is, however, that none of the existing models performs adequately for empirical work (see Meese and Rogoff 1983).

5. Our countries were chosen on the basis of data availability and include the USA, the UK, Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Sweden, Switzerland, Canada, Japan, Finland, Greece, Ireland, Portugal, Spain, Australia, South Africa, India, and South Korea.

6. In our earlier paper we conducted sensitivity analysis varying the width of the exclusion window as well as the two standard deviation threshold for identifying crises.

7. Only comprehensive data on exchange-market intervention, which is currently made available on a limited basis by only a few central banks, would solve this problem.

8. The absence of Euro-market data for most of the sample means that offshore-onshore interest rate differentials, another potential indicator of controls, are unavailable to us.

9. We smooth the trade data using a centered seven-month moving average to eliminate

noise.

10. It would be nice to be able to compare the rate of reserve loss in the presence and absence of controls. But since our data are monthly, we cannot differentiate between short and violent attacks of the kind likely to be associated with free capital mobility and slower erosion of reserves than may take place in the presence of controls.

11. This effect of controls is modelled formally by Obstfeld (1984) and Wyplosz (1986), both of whom emphasize the distinction between supporting an unviable exchange rate and lengthening the period between crises.

12. The realignment can be in either direction, and the change in regime can be associated with an appreciation or depreciation.

13. Bank A still faces the risk that its customer or Bank B will not fulfill its contractual obligation, but this is not an exchange risk and is therefore not treated here.

14. The central bank may refuse to buy its currency spot. In that case the exchange rate will depreciate and the attack will succeed. Alternatively, the central bank may limit its loans to the banking system, and the interest rate will rise. This, the standard defense against a speculative attack, proved to be problematic during the EMS crises of 1992 and 1993, for reasons explored in Eichengreen and Wyplosz (1993) and Bensaid and Jeanne (1994).

15. For reasons discussed earlier, we know that published data on foreign exchange reserves are unreliable. We therefore checked fluctuations in reported reserves against the intervention data reported by Alogoskoufis (1992). At $46 billion from July to August 1992 and $228 billion from September to October 1992, these tell a consistent story.

16. These data come from the IMF and are open to the same limitations as those concerning central bank reserves (see above). Banks' assets are line 7a.d, their liabilities line 7b.d. We calculate net assets as line 7a.d minus line 7b.d. Assets vis-à-vis non-resident non-banks are line 7ad.d, liabilities line 7bd.d. We calculate assets vis-à-vis non-resident banks as 7ad.d minus line 7bd.d, and similarly for liabilities.

17. The IMF data do not discriminate between loans in domestic and foreign currencies. The preceding analysis of bank activities during attacks suggests that the surge of activity documented by the histograms is most likely to correspond to domestic currency loans.

18. Eichengreen and Wyplosz (1993), Obstfeld (1994) and Eichengreen, Rose and Wyplosz (1994) suggest that evidence from recent ERM crises is not inconsistent with the predictions of these models.

19. For example, the cost of a 10-year loan will be increased by a tenth assuming that the interest rate is constant and the yield curve flat.

20. The example that follows is drawn from Garber and Taylor (1994).

21. It is unclear whether the treaty in fact rules out a scheme like that proposed here. Absent an amendment to the treaty that addressed this issue head on, the question of Maastricht compatibility would have to be adjudicated in the European Court of Law.

22. For a description, see Linde (1993) and Linde and Alonso (1993).

23. See Freitas de Oliveira (1994)

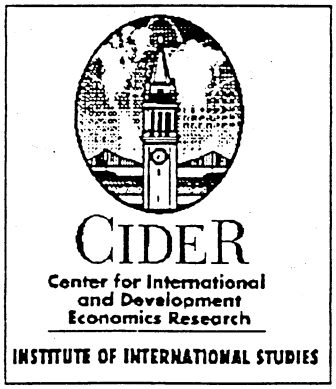
24. Fieleke (1994) dismisses as ineffectual the capital controls applied by Ireland, Spain and Portugal in 1993 on the grounds that "all three countries were obliged to devalue within months after imposing or intensifying controls." Leaving aside whether these countries'

controls were well designed, this criticism misses the point that these three countries were all able to realign and stay in the ERM, whereas countries that did not apply controls, like Italy and the UK, were driven out of the system.

25. It is useful to recall that the EMS has never lost a member as a result of a speculative attack so long as its weak currency countries were operating under capital controls.

26. For example, the German Constitutional Court has ruled that the final decision to go ahead with monetary unification belongs to the Bundestag. It is easy to guess how the markets will react if there is an off-chance that the Bundestag is headed toward a negative vote.

27. The German Constitutional Court has also ruled that the Maastricht Treaty's so-called convergence criteria must be interpreted strictly, which throws into question the realism of this strategy.



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