This paper evaluates the causes and consequences of episodes of turbulence in foreign exchange markets. Using data from 1959 through 1993 for twenty OECD countries, we consider the antecedents and aftermath of devaluations and revaluations, flotations, fixings and speculative attacks (which may not be successful). We find that realignments of fixed exchange rates are alike: devaluations are preceded by political instability, budget and current account deficits, and fast growth of money and prices. Revaluations are mirror images of devaluations. Speculative attacks resemble devaluations, but money growth and inflation are more endemic and there is no last-minute attempt to tighten monetary policy. In contrast, few consistent correlations link regime transitions like flotations or fixings to macroeconomic or political variables. Transitions between exchange rate regimes are largely idiosyncratic, and are neither consistently provoked ex ante by systematic imbalances, nor typically justified ex post by subsequent changes in policy. We conclude that there are no clear early warning signals of many speculative attacks, and no easy solutions for policy-makers.

— Barry Eichengreen, Andrew K. Rose and Charles Wyplosz
Exchange market mayhem: the antecedents and aftermath of speculative attacks

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1. INTRODUCTION

The exchange rate is the chink in the armour of modern-day macroeconomic policy-makers. Be it Italy and the United Kingdom in 1992, France in 1993, Mexico in 1994 or Spain in 1995, speculative pressures and the dire consequences of the policy responses required to defend the exchange rate can bring a government’s entire macroeconomic strategy tumbling down. Countries like Sweden, which in 1992 raised central bank lending rates to 500% in a futile attempt to defend its currency peg, have been forced by speculative attacks to concede and radically reorient their policies. Countries like Mexico, which attempted to devalue in advance of the crisis, have

This paper was marked by many visits: Eichengreen to the Federal Reserve Board; Rose and Wyplosz to the IMF; and Rose to the US Department of Treasury, ECARE and IIES. For sterling research assistance we thank Chang-Tai Hsieh. We have floated some of our ideas by Michael Dooley, Jeffrey Frankel, Paul Krugman and participants at the 1995 FRBSF/CEPR Conference, IIES and UCSC; we are grateful for their frank remarks. The sensible comments pounded in by David Begg, Bernard Dumas, Axel Weber and the Economic Policy Panel have helped to fix many problems. The STATA 4.0 programs and data used in this analysis are available for a year following publication, upon receipt of a self-addressed stamped envelope with four 3.5’ formatted high-density diskettes.
destroyed investor confidence, provoked capital flight and ignited a financial market meltdown. Even the United States, a relatively large closed economy committed to a policy of benign neglect, was forced in 1994–5 to consider sacrificing other policy goals on the altar of the exchange rate when the dollar declined precipitously against the yen. Without realizing it, many observers have derived an impossibility theorem: neither pegging like Sweden, nor occasionally realigning like Mexico and the EMS countries, nor floating like the United States is a tolerable option. Policy-makers seem to retain no acceptable international monetary alternative.

The more optimistic view is that countries experiencing severe exchange market difficulties are not drawn at random from the underlying population. Those whose pegged rates are attacked, whose realignments destroy rather than strengthen investor confidence, and whose floating rates are buffeted by exchange market turbulence, are countries which recklessly pursue inappropriate policies and thereby bring exchange market difficulties upon themselves. Thus, the speculative attacks on the Italian lira, British pound and Spanish peseta in 1992 have been attributed to inadequately restrictive monetary and fiscal policies.\(^1\) Mexico’s difficulties were anticipated, at least in some circles, by observers who warned that the stability of the peso was threatened by excessive inflation and unsustainable current account deficits.\(^2\) The weakness of the dollar has been blamed on low domestic savings and on the Fed’s having waited too long to raise interest rates. By implication, governments can escape exchange market difficulties if they only avoid policy mistakes. Sinners are justly punished by financial markets and foreign exchange market difficulties are simply a reflection of policies gone awry.

If unsustainable fundamentals are responsible for speculative attacks, then eliminating the latter is straightforward once the former have been identified. One objective of this paper is to see whether there is indeed a set of politico-economic fundamentals which are sensibly and consistently linked to speculative attacks. We consider a wide array of variables in our search for ‘early warning’ signs of trouble brewing.\(^3\) But not all speculative attacks may be warranted

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1 See, for example, Bank for International Settlements (1993), Commission of the European Communities (1993), Committee of Governors of Central Banks (1993a,b), Goldstein et al. (1993).
2 See, for example, Dorbusch and Werner (1994).
3 The IMF has recently moved towards a consensus in favour of close monitoring of countries with potential financial crises, by means of an early warning system; see the Financial Times, 27 April 1995.
by fundamental forces. If some attacks are self-fulfilling – i.e. some of
the ‘innocent’ are slaughtered, while not all of the ‘guilty’ suffer –
then policy prescriptions become much more difficult.

Our goal in this paper is to provide a guide for the perplexed
policy-maker. Are there significant differences in the observed
behaviour of economic and political variables in periods leading up
to episodes of exchange market crisis and in placid periods? Are there
economic and political actions that policy-makers must forgo to
avoid exposing their currencies to speculative attack? Are there
significant differences in the post-attack behaviour of economic and
political variables depending on whether the authorities respond by
defending, devaluing or floating the currency? How, in short, should
policy-makers manage turbulence in foreign exchange markets?

To understand our answers, it is essential to grasp the distinction
between actual realignments (i.e. devaluations) of pegged exchange
rates and currency crises. A realignment may be orderly – the
authorities may undertake it without being forced to by the markets –
or it may be disorderly, accompanied and provoked by a speculative
attack featuring massive sales of domestic currency for foreign
exchange. A ‘crisis’, in contrast, necessarily entails a speculative
attack which causes the exchange rate to depreciate or forces the
authorities to defend it by radically raising interest rates or expending
reserves. Not all crises lead to devaluations, decisions to float the
currency, or other changes in exchange rate regimes. In other words,
the authorities may succeed in fending off the attack. Thus crises,
devaluations and flotations are overlapping but distinct sets of
turbulent foreign exchange market events.

We find that devaluations generally occur after periods of
expansionary monetary policy. These expansionary policies lead to
price and wage inflation, deteriorating international competitiveness
and weak external accounts. They tend to occur when unemploy-
ment is high, as if the government is attempting to stimulate an
economy in which unemployment has political and economic costs.
But the policy of stimulus leads to a loss of reserves, which
jeopardizes exchange rate stability. There are some signs that
governments are cognizant of this development and shift policy in a
more restrictive direction to stem the loss of reserves. But in episodes
that culminate in devaluation, those restrictive steps prove
inadequate. Reserves continue to decline, eventually forcing the
government to devalue the exchange rate. When devaluation finally
occurs, it is the occasion for retrenchment on the monetary and fiscal
fronts, intended to ensure that the new level of the exchange rate is sustainable. As a result, the boost to competitiveness is effective in restoring balance to the external accounts.

Not all devaluations are preceded by speculative attacks, however; and not all attacks are successful. There is no presumption, in other words, that actual devaluations resemble exchange rate crises. In contrast to devaluations, which can be orderly, crises – some of which lead to devaluations, but others of which are successfully repelled or cause the authorities to abandon their policy of pegging the exchange rate entirely – are accompanied by different behaviour of policy variables, as the label for these episodes itself connotes. It is more difficult to generalize about crises than about devaluations, but there are signs that they too are preceded by loose money and inflation. But, in contrast to the run-up to devaluations, there is no sign of government attempts to rein in its expansionary policy as the looming threat to the exchange rate develops. The foreign exchange market intervention is sterilized. There is little evidence of slowing rates of money and credit growth. And there are fewer signs of monetary and fiscal retrenchment in the wake of the attack. Exchange rate changes that take place in response to crises are often disorderly. They do not lead to the establishment of new parities that are clearly sustainable.

This failure of governments to adapt policy in a manner consistent with their stated exchange rate targets is, not surprisingly, at the heart of many currency crises. It points to the need to study political constraints on economic policy formulation. Hence, in addition to analysing the behaviour of macroeconomic variables, we consider political conditions directly. We ask whether speculative attacks are more likely to occur before or after elections and whether left- or right-wing governments are more susceptible to their effects. We ask how much political variables explain the incidence of speculative attacks after controlling for macroeconomic policies. Are economic indicators a sufficient statistic to warn of impending currency crises, in other words, or do political variables have additional explanatory power? Indeed, how easy is it to predict currency crises at all?

Monetary policy is loose before both actual realignments and currency crises; there are early warning signs of pending speculative attacks. However, the same cannot be said of regime transitions such as exchange rate flotations, which are difficult to distinguish systematically from periods of tranquillity. Since it is difficult to know whether a fixed exchange rate under attack will be devalued or
floated (or for that matter, successfully defended), there do not appear to be clear early warning signals which precede changes in exchange rate regimes. This is especially true because there are few significant differences in the behaviour of these variables when we divide crises into successful and unsuccessful attacks. Some attacks may be motivated by actual or expected lax policy, others not.

That there is uncertainty about when and where speculative attacks occur should be intuitively plausible. Policy-makers – and market participants – are often taken by surprise by the outbreak of crisis. After all, if crises were readily avoidable, why would we continue to observe so many episodes that severely damage the standing of politicians and governments? That the timing of crises is hard to predict is consistent with the conclusions of Rose and Svensson (1994) that macroeconomic fundamentals are of little use for explaining the credibility of EMS parities, and of Eichengreen and Wyplosz (1993) that fundamentals did not obviously predict the timing of the 1992 attack on the EMS.

From a policy point of view, our findings reinforce the feeling that there exist no easy solutions to the exchange rate dilemma. There are no unambiguous early warning signals of impending crisis. Governments which follow traditional conservative policies cannot be assured of insulation from speculative attacks; there are no clearly ‘right’ policies. It would appear that exchange rates can be, and repeatedly are, severely strained and destabilized by speculative pressures even in the absence of clear imbalances in macroeconomic fundamentals.4

The paper is organized as follows. Section 2 reviews what the literature in economics has to say about the causes and consequences of speculative attacks. Section 3 provides a brief description of the data. The heart of our paper is section 4, in which we use graphical techniques to explore the empirical regularities of macroeconomic data around periods of devaluations, flotations, speculative attacks and a variety of other exchange rate events. Section 5 provides a more statistical treatment. Section 6 draws out the policy implications.

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4 Similarly, governments that give in to speculative attacks are not always clearly punished by higher interest rates or inferior economic performance subsequently.
2. LITERATURE

In this section we review what the literature in economics has to say about the causes and consequences of speculative attacks. Following a review of the standard approach, we focus on the literature which postdates the 1992 EMS crisis and highlights non-standard channels through which speculative pressure can be transmitted to the foreign exchange market.

2.1. The traditional approach

The standard approach to balance of payments crises follows Krugman (1979). The authorities peg the exchange rate until their reserves are exhausted, at which point they float the currency. With the government pegging the relative rate of return (in Krugman's model, the exchange rate), investors hold domestic and foreign assets in fixed proportions. When they rebalance their portfolios by selling an incipient excess supply of domestic assets for foreign exchange, the central bank is forced to intervene, using reserves to prop up the exchange rate.

Krugman assumed that government budget deficits were at the root of speculative attacks on pegged currencies. In his model, all budget deficits are financed with domestic credit. Since investors exchange only a portion of the incremental supply of domestic credit (portfolio proportions remaining constant), the shadow exchange rate (which would prevail in the event that the pegging policy is abandoned) depreciates gradually over time. When it equals the current exchange rate, investors attack the peg, depleting the remaining reserves, for to do otherwise would make available arbitrage profits and imply market inefficiency.

The empirical implication is that we should observe expansionary fiscal and monetary policies prior to speculative attacks. Such policies should be accompanied by the steady erosion of reserves.

Krugman's model has been extended to incorporate deviations from purchasing power parity (so that pre-attack fiscal expansions are accompanied by increasingly overvalued real exchange rates, rising real wages, growing relative unit labour costs, and current account deficits); capital controls (which lengthen the period of time

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5 Krugman's model is an adaptation of the Salant and Henderson (1978) model of buying attacks on commodity price stabilization schemes.
for which a currency peg can be maintained given the stance of monetary and fiscal policies; uncertainty about monetary and fiscal policies (the greater the uncertainty, the faster reserves will be depleted, since the probability of a burst in domestic credit creation which causes the shadow exchange rate to depreciate below the current rate is correspondingly increased); and portfolio optimization by investors (in which case the assumption that domestic and foreign assets are held in fixed proportions prior to the attack can be relaxed, implying accelerating losses of central bank reserves as investors hedge against a currency crisis). These extensions suggest additional regularities that should be evident in the run-up to attacks: overvalued real rates, higher real wages, rising relative unit labour costs, significant policy uncertainty, current account deficits, and accelerating reserve losses. In our empirical work, we search for all of these regularities.

Krugman’s formulation carries over to crawling pegs and managed floats, under which the authorities do not peg the level of the currency but commit to an intervention strategy framed as a path for the exchange rate. Thus, the same general model can be used and the same empirical predictions derived for attacks on a variety of exchange rate arrangements. Again, the implication is that countries which suffer exchange rate instability and/or rapid depletion of their reserves should be those whose policy is excessively expansionary and uncertain, in which the real exchange rate indicates overvaluation, and where the absence of capital controls allows the markets to capitalize on the consequences.

For a few countries with histories of high inflation (Mexico and Chile in the 1970s; France and Italy in the early 1980s), the predictions of these models broadly fit the facts. Yet there are also cases in which monetary and fiscal imbalances are not clearly apparent in the period leading up to crises. Eichengreen and Wyplosz (1993) argue this for many countries affected by the ERM crisis in 1992, for example. Rose and Svensson (1994) show that, for

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7 See, for example, Connolly and Taylor (1984) and Connolly (1986).

8 See, for example, Cumby and van Wijnbergen (1989) and Penati and Pennacchi (1989) on developing countries, and Thomas (1994) on Italy and France.

9 See also Portes (1993) and Obstfeld (1994).
a variety of European currencies, measures of realignment expectations (interest differentials purged of the effect of expected exchange rate movements within the band) are little affected by the prior and contemporaneous movement of the economic fundamentals to which the traditional theoretical models point.\textsuperscript{10}

\textbf{2.2. Recent theoretical developments}

These observations prompted the development of a subsequent generation of theoretical models whose assumptions and predictions depart from those of the canonical Krugman model. An example is Ozkan and Sutherland's (1994) model of the ERM crisis. In that model, there may be no evidence of monetary and fiscal imbalances in the period preceding the crisis. In contrast to Krugman's assumptions, the authorities may be following macro policies consistent with the indefinite maintenance of the prevailing currency peg. Assuming the continued pursuit of those policies, there is no reason to anticipate the eventual exhaustion of international reserves. But if those policies are associated with high and rising unemployment (perhaps for reasons beyond the authorities' control, including reasons originating outside the country), a government whose survival probability is negatively affected by unemployment and which can reduce unemployment by shifting to more expansionary policies may be induced to abandon the currency peg. Anticipating this eventuality, speculators attack in advance of the policy shift. Thus, where the Krugman model focused on the determinants of external balance, the Ozkan–Sutherland model focuses instead on the decisions of governments concerned with internal balance and constrained by the exchange rate in their choice of policy response.

In this formulation, the crisis need not be preceded by expansionary monetary and fiscal policies or by the imminent exhaustion of reserves. Rather, one should observe rising unemployment and other domestic economic developments of concern to the authorities. These predictions are consistent with European experience in 1992–3, when speculative attacks coincided with a deepening recession that aggravated existing levels of unemploy-

\textsuperscript{10} One exception to this generalization is inflation differentials, which do display some association with realignment expectations in the Rose–Svensson study (consistent with the findings of the literature). Thomas (1994) finds that some measures of fundamentals significantly predict realignment expectations for France but not for Italy. Their effect is stronger when the deviation of the exchange rate from the central parity is included in the specification. In any case, Thomas concurs with Rose and Svensson: the effect of fundamentals is uniformly small.
ment. Caramazza (1993) and Drazen and Masson (1994) consider data for France, finding that unemployment positively affected realignment expectations ever since 1987, a result confirmed by Thomas (1994). Masson (1995) studies the UK and similarly concludes that persistent high unemployment increased the perceived probability that the government would abandon the sterling parity. To shed light on such issues, we look at a variety of measures of political variables jointly with labour market conditions in our empirical work.

The Ozkan–Sutherland model, in which events abroad can raise domestic unemployment and induce an optimizing government to abandon the currency peg, provides one channel through which developments external to a country can provoke a currency crisis. Gerlach and Smets (1994) introduce others. In their model, a speculative attack which leads to devaluation by one country may threaten the competitiveness of a trading partner. This argument has been invoked for Ireland and Portugal in 1993, whose positions were said to be undermined by the depreciation of the pound sterling and the Spanish peseta, respectively. The empirical implications of their analysis again differ from those of the Krugman model. Here, there may be no evidence of budget deficits, rapid monetization, overvaluation, current account deficits or reserve losses in the period leading up to the attack. But once the neighbouring country devalues, observers revise their assessment of the likely future evolution of these variables and attack the other currency as well; an infectious contagion of exchange rate crises may break out. As in the Ozkan–Sutherland framework, the attack may precede rather than follow imbalances in domestic fiscal policies and current accounts, although the Ozkan–Sutherland and Gerlach–Smets models provide different predictions about which other variables (unemployment in the first case, a successful attack on a major trading partner in the second) behave distinctively in the pre-attack period. We document the extent of ‘contagion’ effects below in our empirical work.

11 Again in 1995 the realignment of the Portuguese escudo was blamed on exchange market difficulties culminating in realignment in neighbouring Spain.

12 Honohan and Conroy (1994) document the strong effect of the sterling/Irish pound rate on the Irish pound/DM rate during the EMS period, which is consistent with the predictions of models of spillover effects. Their analysis is less than an ideal test, however, for it focuses on the impact on interest differentials rather than realignment expectations (interest differentials purged of the contribution of expected exchange rate movements within the band) and because their specification does not also include other obvious fundamentals. More generally, a prediction of these models, which we can test using our data, is that exchange market crises and events should be clustered in time.
Another channel is information effects, in whose presence the collapse of one currency may convey information about the collapse of a second. Eichengreen and Wyplosz (1993) describe how speculative attacks which drove a subset of EC countries out of the ERM in 1992, by dimming the prospects for early monetary unification, conveyed information about the preparedness of other countries to defend their currency pegs. We might then expect evidence of monetary and fiscal imbalances in a particular country in the period leading to a wave of speculative attacks.

Yet another possibility is that there exist multiple equilibria in foreign exchange markets and that the collapse of one currency coordinates expectations so as to shift the market from one equilibrium to another. Flood and Garber (1984) and Obstfeld (1986) first linked multiple equilibria to speculative attacks. In their models, multiple equilibria exist in the foreign exchange market because of the contingent nature of the macro policy rule. In the absence of an attack, monetary and fiscal policies are in balance, and nothing precludes the indefinite maintenance of the prevailing peg. If and only if the currency is attacked, however, will the authorities switch to more accommodating monetary and fiscal policies consistent with a lower level for the exchange rate. Thus, speculative attacks can be self-fulfilling. One of our objectives in this paper is to examine the actual behaviour of monetary and fiscal variables to search for empirical manifestations of policy switches, and characterize them as being frequent or atypical.

In the early multiple-equilibrium models of Flood–Garber and Obstfeld, the assumption of a contingent policy process (of a monetary policy that shifts in a more expansionary direction only in the event of an attack) was ad hoc. Obstfeld (1994) and Bensaid and Jeanne (1994) add the relevant micro foundations. Bensaid and Jeanne appeal to the Barro–Gordon (1983) model, assuming that an increase in the unemployment rate raises the costs to the government

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13 Barnett and Ho (1995) generalize this point about the possibility of multiple equilibria.

14 In the Flood and Garber (1984) and Obstfeld (1986) formulations, the contingent nature of the money supply rule opens up the possibility of self-fulfilling attacks. But the same general result obtains if one assumes contingent processes for other policy instruments. For example, Dellas and Stockman (1993) show that multiple equilibria can obtain if an attack induces a government to impose capital controls on a regime of otherwise free international capital mobility. Uribe (1995) similarly shows that, if the authorities adopt a real exchange rate rule, increasing the devaluation rate when the real exchange rate is below its long-run level and vice versa, there is again scope for self-fulfilling expectations.
of continuing to pursue policies of price stability.\textsuperscript{15} When the public observes unemployment, it revises upward its forecast of the probability that the authorities will deviate in order to reflate the economy; this in turn requires the authorities to raise the discount rate to defend the currency, which only serves to aggravate their unemployment problem.

This positive feedback has two implications. One is that a small rise in unemployment can provoke a crisis, since that rise in unemployment will require the adoption of policies that aggravate the initial problem in a vicious spiral, and the markets can be expected to anticipate the operation of that negative feedback. The other is that speculative attacks can be self-fulfilling. If speculators, for whatever reason, lose confidence in the official commitment to defend the currency peg, the government will be forced to raise interest rates. This will create actual or expected unemployment and thereby further undermine confidence in the government's commitment to pursue policies of price stability, requiring further interest rate hikes, further aggravating unemployment and so on, until the currency collapses. If this process is sufficiently swift, periods of speculative attack may look indistinguishable from periods of tranquillity in the data.\textsuperscript{16}

The question for models with multiple equilibria, as Grilli (1986) emphasizes, is what coordinates the expectations and actions of market participants. So long as speculators do not attack, the exchange rate can be maintained for ever, but whenever many traders sell the currency simultaneously, the peg collapses. A single large trader in the foreign exchange market can collapse the peg at any time; but if there are a large number of small, credit-constrained traders, they must move simultaneously to mobilize an attack of magnitude sufficient to shift the system from one equilibrium to another. Gerlach and Smets suggest that traders may use prominent events, like turbulence in foreign exchange markets and successful attacks on other countries, as focal points for coordinating their actions. This may explain why

\textsuperscript{15} Obstfeld describes a number of other channels through which an attack on a currency which forces the authorities to raise interest rates may thereby induce them to abandon the exchange rate peg: the impact of higher interest rates on the cost of public debt service, an induced increase in non-performing bank loans and hence bank failures, and a rise in the cost of indexed mortgage debt. A survey and synthesis of the relevant literature is provided by Jeanne (1994).

\textsuperscript{16} Similar dynamics arise in Obstfeld's (1994) optimizing model because the cost of servicing the public debt depends positively on the interest rate. Hence, a loss of confidence which must be met by interest rate hikes can so worsen the fiscal position as to provoke a self-fulfilling attack. See also Lehment (1994).
Particular events can trigger an attack by coordinating expectations of speculators. Empirically, if the coordinating devices which trigger speculative attacks differ over time, speculative attacks may look idiosyncratic rather than similar; we may also expect to see the clustering of attacks over time (a phenomenon sometimes known as ‘contagion’).

For a given set of macroeconomic fundamentals, it is equally possible for an attack to occur or not depending on how market participants expect one another to react, and how they expect government to react to their reactions. Strategic behaviour by traders and governments thus determines the incidence of speculative attacks. In the same way that a devaluation in a neighbouring country can serve as a focal point inducing speculative sales, so intervention can serve as a focal point encouraging speculators to withdraw from the market. One can equally well imagine, however, that intervention might encourage bear speculation if currency traders have reason to believe that the costs of intervention rise with its magnitude. Assume, for example, that the authorities defend the currency by raising the interest rate, but that the marginal cost to the government of raising the rate rises as the rate scales higher levels. Then speculative sales met by interest rate increases may cause currency traders to revise downward their estimate of the government’s capacity to defend the currency further, and encourage them to commit additional resources to its attack.

Chen (1995) models these dynamics in a world inhabited by a single central bank and a single Soros-like speculator. The flow costs of currency sales by the speculator and intervention by the government are assumed to increase with their respective magnitudes. The benefits to each depend on the level of the exchange rate, whose movement depends on the ratio of speculative sales to

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17 See Gerlach and Smets (1994) and Eichengreen and Wyplosz (1993). The latter report a survey of foreign exchange traders, the results of which can be interpreted in terms of this focal-point notion.
18 One might think that this possibility is especially plausible if intervention is coordinated with other countries. This information effect is distinct from the impact of foreign borrowing, and foreign support generally, on the exchange reserves of the government under attack. Buiter (1987) shows that foreign borrowing does not unambiguously delay the timing of an attack; besides increasing the resources at the authorities’ command, borrowing increases a country’s foreign indebtedness, implying a larger eventual devaluation and therefore a greater incentive for an early attack on a country with Krugman-like imbalances in fundamentals.
19 Lehment (1994) provides a model of these dynamics.
20 Assuming multiple speculators adds the questions about coordination addressed in the previous paragraph. Chen’s framework is an application of the Markov differential game model of patent races by Budd et al. (1993).
intervention. Solving for the subgame perfect equilibrium, Chen shows that there can exist a stable zone around the middle of a currency’s fluctuation band within which it is in the interest of neither the trader nor the government to enter the foreign exchange market. But an accumulation of small shocks that pushes the currency out of that zone and toward the edge of its band may induce the trader to initiate speculative sales. Intuitively, shocks have already done part of the work of pushing the currency out of its band without requiring the trader to incur costs. The government, in other words, is forced to engage in costly intervention to limit the effect of those shocks. The trader, having acquired a cost advantage relative to the government, may conclude that it is advantageous to force the issue. In this model, small shocks which shift the exchange rate within the band may set off large speculative attacks. These predictions are consistent with recent evidence that the position of the exchange rate within the band is a strong indicator of market expectations of realignment (Caramazza, 1993; Chen and Giovannini, 1993; Cuikerman et al., 1993; Rose and Svensson, 1994; Thomas, 1994).

One can approach this problem from the viewpoint of strategic behaviour among governments as well. Mélitz (1994) provides a model of a strategic game between two governments which use interest rate policy to support their currencies and achieve other objectives. Country A may wish to reduce its interest rate and be able to do so without destabilizing its exchange rate if Country B responds in kind. But if Country B fails to respond, Country A’s interest rate reduction may provoke an attack on its currency. This model is compatible with those described above that are driven by information revelation: the interest rate reduction by Country A, by failing to elicit a sympathetic response by Country B, reveals information about the latter’s commitment to supporting Country A’s exchange rate. Again, the attack on Country A’s currency can occur in the absence of obvious imbalances in macroeconomic fundamentals.  

This recent research highlights the possibility that political variables, rather than narrowly macroeconomic ones, play a critical role in speculative attacks. It implies, for example, that left-wing governments may be more inclined than their right-wing counter-

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21 Mélitz applies this model to the attack on the French franc in the summer of 1993, when French interest rate reductions did not elicit the expected German response, causing market participants to revise their views of the depth of Germany’s commitment to the maintenance of the franc/DM rate and the monetary union project.
Causality operates both ways. Exchange rate crises can affect politics

parts to abandon a currency peg in response to rising unemployment.\textsuperscript{22} Governments with small parliamentary majorities may be particularly susceptible to pressure to abandon the prevailing currency peg in response to additional unemployment (because, for example, they are most likely to fall as a result of a vote of no confidence by their unemployment-averse constituency if joblessness rises). Even controlling for the size of the governing majority, governments with short expected life spans may be more likely to abandon a currency peg in response to additional unemployment (since short-lived governments benefit less from an enhanced reputation for defending the parity in the future and suffer more from unemployment now). Crises may occur before elections if governments are prone to reflate the economy in order to enhance their chances of victory (Rogoff and Siebert, 1988) or after changes in government if the markets are uncertain of the new cabinet’s commitment to defending the currency. But while considerable attention has been paid to how such variables affect inflation rates, budget deficits and public debts (see inter alia Grilli et al., 1991; Roubini and Sachs, 1988), little if any work has been done to date on the political determinants of currency crises.

Much the same is true of the opposite direction of causality. Political variables can be affected by and affect exchange market outcomes. Cooper’s famous 1971 study found that currency devaluation was a leading indicator that an incumbent finance minister would be removed from office. More generally, exchange market turmoil is frequently interpreted as an indication of the government’s macroeconomic incompetence and as a leading indicator of an impending electoral defeat. But whether such relationships hold systematically has yet to be studied.

The recent literature says relatively little about what can be done to contain market pressures. One exception is Ozkan and Sutherland (1995), who analyse the effects of capital controls in a model of an optimizing government seeking to maintain an exchange rate peg. Controls, by reducing the impact of foreign interest rates – and foreign exchange market transactions generally – on domestic interest rates, can directly affect the policy-maker’s decision of whether to abandon the currency peg. In addition to this direct

\textsuperscript{22} Alesina and Tabellini (1989) find that left-wing governments are more inclined to impose capital controls, which is one of the events in response to which capital outflows and a speculative crisis may occur.
effect, there is an indirect effect operating through expectations: currency traders realize that the presence of controls encourages the government to continue defending the currency peg, and this discourages them from attacking it.

2.3. Empirical work

The questions that we consider are among the most basic in all of international macroeconomics. It is therefore striking that we possess so little systematic empirical analysis on which to base policy advice. There is a literature on the effects of currency devaluation (Cooper, 1971; Kamin, 1988; Edwards, 1989, 1993), but most of the episodes it considers are drawn from earlier periods in which financial markets were less well developed and capital controls were pervasive. None of these studies takes into account the authorities' choice between devaluing, floating and widening their currency bands in response to an attack, much less the efficacy of the alternative responses. Most importantly, these studies focus on exchange rate changes per se rather than currency crises: that is to say, they include exchange rate changes not preceded by speculative attacks, and exclude attacks that were successfully repelled. For our purposes, this is a source of selectivity bias in whose presence inferences about the consequences of speculative attacks may be misleading.

The literature on the causes of currency crises is even spottier. A few studies (Blanco and Garber 1986; Cumby and van Wijnbergen, 1989) have asked whether attacks on particular currencies (e.g. the Mexican peso in the 1970s, the Argentine peso in the 1980s) can be explained by lax monetary and fiscal policies, as predicted by standard macroeconomic models. But aside from our own previous work (Eichengreen et al., 1994a,b), we know of no recent studies that compare the evolution of macroeconomic variables in periods leading up to speculative attacks and in a control group of tranquil, non-attack periods.

In this paper we extend that previous work and draw out its policy implications. We examine a large panel of twenty industrial countries since the restoration of current account convertibility at the beginning of 1959. Where our previous study considered only periods when exchange rates were pegged within pre-announced bands, here we analyse the causes and consequences of turbulence affecting both pegged and floating rates. By considering a wider

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23 Anyone who doubts that floating exchange rates can be attacked has merely to think of the movements of the American dollar in the spring of 1995.
variety of economic variables, including labour market variables like employment, unemployment and wages, we more clearly distinguish between different explanations for speculative attacks.

We also consider political conditions directly. We ask whether speculative attacks are more likely to occur before or after elections and government changes, whether they are more likely to be directed at unstable or minority governments, and whether left- or right-wing governments are more susceptible to their effects. We ask how much political variables contribute to explaining the incidence of speculative attacks after controlling for macroeconomic policies. Are economic indicators a sufficient statistic to warn of impending currency crises, or do political variables have additional explanatory power?

Our previous papers were essentially static, limited to the periods around crises. In contrast, here we analyse both the prelude and aftermath of attacks. We ask how the post-crisis development of macroeconomic and political variables is affected both by the pre-attack behaviour of those variables and by policy-makers’ response to the crisis. Where our earlier papers took a univariate approach to analysing the data (comparing the behaviour of individual variables, one at a time, during speculative attacks and periods of exchange market tranquillity), here we embed our analysis in a multivariate, multinominal framework. We ask whether it is possible to discern differences in the joint behaviour of groups of economic and political factors across a variety of different exchange rate episodes. We emphasize that devaluations, decisions to float (or fix) the exchange rate, decisions to widen the band and success in repelling successful attacks are all alternatives, and analyse them jointly. We study the behaviour of macroeconomic and political variables in both the run-up to and the aftermath of various developments in financial markets – devaluations, flotations, unsuccessful attacks, and so forth – in an integrated fashion.

2.4. Recapitulation

The theoretical literature on speculative attacks analyses channels through which economic and political variables at home and abroad can provoke crises in foreign exchange markets. It provides a variety of predictions of how economic and political variables should behave in the period leading up to crises. Similarly, theoretical models of depreciation and realignment offer predictions of how exchange rate changes should affect real and nominal variables as a function of structural parameters such as the rigidity of real and nominal wages. There are gaps in the theoretical literature: for example, the decision
that a government faces when choosing whether to devalue or float its currency has not yet been tackled. But the imbalance between theory and evidence in the literature is striking. In contrast to the panoply of theoretical models made available by the economics profession, evidence on the empirical importance of the factors on which theorists focus is partial and conflicting in the case of economic variables and essentially non-existent in the case of political ones. There is no consensus view on whether speculative attacks are all alike, and whether different types of speculative attack resemble one another. In the remainder of this paper we set about rectifying this deficiency.

3. THE DATA

Any attempt systematically to study events and crises in foreign exchange markets must start by compiling a list of such episodes. We used the IMF’s annual report on Exchange Arrangements and Exchange Restrictions (EAER) to compile a list of officially declared devaluations and revaluations, decisions to float and fix the exchange rate, instances when a fluctuation band was widened, and other significant changes in exchange arrangements. We refer to these as foreign exchange market ‘events’ in contrast to a separate category (introduced below) called exchange market ‘crises’. Crises include unsuccessful speculative attacks and exclude changes in exchange rate arrangements not preceded by or associated with significant exchange market pressure; they overlap with ‘events’. We went through EAER for each year starting in 1959, tabulating and categorizing the events for each country in our sample. The tables at the end of EAER also provide us with binary indicators of the presence of capital controls.

The appendix provides information on sources we used to construct our macroeconomic variables. Our political variables were constructed from various issues of Keesing’s Record of World Events and Banks’ Political Handbook of the World, except for indicators of regime strength which were constructed following Roubini and Sachs (1989).

Any empirical analysis of issues in exchange rate economics

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24 We attempt to shed some empirical light on this issue below.
25 Our political variables have many missing observations.
requires one to choose the 'centre' or 'reference' country against which the exchange rate and other relative magnitudes are measured. We use Germany (for example, the exchange rate is defined as the price of a DM). Within the EMS this choice is clear. For the Bretton Woods period, when par values were declared against the dollar, perhaps the USA should occupy this position. But the dollar was a weak currency for portions of the 1960s and was subjected to attacks in 1971 and 1973. If the response to attacks is different in strong and weak currency countries because, for example, the costs of lowering interest rates are not the mirror image of the costs of raising them, there is an argument for using a centre country with a consistently strong currency. For this reason we use Germany as the reference country throughout.  

Before proceeding, a number of caveats are in order. First, published changes in international reserves are a very imperfect guide to the magnitude of foreign exchange market intervention. Monetary authorities sometimes report only the gross foreign assets of the central bank. But since it is standard operating procedure to arrange for stand-by credits in foreign currency, the authorities may intervene by drawing on credit lines without having to sell any of their 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.

Even when published data are accurate, intervention by foreign central banks can be hard to detect. In the ERM, interventions are compulsory at the margins of the currency grid. It is always the case that two (or more) currencies reach their margins simultaneously; thus, compulsory interventions are undertaken simultaneously by two (or more) central banks. In so far as we analyse changes in the reserves of each country relative to changes in German reserves and Germany is a strong-currency country throughout our sample, we are likely to pick up much of this foreign intervention. But

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26 In fact, our results were largely unchanged when we substituted the USA for Germany for the pre-1971 period. Note that when we cull devaluations and other foreign exchange market 'events' from EAER, we consider the behaviour of a currency vis-à-vis the country's chosen peg — typically the dollar prior to 1971 — rather than vis-à-vis the centre country, Germany. For example, when the Dutch guilder was revalued against the ecu but not against the Deutschmark in the second half of the 1980s, we classify this as an event.
intervention undertaken by third countries will not be detected. This would be the case if the Netherlands intervened to support the Italian lira. There is also the problem of attributing Germany's interventions to a particular country. German intervention in support of the Italian lira could produce a large percentage rise in German reserves relative to those of the Netherlands, seemingly signalling an attack on the guilder in a period when Dutch reserves were rising. Only proprietary central bank data on exchange market intervention would solve this problem. Reassuringly, work by Weber (1994) shows that the IMF series we use are broadly similar to proprietary intervention data.

In addition, quarterly observations may not be of a sufficiently fine periodicity to identify every speculative attack, especially unsuccessful ones. Pressure against pegged currencies can mount and be repelled through interest rate increases or foreign exchange market intervention within the month. If an attack is launched and repelled in a matter of days, the average behaviour of interest rates and international reserves over the quarter may not reveal the intensity and frequency of speculative pressures.

Finally, changes in capital controls may affect the meaning of interest differentials and reserve changes. When controls are in place, the authorities may keep the interest rate on the domestic money market virtually unchanged, while defending the parity with sterilized purchases on the foreign exchange market. The problems this creates for our analysis could be circumvented through the use of offshore interest rates; in practice, these are available for only a few countries, and even then only recently. An alternative is to use the imperfect data that are available on capital controls to contrast the behaviour of interest rates, reserves and other variables in periods when controls were present and absent; we pursue this in Eichengreen et al. (1994b).

4. THE STORY IN PICTURES

We begin our search for regularities by plotting the data. Figures 1–5 show the movements of various macroeconomic variables around different exchange rate 'episodes' (we use the term to denote both 'events' and 'crises'). The five figures portray respectively: devaluations; revaluations; exchange rate flotations; fixings of exchange rates; and other exchange rate regime events (changes in band width, unification of exchange rates, transitions to crawling pegs and so forth).
Each of the figures contains sixteen panels. Each of these small graphs illustrates the behaviour of a single variable for a four-year window around the time of devaluations (in the case of Figure 1), comparing its behaviour with that of a control group of country/period observations in which no exchange rate episode occurred. The top-left panel, for example, shows the behaviour of foreign exchange reserves (in annualized percentage changes, relative to Germany), beginning eight quarters before devaluation, continuing through the actual event (marked with a vertical line) and ending eight quarters after devaluation. We show the deviation of this variable from its value during 'typical' periods of tranquillity (interludes in which no events or crises occur).27

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27 Our control group excludes all observations both for actual events and for observations defined as crises, using the methodology we develop below. We also exclude observations within a two-sided, one-quarter window of each event and crisis to avoid double counting. Although there are 81 (potentially non-independent) devaluations in our sample, the number of observations that underlies an observation in any individual panel may be lower because of missing data. In this sense, the sample are not directly comparable across panels. Making our panels cross-comparable would involve the sacrifice of many observations and much precision.
Average values are plotted in the panels; a band of plus and minus two standard deviations is also provided to illustrate the extent of variation.

4.1. Realignments

The patterns in Figure 1 make intuitive sense. Reading across the first row, we see a steady loss of foreign exchange reserves for several quarters prior to devaluations associated with persistent weakness in the external accounts. The dollar value of exports falls in the period leading up to devaluations, by about 5% (compared to the observations for periods of tranquillity that comprise our control group). Import growth is also higher prior to devaluations than during periods of tranquillity. Unsurprisingly, the current account deficit is about 2% of GDP higher at devaluations than in periods of tranquillity.

Following devaluation, these patterns are reversed. Reserve losses slow and end after two post-devaluation quarters. Exports recover within a year to typical values; the turnaround in imports and the current account takes longer (perhaps due to the reasons traditionally cited in the literature on the ‘J-curve’).

The second row shows that devaluing countries run larger deficits (relative to Germany) than do countries in the control group, although the two-standard-deviation bands suggest that this differential is barely significant statistically. Domestic credit and money grow faster prior to devaluations than in tranquil periods; those growth rate differentials decline (at least temporarily) after devaluation, inconsistent with the self-fulfilling attack model.28 Thus intervention in support of the exchange rate appears to be sterilized during the early run-up to devaluations; M1 growth remains fast despite reserve losses. However, as reserve losses mount, money growth slows, suggesting that sterilization is less and less complete as the devaluation approaches. The real effective exchange rate is overvalued prior to the devaluation; competitiveness improves with devaluation and stays higher for a couple of years.

The third and fourth rows document the response of domestic markets. The rate of CPI inflation bears the expected relationship to money growth: it is faster, by two or three percentage points per quarter, in countries about to devalue than in the control group. This

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28 Although we only show M1, the behaviour of M2 is similar.
behaviour is mirrored, though to a lesser degree, in the behaviour of wage inflation and the long-term bond yield. Short-term interest rates are higher than in the control group for the two years leading up to devaluation, as if a positive probability is attached to the change in the exchange rate. As the event gets closer and probabilities of devaluation are refined, the interest rate rises significantly in anticipation of the coming devaluation.\(^{29}\) Stock prices are significantly lower in the period leading up to devaluation, presumably reflecting these higher interest rates. Neither short nor long interest rates decline substantially afterwards. This suggests that devaluation has credibility costs, and that markets expect further subsequent attacks.\(^{30}\) It is as if the markets realize that inflation is likely to remain significantly higher in post-devaluation countries than in the control group cases for a while, and demand appropriate compensation. But the inflation differential is larger than the interest

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\(^{29}\) This reasoning relies on both uncovered interest parity and an absence of mean-reversion when the exchange rate is constrained within a band; however, both of these are questionable assumptions.

\(^{30}\) This is especially plausible if the ‘interest rate defence’ imposes costs per se through, for example, more politically painful unemployment, as suggested by Bensaid and Jeanne (1994). The ‘contagion effect’ is the spread of such attacks across countries as well as across time; we explore this further below.
differential, suggesting a post-devaluation fall in real interest rates. Devaluation is good for expectations of profitability: stock prices rise in the wake of the event. Since prices rise significantly faster than wages, a decline in the real wage may be the source of the expected profitability implicit in higher stock prices.

The final row looks at the labour market and output. Unemployment is higher in the years surrounding devaluations, even though real wages are falling. Following the parity change, employment and output growth slow down quite markedly after a year and a half.

Overall, these patterns suggest that countries devalue mostly in response to external imbalances (falling reserves, current account imbalances, poor competitiveness and so forth), although there are also internal imbalances (high unemployment). The external imbalances are associated with expansionary monetary policies, but the roots of monetary expansion do not obviously lie in the fiscal domain. Governments appear to react well to devaluations, tightening monetary and fiscal policies in order to lock in competitiveness gains. Succinctly, devaluations appear to be caused by traditional reasons and appear to work.

While macroeconomic variables can be useful for predicting which countries are most likely to devalue, they are less useful for predicting the precise timing of the event (which has been the focus of much of the theoretical literature). Still, there are only a few sharply defined dynamic patterns in the run-up to devaluations. For instance, while the unemployment rate is a percentage point higher around devaluations, the differential does not change significantly during the years prior to the event.

Figure 2 is the analogue to Figure 1 for the case of revaluations (scales vary across figures). Most patterns mirror images of Figure 1. The growth of foreign exchange reserves is faster prior to revaluations than in the control group and no different afterwards. Exports grow faster and imports more slowly prior to revaluations (though not afterwards); this is mirrored in the behaviour of the current account. There is little evidence that the reason why countries have strong external accounts in the period leading up to revaluation is that monetary and fiscal policies are tight. Money and credit growth, wage and price inflation, and short- and long-term interest rates tend to be lower in the revaluing countries than in periods of tranquillity. Like devaluations, revaluations have unexceptional internal conditions.

To summarize, devaluations typically occur when unemployment is high, monetary policy is loose, inflation is rapid, and the external
accounts are weak. Late attempts to moderate monetary policy precede but do not preclude devaluations. Once the devaluation has occurred, reserves flow back and external balance is restored, while monetary and fiscal policy tightens. In the case of revaluations, macroeconomic variables move in the opposite direction, but their movements are less dramatic. Broadly speaking, exchange rate realignments are all alike.

4.2. Regime transitions

Figures 3, 4 and 5 portray the movements of our variables around three different sorts of regime transition: instances where the exchange rate was floated, when it was fixed, and other transitions (such as exchange rate unifications, changes to band-widths and so forth).

Conventional wisdom is that fixed exchange rates are floated in response to weakness. One thinks of the ignominious departures of the pound and lira from the EMS in September 1992, and Sweden’s abandonment of its unilateral peg two months later. It is also true, however, that the yen, guilder and Deutschmark were floated out of the Bretton Woods system in response to strength. While this conventional wisdom might lead one to expect that Figure 3 should
Figure 4. Fixings of exchange rates
Notes: Movements eight quarters before and after (33) fixings. Deviation of differentials from tranquillity; samples not comparable. Mean plus two standard deviation band. Industrial Country Panel, 1959–93.

resemble Figure 1, this is not the case. Indeed, there is little evidence of differences between the periods around flotations and tranquil periods.

Some of the movements around flotations in Figure 3 seem sensible. For instance, reserves fall quickly (compared with periods of tranquillity) prior to flotations and money growth rises. But other movements are more difficult to interpret, such as the strong current account and below average long-term interest rates. Perhaps the most striking feature of the figure is that most of the confidence intervals overlap the zero line, implying that the flotations cannot be distinguished from tranquil periods. This is true of inflation and wage growth, unemployment and output growth. Flotations are idiosyncratic, with few typical co-movements characterizing either the run-up to or the aftermath of flotations. There are signs that policy is relaxed after flotations; money growth stays higher than that in tranquil times, while wage and price inflation picks up. Further, the real economy improves, as unemployment falls while output and employment growth rise. These effects need not be caused by any slackening of policy; a flotation-induced depreciation can be expected to be inflationary and to improve competitiveness. But the long-term interest rate does not rise in anticipation of an
Unlike realignments, there are no reliable early signals of a change in exchange rate regime.

inflationary binge, despite the inevitable loss of credibility. Although the movement is quite weak, there is a deterioration of the budget.

Our negative result can be explained in a number of different ways. It may be that countries float their exchange rates for very different reasons, despite the common impression that countries are forced to float out of weakness. Some flotations may not have systematic causes; they may be of the self-fulfilling variety, unjustified by fundamentals. Also, countries switch from a policy of fixed exchange rates towards alternatives which may differ enormously, making the post-flotation heterogeneity perhaps unsurprising. But it is similarly difficult to generalize about the macroeconomic causes and consequences of decisions to fix a previously floating rate (or to widen the band, or otherwise to change the exchange rate regime).

Fixing might be thought of as the final step in a process of policy discipline, the crowning of disinflation efforts. Indeed, over the two years preceding a fixing, we observe some evidence of declining wage

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31 Our result is not an artifact of our choice of Germany as the base country; similar results hold if we treat the United States as the base country before 1973, and Germany thereafter. This is perhaps to be expected, since the United States was commonly viewed as a 'weak centre' during the collapse of Bretton Woods, whereas Germany was a 'strong centre' during the EMS speculative attacks of 1992-3.

32 We thank Torsten Persson for this point.
and price inflation. Yet fixings are also preceded by reserve losses and unremarkable fiscal and monetary policy. Confidence intervals are wide, and few regularities distinguish either the run-up to regime transitions or the periods immediately following them. While realignments seem to be fundamentally alike, transitions between exchange rate regimes are unpredictable and idiosyncratic.

Two conclusions follow. First, many regime transitions do not appear to be warranted by macroeconomic imbalances. Second, the speculative attacks that provoke them are not clearly justified by subsequent changes in the stance of policy provoked by the regime transition itself.33

It may be that our 33 flotations and fixings do not provide a sufficiently large sample to allow the data to discriminate between such events and tranquility, especially since some of these events are clearly linked and therefore do not provide independent observations (e.g. the flotations of the lira and the pound in September 1992).34 Alternatively, different transitions between exchange rate regimes may simply be undertaken for fundamentally different reasons. Markets seem to focus on different aspects of economic and political stability during different speculative attacks.35

4.3. Exchange rate crises

The preceding evidence is only indirectly informative about the causes and consequences of speculative attacks, since not all speculative attacks on exchange rates culminate in devaluations, revaluations or decisions to float, fix or widen the band. The currency may be supported by the expenditure of reserves by the central bank or by intervention by its foreign counterparts. Alternatively, the authorities may discourage bear speculation by raising interest rates and adopting other policies of austerity. Nor are all decisions to devalue or float the exchange rate necessarily preceded by speculative attacks. ‘Events’ and ‘crises’ in the foreign exchange market, in our terminology, are not the same. The next

33 Flood and Rose (1993) show that ‘fundamentals’ (dictated by different monetary models) do not vary across exchange rate regimes; here we show that they do not vary between regime transitions and tranquility.
34 It is also important to recall that our regime transitions, like realignments, are not necessarily declared in EAER with respect to the Deutschmark.
35 This seems prima facie reasonable; we think recently of British mortgage rates and Italian government debt in September 1992, Swedish financial woes in November 1992, and French unemployment rates in August 1993.
4.3.1. Identifying crises. A speculative attack is a period of extreme pressure in the foreign exchange market. Ideally, a measure of this pressure should stem from a model of exchange rate determination (from which the policy actions needed to maintain the currency peg could also be derived). However, much research has underscored the inadequacy of models linking macroeconomic variables to the exchange rate (Meese and Rogoff (1983) is the classic reference). To approach this question we therefore use a simple, if admittedly ad hoc method to measure exchange market pressure, following earlier work by Girton and Roper (1977). Speculative pressure is measured as a weighted average of exchange rate changes, interest rate changes and reserve changes, where all variables are measured relative to those prevailing in Germany, the reference country. Speculative attacks – crises – are defined as periods when this speculative pressure index reaches extreme values. Intuitively, an attack on a currency can lead to a loss of reserves, be rebuffed by a rise in domestic interest rates (and an associated contraction of domestic credit), or be accommodated by a depreciation or devaluation of the exchange rate. ‘Events’ which entail large fluctuations in quarterly values will be picked up by our index. But not all events entail crises (e.g. orderly realignments), and not all crises are events (e.g. successful defences).³⁶

The question is how to weigh the three components of the index of speculative pressure. The empirical literature provides little guidance. An unweighted average has the advantage of simplicity. But a look at the data reveals that the conditional volatility of percentage changes in reserves is several times the conditional volatility of the percentage change in the exchange rate, which is itself several times the percentage change in the interest differential. Movements in an unweighted average will therefore be heavily driven by reserve movements. An alternative is to weight the three components so that their conditional volatilities are equal. This is the measure on which we focus below.³⁷

³⁶ Further, not all speculative attacks may be picked up by our measure of crises. For example, an attack countered successfully by a very brief ‘interest rate defence’ (in which domestic interest rates are raised for a brief period of time) may not be captured.

³⁷ In Eichengreen et al. (1994a) we conducted sensitivity analysis in order to gauge how much difference different weighting schemes make. There we found that our central conclusions were largely robust to our choice of weighting scheme. We also found that our procedure picks up an intuitively reasonable sample of speculative attacks.
We refer to those quarters in which our index of speculative pressure was at least two standard deviations above the mean as an exchange market crisis. Sometimes two (or more) potential crises occur close together. To avoid counting the same crisis twice (or more), we exclude second (and subsequent) observations which occur within given proximity to the first crisis. Our initial window width is plus and minus two quarters.

Figure 6 shows the number of crises (and events) over time. Following the relatively placid 1960s, there is an up-tick in events in 1967, when the pound sterling was devalued. The number of crises stays up, reflecting turbulence in the market for other European currencies such as the French franc. The crisis in the Bretton Woods system in 1971 accounts for the peak in the number of events we pick up in that year, but it is notable that we detect only a slight up-tick in the number of crises (which can be interpreted as the crisis of 1971 being essentially a dollar crisis). The year 1973, in contrast, shows up as a more general crisis. The 1970s are characterized by more crises and events than the 1960s, although they settle down as the decade draws to a close. There are then simultaneous upswings in crises and events after 1980 (associated with global recession, the Volcker–Thatcher disinflations, and the earlier trials and tribulations of the
Figure 7. Exchange rate crises

Notes: Movements eight quarters before and after (78) crises. Deviation of differentials from tranquillity; samples not comparable. Mean plus two standard deviation band. Industrial Country Panel, 1959–93.

European Monetary System), after 1985 (associated with the high dollar and the Plaza and Louvre Accords designed to bring it down), and after 1991 (associated with the crisis in the EMS). This clustering of crises (and events) is consistent with theories of speculative attacks and policy responses that entertain the possibility of contagious spillovers across countries.

4.3.2. Regularities. We now analyse the behaviour of macroeconomic variables around the crises identified using this technique. Ineluctably, more confidence can be attached to the preceding analysis of ‘events’ than to the analysis of ‘crises’ that follows. Events are based on concrete reports of actual policy measures. In measuring ‘crises’, in contrast, we are forced to construct an index by imposing a variety of assumptions.

Figure 7 shows the evolution of the major macroeconomic variables in the eight quarters preceding and following crises; it is an analogue to Figures 1–5. There is an obvious temptation to compare crises (Figure 7) with devaluations (Figure 1) to see how much difference the categorization makes. The patterns are broadly similar, suggesting that crises have much in common with devaluations, although the patterns are weaker in the case of crises. (Given our definition of crises, it is no surprise that reserve losses,
interest rate hikes and real depreciations are more pronounced around speculative attacks.)

In order to make the differences between crises and devaluations easier to spot, Figure 8 compares the two directly. This is done by subtracting the variables at times of devaluations from those at times of crises.

Devaluations follow excessively expansionary policies that lead to balance of payments deficits and overvalued exchange rates. Initially it is the current account which is in deficit, but as the time of realignment nears, the capital account also worsens. Partial sterilization over the final pre-devaluation quarters implies a tightening of monetary policy. Indeed, interest rates, both short and long term, rise markedly while stock prices fall. In contrast, crises respond to more recent and sharper monetary relaxation, with no last-minute attempt at correction despite deeper reserve losses, often in an economy displaying more inflationary symptoms, with endemic export and current account difficulties. In the run-up to the attack, credit keeps growing (while it declines before devaluations), suggesting that foreign exchange market intervention is fully sterilized. Interest rates do not rise and remain lower than before devaluations – another sign of the absence of serious attempts to defend the exchange rate. Prior to devaluations, stock prices fall,
which can be explained by the rise in interest rates and by market expectations of monetary tightening. The same does not occur prior to a crisis, which is consistent with unchanged interest rates, but also suggests that the markets do not clearly foresee the attack or do not expect the attack to be followed by a tightening of monetary policy.

Indeed, further differences between devaluations and crises are also evident after the events have taken place. After devaluation, monetary policy becomes more restrictive; as a result output and employment growth weaken and external balance is quickly restored. In contrast, following a crisis there is little discernible slowdown in credit and money growth (certainly much less than after a devaluation). In both cases, interest rates remain high, although they are higher following devaluations. Indeed, policy restraint lingers after devaluations, while there are no signs of it following a crisis.

Thus the circumstances under which devaluations occur are best characterized as instances where policy corrections are needed due to relatively modest policy imbalances, and where the requisite adjustments can still take place in advance of the outbreak of crisis. In contrast, crises occur when macroeconomic conditions are allowed to run faster and further out of control without any last-
minute correction of policies, as if the requisite policy changes cannot be taken in time to head off the crisis itself.

The question therefore becomes why the necessary correction is not even attempted in advance of crisis. The answer lies in the economic and political cycle. Crises occur when unemployment is high and (as shown later) when political circumstances are unpropitious. These economic and political constraints are what prevent governments from reining in unsustainable policies, provoking the crisis.

We can shed further light on the distinction between crises and events by splitting our sample of crises into successful attacks and successful defences. We define the former as a crisis followed within a year by an event (e.g. a devaluation or flotation). Figure 9 provides a comparison between the two. It is an analogue to Figure 7, but compares successful attacks to successful defences instead of comparing all crises to periods of tranquillity.

There is no clear way of telling what makes attacks succeed or fail; most macroeconomic variables exhibit the same behaviour before successful and failed attacks. One difference is that the growth of output and employment is slower and unemployment higher before successful attacks. External conditions do not vary substantially between successful and unsuccessful attacks; imports and the current account are not significantly different between the two, even though exports, curiously, are stronger in the case of successful attacks, in spite of significant overvaluation of the exchange rate which is corrected by the attack itself. Perhaps the single most promising variable to tell successful attacks and defences apart is the fiscal situation. Countries whose currencies are successfully attacked have larger and worsening budget deficits before attacks, although this does not show up in the monetary aggregates.

Interest rates and the budgetary position improve dramatically after the event, while money growth falls, as if the authorities learn their lesson and strive to improve credibility. Thus, there is little evidence that speculative attacks, whether self-fulfilling or not, typically prompt governments to ease fiscal and monetary policies. However, this does not prevent a general wage and price inflation which is reflected in long-term interest rates. Successful attacks also take place in the context of a significantly weaker economy than successful defences (as is to be expected from the generally weak fiscal positions). Unemployment rates are higher and employment and output growth are lower before attacks that succeed. After successful

Recession makes governments more vulnerable to speculative attack
attacks, a number of macroeconomic indicators improve sharply, including the budget, exports and foreign exchange reserves.

All this suggests that governments are less able to defend themselves against speculative pressures during cyclical contractions. Governments seem to balance the exchange rate constraint against output and employment objectives.

These results do not provide much hope for identifying early signs of impending problems. The problems are threefold. First, the \textit{ex ante} differences between successful attacks and successful defences are generally domestic, whereas devaluations seem generally to be provoked by international imbalances. Second, differences are almost always statistically and economically insignificant, and move sluggishly over time (thereby giving few indications about the timing of speculative attacks). Third, while the obvious place to look for signs of difficulties is financial markets, short- and long-term interest rates appear to be \textit{ex ante} indistinguishable, not only between successful and unsuccessful attacks, but also between exchange rate crises and events and periods of tranquility.

4.4. Sensitivity analysis

We established the robustness of our findings by briefly examining a
variety of perturbations to our methodology. Our findings do not appear very sensitive.

Our most important check consisted of dropping all non-ERM observations from our data set. One advantage is that the remaining observations correspond to more homogeneous and recent conditions for a group of countries with exchange rates limited to relatively narrow bands. This essentially limits our event analysis to devaluations, and has the additional advantage of excluding all floaters from the sample.

Figure 10 closely resembles its analogue, Figure 1. Consistent with the standard view of EMS realignments, ERM devaluations were preceded by generally weak external positions: falling reserves, weak exports, high import growth and current account deficits. Government budgets show larger deficits than those of tranquil countries; money and credit growth is similarly high. These expansionary policies are reflected in higher actual and expected inflation, high long-term interest rates and depressed stock prices. The devaluations are partially expected, although interest rates rise sharply close to the actual realignments. Further, realignments tend to take place in a weak internal environment of high unemployment and low employment growth.

Movements after the devaluations are also consistent with conventional wisdom. Monetary and fiscal policies appear to be
tightened slowly after realignments, although both short- and long-
term interest rate differentials persist in the face of imperfect
credibility. Wage and price inflation gradually fall, and there is little
effect on the real economy. The authorities are rewarded for these
actions with a booming stock market and reserve inflows. Thus
realignments appear to have had the intended effects of improving
external positions.

We also undertook a number of additional sensitivity analyses. For
instance, we split our sample in different ways. We also normalized
the data displayed in our graphics differently, comparing our
variables around exchange rate events and crises (as always in
differentials vis-à-vis Germany) to country-specific periods of tranquillity
rather than to periods of tranquillity drawn from the sample as a
whole. We experimented with removing observations within a two-
year window around exchange rate events, so as to avoid counting
the same exchange rate episode twice, and two-quarter windows
around periods of tranquillity. None of these perturbations
substantially changed the results.

Finally, we provide some evidence on the importance of capital
controls. We divided our exchange rate episodes into those which
were experienced with and without capital controls (as measured by
the dummy variable in \( EAER \)). Figure 11 provides the evidence; it is
the analogue to Figure 7, but it compares exchange rate crises during
periods without capital controls to crises experienced during periods
with controls, not all crises to tranquillity. (We only have enough
observations both with and without capital controls to compare
exchange rate crises.)

When capital is more mobile, money growth, long-term interest
rates and price and wage inflation are lower before crises. Controls
allow the authorities to bottle up more inflation before an attack is
provoked. There is also significantly higher employment growth
before crises when capital is unconstrained. While many of the
differences are statistically insignificant, this does confirm our
previous work (Eichengreen et al., 1994b) which shows that controls
both allow more lax macroeconomic policy and increase the
incidence of (more manageable) attacks.

4.5. Recapitulation

Countries which devalue experience problems of external balance in
the period leading up to the event. Their trade deficits and reserve
losses are associated with relatively expansionary monetary policies.
In addition, the period leading up to devaluations is characterized by
problems of internal balance, as is reflected in relatively high levels of unemployment. The expansionary monetary stance may be partly motivated by these domestic problems. Revaluations are generally the mirror images of devaluations, and crises resemble actual devaluations. However, evidence of systematic patterns surrounding other events in foreign exchange markets paints a very different picture. In contrast to realignments of fixed exchange rates, transitions between exchange rate regimes seem both unpredictable and idiosyncratic. Devaluations are fairly predictable, events like floatations are not. Since it is not known ex ante how a government will react to any given speculative attack, our findings do not bode well for the development of ‘early warning’ systems designed to detect pending problems in international financial markets. They are also consistent with the belief that many changes in exchange rate regimes are caused by attacks which, while being successful, are not warranted by sinful policies either before the transition or after.

Finally, it is important to note that we have not detected any link between lack of fiscal discipline and exchange market turbulence. One interpretation is that fiscal profligacy is simply not the source of speculative attacks and does not create the need to change the exchange rate. Another is that only money-financed deficits matter. Probably the most plausible interpretation is that, in our sample of mostly fiscally virtuous advanced economies, budget imbalances and debts have not played a major role in exchange rate travails, but that we might come to very different findings with a sample that also included episodes of high inflation in Latin America and elsewhere in the developing world. One of our earlier conclusions is that an exchange rate defence may be politically costly. Bringing these two observations together suggests a strategy for fiscally sound countries: instead of relaxing monetary policy to avoid a politically costly slowdown, they may improve their chance of fending off speculative attacks by using expansionary fiscal policies so that high unemployment does not make defence too expensive.

5. STATISTICAL ANALYSIS

The presentation in section 4 relies upon graphical tools. Using the theoretical framework presented in section 2, we examined a number of macroeconomic variables to search for patterns in the periods surrounding exchange rate events and crises. Nevertheless, this
approach is intrinsically informal. In this section, we consider more rigorous statistical tests of the generalizations developed in section 4.

We undertake two types of statistical analysis. First, we introduce political variables and check to see if they are closely related to events and crises. Second, we replace the variable-by-variable approach with an analysis of the joint effects of the economic and political variables of interest (by estimating multivariate regression models).

### 5.1. The role of politics

Table 1 presents information on a variety of different political variables for our taxonomy of exchange rate episodes. Our sample contains seven columns corresponding to mutually exclusive and jointly exhaustive partitions. These are: devaluations; revaluations; exchange rate flotations; fixings of exchange rates; other changes in exchange rate regime (such as changes in band-widths); failed attacks (crises which do not coincide with one of the five events); and the complementary sample, which we think of as being ‘tranquillity’.

The rows provide tabulations of our variables across these episodes. We are searching for signs that political events are not randomly distributed across exchange rate episodes: for instance,
that governments tend to fall disproportionately before or after realignments. This is done by testing the hypothesis that a given political variable has no effect.

By and large, political phenomena are rarely linked to exchange rate episodes. Our second row shows that the political orientation of the government seems to be independent of exchange rate episodes. The same is true of both elections and changes in government (which do not require elections in many systems), so that political uncertainty per se does not seem to provoke attacks.

Government victories (e.g. winning an election) are not strongly associated with speculative attacks (though one might have expected disproportionate numbers of tranquil periods). This is true not only of contemporaneous government victories, but also of those which occurred during the past or next year. But a defeat of the government in the past year is associated with a disproportionately larger number of realignments; a new finance minister in the past year has the same effect. On the other hand, there is little evidence that exchange rate episodes are associated with future government defeats; the finance minister is used as a sacrificial lamb (consistent with Cooper's celebrated result).

Table 1 also confirms the importance of capital controls (as measured by the EAER dummy variable). Periods of tranquillity and capital mobility outnumber periods of tranquillity with controls by about two to one. But important events like devaluations and flotations are more likely to occur without controls, and failed attacks are more likely when controls are present. It seems that controls allow governments to avoid not only realignments (which are frequently warranted by economic circumstances), but also regime transitions. In other words, capital controls may be a potent weapon for governments wishing to avoid (frequently unjustified) regime switches.

5.2. The joint effects of economic and political variables

Most of the preceding analysis can be criticized on two grounds. First, it is univariate. We compare the behaviour of our variables one by one, during, for example, devaluations and periods of tranquillity. We do not consider groups of variables and ask whether their joint

38 On reflection, this seems unsurprising, since opposition parties frequently state that they will not change the exchange rate regime, often for fear of being blamed for precipitating a speculative attack.
behaviour differs between crises or events and tranquillity. Second, it is *uninomial*. We compare each exchange rate episode state (crisis, devaluation, revaluation, flotation, etc.) to periods of tranquillity in isolation from one another. We do not analyse the causes and consequences of crises and various events *simultaneously*. It is well known, however, that such a piecemeal approach may lead to unwarranted conclusions. That is why we now use a technique to rectify these deficiencies. Our econometric strategy has four important features. The model we develop is *multivariate*, in that it considers a number of economic and political variables simultaneously. It is *multinomial*, in that it simultaneously compares periods of tranquillity to crises and a variety of different ‘events’. It is *dynamic*, in that it examines periods of time both before and after crises and events. We look backward to study the antecedents of various exchange rate episodes, and forward to examine their consequences. Finally, it is *non-structural*, in that it does not estimate or test any particular speculative attack theory. Rather than confirming or rejecting a narrowly defined structural model, our statistical approach amounts to systematic data exploration.

We proceed as follows. We ask whether the economic and political variables under consideration can help predict the likelihood of each of the events listed in the column heading of Table 1: a crisis which is not an event (a failed attack or successful defence), devaluation, revaluation, flotation of the exchange rate, fixing the rate, other events in foreign exchange markets, and tranquillity (the omitted alternative). We use a one-quarter exclusion window, so that each country contributes no more than two observations annually, in order to avoid counting the same episode twice. In assessing the role of each variable, we consider both its past and future linkages to the exchange rate episode (we estimate a multinominal logit model).39

We began by using (the leads and lags of) nearly all of the variables

---

39 In order to deal with the well-known small-sample problems of multinomial logit estimation, we need to reduce the number of regressors (sixteen macroeconomic variables alone are shown in most of the figures!). One way around the problem is to estimate a tightly parameterized theoretical model which would make few demands on the available data. (As discussed above, this is the tactic adopted by the small existing literature, e.g. Blanco and Garber (1986).) The problem is that poor estimates would then constitute rejection of a single model, when we are more interested in developing a stylized picture of different exchange rate episodes. Our approach is to save degrees of freedom by representing leads and lags of regressors using moving averages in a reduced form. Thus, instead of including separately the first, second, third and fourth lags of, for example, inflation differentials in our regressions, we include only a single term which is the average inflation differential in the preceding year. All models are estimated using maximum likelihood.
### Table 2. Variables correlated with exchange rate episodes

(Effect on probability of each episode, and (in brackets) probability that each variable does not affect the distribution of events)

<table>
<thead>
<tr>
<th></th>
<th>Failed attack</th>
<th>Devaluation</th>
<th>Revaluation</th>
<th>Flotation</th>
<th>Fixing</th>
<th>Other event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past crisis</td>
<td>-3.50 (0.00)</td>
<td>0.27 (0.34)</td>
<td>0.03 (0.97)</td>
<td>-0.61 (0.33)</td>
<td>-1.40 (0.09)</td>
<td>0.33 (0.44)</td>
</tr>
<tr>
<td>Past event</td>
<td>0.77 (0.51)</td>
<td>0.14 (0.77)</td>
<td>-1.4 (0.11)</td>
<td>0.55 (0.61)</td>
<td>20.00 (0.00)</td>
<td>-1.10 (0.03)</td>
</tr>
<tr>
<td>Past controls</td>
<td>3.90 (0.00)</td>
<td>-2.2 (0.02)</td>
<td>3.2 (0.05)</td>
<td>-0.62 (0.80)</td>
<td>0.89 (0.79)</td>
<td>-0.58 (0.74)</td>
</tr>
<tr>
<td>Past govt win</td>
<td>-0.44 (0.59)</td>
<td>-0.10 (0.82)</td>
<td>-0.12 (0.88)</td>
<td>0.12 (0.85)</td>
<td>-0.69 (0.55)</td>
<td>0.51 (0.38)</td>
</tr>
<tr>
<td>Past govt loss</td>
<td>1.10 (0.11)</td>
<td>0.88 (0.01)</td>
<td>1.9 (0.01)</td>
<td>0.44 (0.55)</td>
<td>1.20 (0.09)</td>
<td>0.64 (0.21)</td>
</tr>
<tr>
<td>Credit lag</td>
<td>0.02 (0.63)</td>
<td>0.01 (0.74)</td>
<td>-0.11 (0.15)</td>
<td>-0.03 (0.51)</td>
<td>-0.18 (0.00)</td>
<td>0.01 (0.74)</td>
</tr>
<tr>
<td>Inflation lag</td>
<td>-0.21 (0.03)</td>
<td>-0.09 (0.07)</td>
<td>-0.16 (0.23)</td>
<td>-0.13 (0.16)</td>
<td>-0.16 (0.13)</td>
<td>0.03 (0.73)</td>
</tr>
<tr>
<td>Growth lag</td>
<td>0.12 (0.30)</td>
<td>-0.08 (0.30)</td>
<td>0.01 (0.96)</td>
<td>-0.12 (0.43)</td>
<td>0.14 (0.39)</td>
<td>-0.15 (0.21)</td>
</tr>
<tr>
<td>Employment lag</td>
<td>0.55 (0.00)</td>
<td>0.02 (0.87)</td>
<td>-0.34 (0.30)</td>
<td>-0.10 (0.68)</td>
<td>0.62 (0.02)</td>
<td>-0.02 (0.94)</td>
</tr>
<tr>
<td>Unemployment lag</td>
<td>0.17 (0.65)</td>
<td>0.22 (0.27)</td>
<td>0.53 (0.34)</td>
<td>0.07 (0.85)</td>
<td>0.06 (0.90)</td>
<td>0.13 (0.68)</td>
</tr>
<tr>
<td>Budget lag</td>
<td>-0.05 (0.77)</td>
<td>0.09 (0.22)</td>
<td>0.03 (0.88)</td>
<td>-0.01 (0.94)</td>
<td>-0.19 (0.29)</td>
<td>-0.24 (0.03)</td>
</tr>
<tr>
<td>Current account lag</td>
<td>-0.05 (0.68)</td>
<td>-0.22 (0.00)</td>
<td>0.12 (0.43)</td>
<td>0.15 (0.14)</td>
<td>-0.05 (0.69)</td>
<td>0.12 (0.33)</td>
</tr>
<tr>
<td>Future controls</td>
<td>-3.30 (0.01)</td>
<td>2.90 (0.00)</td>
<td>-0.88 (0.49)</td>
<td>1.30 (0.61)</td>
<td>2.20 (0.51)</td>
<td>1.70 (0.34)</td>
</tr>
<tr>
<td>Future govt win</td>
<td>0.43 (0.63)</td>
<td>0.53 (0.13)</td>
<td>0.03 (0.97)</td>
<td>-1.10 (0.33)</td>
<td>1.30 (0.07)</td>
<td>0.70 (0.16)</td>
</tr>
<tr>
<td>Future govt loss</td>
<td>1.80 (0.01)</td>
<td>0.30 (0.41)</td>
<td>-33.00 (1.0)</td>
<td>-0.08 (0.92)</td>
<td>-0.89 (0.43)</td>
<td>0.70 (0.18)</td>
</tr>
<tr>
<td>Credit lead</td>
<td>-0.01 (0.78)</td>
<td>-0.03 (0.16)</td>
<td>0.06 (0.13)</td>
<td>0.05 (0.14)</td>
<td>-0.04 (0.49)</td>
<td>0.01 (0.75)</td>
</tr>
<tr>
<td>Inflation lead</td>
<td>0.38 (0.00)</td>
<td>0.05 (0.34)</td>
<td>0.03 (0.82)</td>
<td>0.16 (0.05)</td>
<td>0.23 (0.02)</td>
<td>-0.05 (0.52)</td>
</tr>
<tr>
<td>Growth lead</td>
<td>0.27 (0.03)</td>
<td>0.04 (0.54)</td>
<td>0.09 (0.63)</td>
<td>0.14 (0.29)</td>
<td>0.39 (0.01)</td>
<td>-0.14 (0.27)</td>
</tr>
<tr>
<td>Employment lead</td>
<td>0.31 (0.08)</td>
<td>-0.13 (0.39)</td>
<td>-0.08 (0.81)</td>
<td>-0.25 (0.29)</td>
<td>-0.39 (0.24)</td>
<td>0.20 (0.33)</td>
</tr>
<tr>
<td>Unemployment lead</td>
<td>-0.02 (0.97)</td>
<td>-0.17 (0.37)</td>
<td>-0.46 (0.40)</td>
<td>-0.12 (0.74)</td>
<td>0.09 (0.85)</td>
<td>-0.18 (0.56)</td>
</tr>
<tr>
<td>Budget lead</td>
<td>0.14 (0.35)</td>
<td>-0.17 (0.02)</td>
<td>-0.00 (1.0)</td>
<td>0.08 (0.57)</td>
<td>0.15 (0.40)</td>
<td>0.14 (0.20)</td>
</tr>
<tr>
<td>Current account lead</td>
<td>0.12 (0.32)</td>
<td>0.14 (0.04)</td>
<td>0.09 (0.55)</td>
<td>-0.24 (0.06)</td>
<td>0.02 (0.91)</td>
<td>0.04 (0.68)</td>
</tr>
</tbody>
</table>

Notes: 1300 total observations. Coefficients estimated by maximum likelihood. McFadden’s $R^2$ = 0.18. Implied chi-squared statistics used to construct inferences below:

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Probability true</th>
<th>Reject hypothesis?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficients same for tranquility and:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>failed attacks</td>
<td>0.00</td>
<td>yes</td>
</tr>
<tr>
<td>devaluations</td>
<td>0.00</td>
<td>yes</td>
</tr>
<tr>
<td>fixings</td>
<td>0.00</td>
<td>yes</td>
</tr>
<tr>
<td>flotations</td>
<td>0.17</td>
<td>no</td>
</tr>
<tr>
<td>revaluations</td>
<td>0.31</td>
<td>no</td>
</tr>
<tr>
<td>other events</td>
<td>0.51</td>
<td>no</td>
</tr>
<tr>
<td>Events uncorrelated with:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>past crises</td>
<td>0.02</td>
<td>yes</td>
</tr>
<tr>
<td>past events</td>
<td>0.00</td>
<td>yes</td>
</tr>
<tr>
<td>Events uncorrelated with past (future):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>government victory</td>
<td>0.95 (0.22)</td>
<td>no (no)</td>
</tr>
<tr>
<td>government defeat</td>
<td>0.00 (0.15)</td>
<td>yes (no)</td>
</tr>
<tr>
<td>credit growth differential</td>
<td>0.07 (0.30)</td>
<td>no (no)</td>
</tr>
<tr>
<td>inflation differential</td>
<td>0.04 (0.00)</td>
<td>yes (yes)</td>
</tr>
<tr>
<td>real GDP growth differential</td>
<td>0.53 (0.02)</td>
<td>no (yes)</td>
</tr>
<tr>
<td>employment growth differential</td>
<td>0.02 (0.27)</td>
<td>yes (no)</td>
</tr>
<tr>
<td>unemployment differential</td>
<td>0.87 (0.93)</td>
<td>no (no)</td>
</tr>
<tr>
<td>budget/GDP differential</td>
<td>0.25 (0.16)</td>
<td>no (no)</td>
</tr>
<tr>
<td>current account/GDP differential</td>
<td>0.03 (0.15)</td>
<td>yes (no)</td>
</tr>
</tbody>
</table>
discussed above but found that (fourth-order moving) averages are appropriate for analysing the causes of crises and events. Very similar results are found when we utilize second- or eighth-order lags. This is unsurprising given the smooth behaviour of the variables manifest in the figures.

Table 2 collects the results. We show how much each economic or political variable listed in the first column affects the probability that the event listed in the top row will occur. A positive number indicates that the relevant variable raises the probability of the event, and conversely for a negative sign. The numbers in parentheses show the probability that the effect is nil; a low value indicates that the measured effect is not a statistical fluke, so that the variable does affect the event under consideration.40

At the bottom of Table 2 we report a number of summary tests. The first series ask whether events listed in the column headings differ (in the sense that the behaviour of the economic and political variables listed down the left-hand side of the table is not the same) from the benchmark case of tranquillity. For example, there is zero probability that failed attacks are identical to tranquillity. The results broadly confirm the discussion above which is based upon graphics.

Failed attacks (a subset of the crises portrayed in Figure 6) and devaluations are significantly different from periods of tranquillity. Revaluations are not, as seems reasonable given the small number of revaluations. More importantly, neither exchange rate flotations nor other changes in regime can be distinguished from periods of tranquillity, a reflection of the fact that regime transitions seem idiosyncratic. Exchange rate fixings can be distinguished from periods of tranquillity, but this is mostly the result of the fact that collective systems of managed rates like the EMS begin at the same time.

The second series of tests ask the opposite question: do the economic and political variables behave differently across the different episodes under consideration? We look separately at lagged and leading effects. These statistics can be interpreted like the first set. Thus the hypothesis that lagged government victories are

---

40 The interpretation of individual coefficients is blurred for two reasons. First, coefficient interpretation in multinomial logit is always slightly tricky. Second, the non-structured nature of our estimation means that each coefficient represents the partial effect of the regressor on the likelihood of the cell's occurring instead of tranquillity; that is, holding all other effects constant. But the co-movements we observed earlier around realignments may make partial correlation coefficients uninteresting.
irrelevant for all cells cannot be rejected, unlike the hypothesis that lagged government defeats are irrelevant. The variables that matter are capital controls (both lags and leads), past government defeats, past and future inflation, future GDP and employment growth, and past current account balances.

Overall, what do we find in the details of the table? In a word, confirmation of the portrait painted by our more informal analysis of the data. Past crises and events matter for current ones: this is an indication that credibility is an important factor. Past crises make failed attacks more likely, while recent events make exchange rate fixings much more likely. Capital controls are also highly significant, as expected. Their presence makes future devaluations less likely, and future unsuccessful attacks more likely. Capital controls are also more likely to appear after devaluations and to disappear after a failed attack.

Although recent government defeats seem to provoke realignments, there is remarkably little evidence of feedback between the government’s popularity and the exchange rate regime. The role of monetary factors and inflation in triggering attacks is confirmed. In contrast, fiscal laxity does not play an important role. Put differently, bond-financed budget deficits typically do not pose an exchange rate problem, unless they have an inflationary impact. The role of labour market conditions is generally not confirmed, however, although favourable employment growth increases the probability of a successful attack. A deteriorating current account balance makes devaluation more likely.

The interpretations of leads of variables can be tricky. One possible reading of the table, for example, is that a successful defence is followed by faster output growth. But the results of Table 2 are also compatible with the view that success in repelling an attack is enhanced by the expectation that the economy is turning around and about to grow faster. In the discussion which follows, we freely use intuition to interpret the results, keeping in mind this ambiguity.

A devaluation is followed by budgetary relaxation and an improvement in the current account, which suggests that private spending declines. Fixing the exchange rate is rewarded with a significantly higher growth rate. Similarly, a successful defence is conducive to growth, and is also followed by inflation; the same applies to fixings.

There is also much to learn from the insignificant entries in Table 2. Unemployment rates, government budgets and the growth rate of domestic credit are essentially unrelated to exchange rate episodes.
The latter two are especially important, since they represent the tools of monetary and fiscal policy, whose laxity is said to both provoke and be provoked by devaluations, exchange rate flotations and the like.\footnote{We also estimated \textit{ad hoc} refinements of these models to focus attention on two phenomena of interest. First, the basic 'fundamentals-based' speculative attack model focuses attention on two underlying causes of speculative attacks: government budget deficits and credit growth in excess of income growth. We estimated models which omit other regressors so as to try to isolate these effects. But it is not the case that lags of either factor are substantially more noticeable in a more parsimonious model. Second, we searched for systematic changes in the same regressors before and after actual exchange rate events, in an attempt to identify the policy switches indicated by the 'self-fulfilling' speculative attack model. We met with a similar lack of success, further confirming our view that there do not seem to be policy switches after exchange rate episodes.}

6. POLICY IMPLICATIONS

The simplest interpretation of our results is that governments bring currency crises on themselves through the reckless pursuit of excessively expansionary policies. In particular, they pursue accommodating monetary policies that lead to high inflation and reserve losses, generally in response to disturbing developments on the unemployment front. Those which take significant last-minute steps to defend the currency by significantly reducing the rate of growth of the money supply (undertaking unsterilized foreign exchange market intervention) may succeed in defending the rate. Those which retrench less dramatically on the monetary front may still have to devalue, but may succeed in doing so without creating an atmosphere of crisis. Those which rely for defence of the exchange rate purely on sterilized intervention may find themselves unable to avoid a full-blown currency crisis.

Thus a clear implication of our results is that governments that are serious about defending their exchange rates cannot expect to rely seriously on sterilized intervention. They need also to be prepared to take serious, and often seriously painful, policy steps with uncomfortable domestic macroeconomic implications.

But many other governments whose currencies are attacked do not clearly bring their exchange market difficulties on themselves through the reckless pursuit of expansionary policies. Virtuous behaviour, in other words, is no guarantee of immunity from exchange market pressures; many flotations are not preceded by lax monetary or fiscal policy. Speculative attacks can occur because markets are uncertain about a government's intentions and test its
resolve. Alternatively, speculative attacks can be a symptom of self-fulfilling attacks, in the sense that markets believe that the government will not resist pressure and will shift to more expansionary policies as it abandons its exchange rate commitment in response to the attack itself.

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

What this means is that a system of fixed exchange rates requires some form of insurance to support countries that cannot simply help themselves. When facing self-fulfilling attacks, they must be able to draw automatic and commensurate support from their strong currency counterparts. Every modern system of pegged exchange rates (Bretton Woods, the EMS) has sought to provide some such insurance. However, as with any insurance system, this raises delicate problems of moral hazard. Experience shows that such problems deter countries that are formally obliged to extend unlimited support to weak currencies from doing so. This same factor limits the ability of multinational organizations like the IMF to provide fast and adequate assistance.

These findings reinforce scepticism about the viability of several otherwise attractive proposals for international monetary reform. Advocates of exchange rate target zones (Williamson and Henning, 1994; Bergsten, 1994) argue that, if governments only commit to the pursuit of the ‘right’ policies, exchange rates between the currencies of the leading industrial countries can be held within bilateral fluctuation bands of, say, plus or minus 10%, which would represent a considerable improvement on the historical volatility of the dollar/yen and dollar/Deutschmark rates. Our results suggest that pursuit of any particular set of policies is no guarantee of insulation from speculative pressure, and indeed no guarantee that an attack, once launched, will not succeed. They suggest that recommendations of a return to even narrower bands, whether globally (Bretton Woods Commission, 1994) or in Europe, where EMS bands were widened from $\frac{21}{4}$ to 15% in 1993, are more problematic still. The realignment mechanism seems to work well, in that devaluations are both warranted and effective, while not tempting the authorities towards lax policies. However, systems of pegged but adjustable rates (or
bands) are inherently fragile in that they disintegrate quickly under stress, even when the speculative pressures giving rise to the crisis are not obviously grounded in fundamentals.

This conclusion leaves only a limited menu of options for improving the operation of the exchange rate system: (1) monetary union in the style of Maastricht, which promises to abolish exchange rate instability by abolishing the exchange rate; (2) a transactions tax on foreign currency dealing to provide policy-makers with insulation from market pressures; and (3) learning to live with the dirty float. All of these options have drawbacks.

A single world currency, or a single currency for the OECD countries, hardly seems feasible in our lifetimes. Our analysis shows that the exchange rate can be a useful instrument of adjustment. And the greater the asymmetry in the disturbances affecting the different OECD countries, the stronger the argument for retaining the exchange rate escape clause. In any case, monetary unification raises fundamental political questions about the limits of national sovereignty. Europe, with 50 years of experience, has proceeded sufficiently far down this road that European monetary union remains possible by the end of the century. But it is hard to imagine a monetary union between, say, the EU and the United States over a horizon relevant for practical policy discussion.

The second option is a Tobin tax on foreign exchange transactions. If effective, this would enhance policy-makers' ability to contain market pressures, and allow them to repel self-fulfilling attacks. Economists, including the authors of this paper, resist the idea of interfering in the operation of markets.

In addition, to be effective, a foreign exchange transactions tax would have to be implemented globally. An initiative along these lines would presumably have to take the form of an amendment to the IMF Articles of Agreement. This is not something that will occur overnight.

For those who oppose both monetary unification and the Tobin tax, there remains only one alternative: living with floating – misalignments, volatility and all. This means more systematically adapting domestic policies in a manner consistent with exchange rate stability, coordinating policies internationally, and hoping for the best. There are no facile alternatives free of costs.

42 See Eichengreen et al. (1995), from which the following discussion is drawn.
Discussion

Bernard Dumas
Haute Études Commerciales, Jouy-en-Josas

This paper represents a wide-ranging attempt to gather ‘facts’ without testing a particular theory of speculative attacks. The main findings may be summarized in the following way. It is shown very clearly that comparatively rapid monetary growth, comparatively high inflation, wage increases and unemployment are triggering factors for devaluations and speculative attacks. A somewhat less clear-cut result is that rates of wage and price inflation are high for a longer period prior to successful than to unsuccessful attacks. Also, the current account deficit as a percentage of GDP is larger in the case of successful attacks. I have some comments to formulate about the statistical method used and about the role of the financial market in events and attacks.

Method: comparison with event-study method

The method used in this paper is rather reminiscent of the ‘event-study’ method commonly used in the field of finance. Fama, Fisher, Jensen and Roll (1969) (FFJR) did a study on the reaction of the stock market to stock splits (i.e. division of company shares into smaller denominations or issue of ‘free’ shares to existing stockholders). In order to obtain clean results, FFJR took a number of precautionary measures: first, they studied events that concerned individual companies and that were spread out over a wide span of time; second, they collapsed event dates to time zero and computed an average over companies so that extraneous events have a good chance of washing out, since they occur at different historical times; third, systemic (market-wide) effects were further reduced by considering residual stock returns after removing (by means of regression) the effect of the market portfolio return. At any rate, FFJR were working on stock market rates of return which are approximately independent over time. They were on safe ground when they interpreted any pattern in the residual returns around the event date as being due to the proximity of the event and not to serial dependence. Their most striking result was obtained when contrasting splits that lead to dividend increases with those that do not; they
found that the market correctly guesses the probability that the dividend (per old share) is increased in the aftermath of the stock split.

In the case of the study by Eichengreen, Rose and Wyplosz (ERW), I am afraid that the conditions under which the study is conducted are not as ideal as they were in the case of FFJR and, as a result, interpretation of the result is less clear-cut.

My main concern is that we can expect dependence between events or between attacks. First, there is likely to be serial dependence between them, so that spurious patterns can appear that are not related to the event under examination. Second, there is likely to be cross-sectional dependence of events/attacks, as these occurrences are known to be contagious from country to country.

Perhaps even more important, the explanatory variables used in this paper are macroeconomic (systemic) variables. Business cycle swings are common to many countries. It would have been useful to identify country-specific components in the behaviour of these economic variables. The authors do make an attempt to remove dependence between the macroeconomic variables. They compare each country’s values of the variables with their values during an average tranquil period. However, it is not clear how tranquil periods are selected, and what influence that choice has on the results. Some of the blips in the curves, which seem common to several diagrams, are probably due to the common influence of the tranquil period. This is a case in which the control variate, far from removing an unwanted dependence, instead creates one. Furthermore, the authors do not provide any exact econometric justification for their procedure; this would be a justification based on an explicit assumption concerning the process followed by the variables. How do we know that the chosen procedure is better or worse than, say, a comparison with the contemporaneous variables of an ‘average country’ or with the contemporaneous variables of a non-attacked country?

By a familiar backward induction argument, it is crucial to figure out what makes an attack successful or unsuccessful, as the same determinants would also condition the likelihood of an attack occurring in the first place. In the final draft of their paper, ERW have focused their analysis more sharply on that issue by comparing the two types of attack not against a tranquil period but against each other (Figure 9). Such an analysis is analogous to FFJR comparing the stock splits that lead to a dividend increase to those that do not. It
is disappointing that no clear message emerged from that comparison.

The role of the financial market in events and attacks

ERW point out (Figures 7 and 9) that, following a crisis or attack, the attacked country’s interest rate, compared to other countries’ interest rates, remains lastingly higher than it was before. This is true even when the attack was met with a successful defence on the part of the country’s authorities.

It would have been useful to know whether the same is true of other variables that describe the attitude of the financial market (long-term bond prices, stock prices, etc.). I discern here a phenomenon analogous to one uncovered by David Bates (1991) in the stock market. Using option-implied volatility/skewness measurements, he showed that the stock market crash of 19 October 1987 was not anticipated by the market, but, following the crash, a second crash was lastingly expected. In later work, Bates also showed that these expectations survived all the way through 1993, and probably still do.

Admittedly, one can produce more than one interpretation of the interest rate phenomenon observed by ERW. For instance, one can subscribe to the vicious circle theory of Bensaid and Jeanne (1994), who argue that the interest rate defence is costly in terms of unemployment and makes further attacks more likely.

However, I find another interpretation more intriguing. The financial market may switch its attitude towards a particular country. The switch could be the result of financial market participants playing a game with imperfect information. In that game, the market would be a learning apparatus as each market participant constantly learns about the central bank behaviour (in that sense, it would be a reputation game), but also, and above all, learns about other participants’ behaviour. In this latter regard, an analogy could be drawn with Chari and Jagannathan’s (1988) model of bank runs. The reason why participants need to know about each other’s behaviour is that, in the case of attacks, they know that if they join forces they can bring a central bank to its knees. In this interpretation, a coordination device is needed to trigger an attack by speculators (e.g. in Chari and Jagannathan, the coordinating variable is the length of the queue at the bank, which people can observe).

The paper of ERW can therefore be viewed as a search not for fundamental variables, but for coordinating variables. But a major
conceptual problem is created by this interpretation: why should there be empirical regularities in coordination devices? It is quite conceivable that a different variable plays the role of rallying cry each time. What is needed is a statistical technique to identify the variable that is currently at an extraordinary level and which may, therefore, act as the current rallying cry.

Conclusion

After reading this very stimulating paper, I feel that, perhaps, future research should be directed towards switching models in which, on the occasion of each attack, one or two variables play a dominant role. The statistical model should focus on the determination of the choice of the dominant variable in each attack episode. For example, the model should aim to determine how far away from a normal value each relevant variable identified by ERW has to be in order for it to trigger an attack.

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I enjoyed reading the paper by Eichengreen, Rose and Wyplosz. The authors take an important and significant step towards establishing some stylized facts about the difference in behaviour of major macro variables in periods of exchange rate tranquillity and in periods surrounding various exchange rate events. In order to derive such stylized facts and to draw out the policy implications, the paper studies the entire post-war experience of OECD countries with exchange rate management under full convertibility by looking in detail at a wide range of different exchange rate episodes, such as devaluations, revaluations, exchange rate floations, fixings of exchange rates and 'other events', which include changes in band width, unification of exchange rates, transitions to crawling pegs and so forth. Such an empirical assessment has been missing in the literature, and I must applaud the authors for their courageous attempt at filling this gap. I also admire their devotion to drawing out the policy implications of their exercise, even though I do not agree with their suggestions.

43 Notice that a new economic theory is developed to fit the facts after each crisis has introduced a new coordination variable. For example, prior to 1992/3, tightness of monetary policies and level of reserves were considered to be the main indicators; tightness was a sign of strength without any consideration for unemployment consequences.
When it comes to empirical work, researchers typically face many choices. The first choice is about the countries and variables to be included in the cross-country analysis. To this end the authors have compiled an impressive database covering 34 years of quarterly data (1959–93) for twenty OECD countries, each containing a large number of macroeconomic time series, such as international reserves, exchange rates, short-term and long-term interest rates, exports, imports, current accounts, competitiveness, budget deficits, domestic credit, money (M1, M2), wages, inflation, output and unemployment. They also include various political and socioeconomic indicators in the statistical analysis. The second choice concerns whether the analysis is to be carried out in time-series space, cross-section space or panel space. The authors have chosen to pool the data by centring them around the various exchange rate events. However, owing to missing observations the pooled panels are not comparable across events or time, which makes the results somewhat difficult to interpret. Finally, the various exchange rate events selected for study are 81 periods of official devaluations, 20 revaluations, 33 flotations and fixings of exchange rates, and 56 ‘other events’. The results of the empirical analysis are presented in graphical form in Figures 1 to 5 by plotting the mean (and a plus/minus two standard deviation band) for the various macro variables relative to Germany in the eight quarters before and after the exchange rate events.

The results indicate that, when compared with periods of tranquillity, devaluations typically show losses of foreign exchange reserves, external imbalances, high interest rates and money growth rates, high price and wage inflation, overvalued real exchange rates, high unemployment and low output growth. Many of these patterns are reversed after devaluations occur. Furthermore, the authors claim that revaluations are a mirror image of devaluations, and that, broadly speaking, exchange rate realignments are all alike. I find this a bold statement to make in view of the diversity of the various graphs in Figures 1 and 2. I also find it striking that the data so clearly refute models of self-fulfilling speculative attacks for realignments. Finally, I am surprised to learn that flotations and fixations are no different from periods of tranquillity.

How may these remarkable findings be explained? In my view it is important to retrieve the time-series dimension of exchange rate events in order to understand the results of the paper. Figure 12 displays the changes in the official DM exchange rate parities for those OECD countries studied by Eichengreen, Rose and Wyplosz,
Figure 12. Exchange rate changes relative to Germany during events (realignments, flotations and fixings), monthly data, January 1959 to August 1993.

Note: The dashed lines represent ±2 standard deviations of the Dutch realignments.

Source: Data from Deutsche Bundesbank, Monthly Report, various issues.
omitting the Nordic countries (Iceland, Finland, Norway, Sweden). Devaluations show up as negative parity changes, and revaluations as positive parity changes; flotations and fixations, on the other hand, are visible as discontinuations or renewed continuations of the lines in the fifteen panels of Figure 1. Several important insights can be gained from these graphs: first, a four-year period of tranquillity is typically reported between 1962 and 1967. Second, revaluations occurred only in 1971 (Japan, Switzerland and Austria) and in 1973 (Netherlands). Third, flotations took place primarily around 1971 (Canada) and 1973 (non-Snake OECD countries), except for the French re-entry into and exit from the Snake in 1975, and the September 1992 exit of both Italy and the United Kingdom from the European Monetary System (EMS). Fourth, fixations are almost exclusively related to the onset of the EMS in March 1979, and to the later entry of Spain, Portugal and the United Kingdom at various dates. Fifth, devaluations occurred throughout the 1959–93 sample period, and involved all OECD countries to various degrees. But during the Bretton Woods and the Smithsonian period, the general devaluations in 1962, 1969 and 1972 were in fact caused by the strength of the German mark. Figure 12 suggests that there were roughly 48 devaluations of the German mark prior to the EMS, as opposed to 44 devaluations during the EMS period. This timing of exchange rate events suggest that the findings of Eichengreen, Rose and Wyplosz are primarily based on events and experiences in the early half of the sample; and my first guess was that these results may be valid primarily for periods of thin and regulated international financial markets subject to capital controls. The authors check the relevance of this criticism by supplying similar evidence for the EMS period and for periods without capital controls. They show that the results are reasonably invariant to these modifications. It would be nice to see whether the results are also robust with respect to the chosen normalization of events relative to times of tranquillity, in particular as the latter appear to be clustered in the 1960s.

A second important aspect of the paper is the distinction between periods of exchange rate events, like the ones discussed above, and periods of exchange rate crisis or speculative attacks. To identify attacks the authors use an index of speculative pressure, which they construct as a weighted average of exchange rate changes, interest rate changes and reserve changes. Crisis periods are identified as those dates when the changes in the index of speculative pressure are larger than twice their standard deviation from the mean. Figure 13
shows each of the three components of such an index separately for the case of the United States and France relative to Germany. In both countries, major reserve changes occurred in 1969–71 and late 1992, but extremely few crisis periods are identified under this criterion. Exchange rate changes, on the other hand, are negligible prior to 1969, and quite pronounced thereafter. Under this criterion many crisis periods could be identified. Finally, interest rate changes are large in 1969, during the oil price hikes in 1973–5 and 1979–81, and during the EMS crisis in 1992–3. Any unweighted average of the three components identifies most of the above episodes as crisis periods. However, the authors use a weighted average which assigns a unit weight to reserve changes, a weight of 7.5 to exchange rate changes and a weight of 51.9 to interest rate changes. As a result, crises are primarily identified as periods of extreme interest rate changes. Averaged across all OECD countries, exchange rate crises identified this way occurred primarily in 1971. For this year the difference between crises and events is also most pronounced, while both types of exchange rate episode move closely together for the rest of the sample. Figures 7 and 8 in the Eichengreen, Rose and Wyplosz paper thus tell us primarily something about the realization of economic variables in the four years around 1971 relative to the rest of the sample. The same is true in Figure 9 for the ‘successful attacks’, which are those crises in 1971 that in 1972 were followed by floating or new parities under the Smithsonian agreement. This time dimension of the events is completely blurred in the paper due to the pooling of events. Nevertheless it is present, and in my reading of the results the focus on the year 1971 plays an important role for the derived results. I do not dispute that the period surrounding the breakdown of Bretton Woods is an interesting episode to study, but I am highly sceptical about the relevance of the Bretton Woods experience for the current debate about the reform of the international monetary system.

Let me briefly mention a third aspect regarding the paper’s empirical approach; it is a completely atheoretical exercise. The authors look at a multitude of economic variables identified in various speculative attack models as a potential source of an exchange rate crisis, but they do not attempt to explore systematically the possible links between these exogenous variables, either in

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44 Similar results may be obtained for the other OECD countries.
45 This fact is also obvious from Figure 6 in the Eichengreen, Rose and Wyplosz paper.
Figure 13. Growth rates of selected macro variables in the United States and France relative to Germany, monthly data, January 1959 to August 1993.

Note: The dashed lines represent ±2 standard deviations of the respective variables.
Source: Data from International Monetary Fund, International Financial Statistics, various issues.

theory or econometrically. The authors are fully aware of this. They point out that their approach is non-structural and that rather than confirming or rejecting a narrowly defined structural model, their statistical approach amounts to systematic data exploration. The problem is that they
nevertheless do not refrain from economic interpretations of their statistical results. For example, they conclude from Figure 1 that the results are inconsistent with the self-fulfilling speculative attack model, because M1 (and M2) growth is high prior to devaluations and declines thereafter, while reserves continuously fall. The authors interpret this as showing that intervention in support of the exchange rate appears to be sterilized during the early run-up to the devaluation, while sterilization is less and less complete as the devaluation approaches. This is a strong statement in view of such informal evidence, in particular as one can easily think of many reasons why M1 growth or M2 growth (rather than monetary base growth) may decline prior to devaluations. Changes in M1 and M2 largely reflect private and banking sector decisions, rather than central bank policy and sterilization decisions. For example, currency substitution of the weak against the strong currency in expectation of a devaluation may equally well explain the stylized pattern in the data. Such endogeneity of money is a key feature of real business cycle models. Business cycles also appear to be an important feature of devaluations, as is suggested by the fact that unemployment is typically high in periods surrounding devaluations. In addition to counter-cyclical unemployment rates, recessions are usually characterized by pro-cyclical movements of real wages, inflation, money, nominal interest rates, consumption, investment, employment and imports (more than exports). It may simply be these cyclical patterns that show up in the various graphs in Figures 1 to 5, and to exclude this possibility requires retrieving the time-series dimension of the results. I would therefore urge the authors to supply and explore this dimension of the data in future research.

To sum up, I think that many of the results provided in the paper are interesting and will stimulate further research and the application of many different empirical approaches to uncover empirical regularities of speculative attacks. In the critical remarks made in my discussion of the paper, I have focused on what I view as a major weakness of event studies like the one presented in the paper: their potential lack of robustness and the possible sample selection bias. The sensitivity analysis provided by the authors overcomes some of these reservations, but not all of them, as would be necessary in order to subscribe wholeheartedly to the paper’s policy conclusions. In fact,

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the authors derive three policy options. First, if no early warning signals are detected, as in the case of flotations or fixations of exchange rates, the policy recommendations are either a tax on transactions to curtail foreign exchange markets or the move to a monetary union, which in fact eliminates the need for such markets. If taken at face value, the overall evidence reported in the paper provides little support for the necessity either to levy a transaction tax on foreign exchange or to move to a monetary union. The third policy option implies that if fundamentals diverge prior to attacks and if there are clear 'early warning signals', a return to sound fundamentals should be implemented by increased international policy coordination under floating exchange rates. Despite the fact that in the present paper many early warning signals are detected for the case of impending realignments and speculative attacks, this policy option seems to be the authors’ least preferred scenario, and clearly has been so in the past.47 I am much more sympathetic to this third option, and I should like to stress that, based on the empirical evidence provided by Eichengreen, Rose and Wyplosz, this option should be the clear winner. I am inclined to think that this is possibly the only relevant option in the G-3 context. With respect to Europe, I think that – like it or not – we have passed the point of seriously discussing such policy options; we have a treaty which has been ratified by all member states, and the intergovernmental conference in 1996 is about how and not about whether to implement this treaty.

General discussion

Alan Kirman was concerned that the authors, while making an important distinction between events and crises, had lumped together all the data from 1959 to the present. Given that exchange rate regimes have changed dramatically over this period, it might have been useful to split the sample into two subperiods, with the possibility of speculative attacks depending on macro fundamentals to a greater extent in the first subperiod; in recent times the greater likelihood and success rate of speculative attacks was partly due to the increased global mobility of capital. He also noted that the authors had sought to relate a country’s vulnerability to speculative

47 See, for example, Eichengreen and Wyplosz (1993), Eichengreen, Rose and Wyplosz (1994a, 1994b), or Eichengreen, Tobin and Wyplosz (1995).
attacks to the absolute value of macro fundamentals, and wondered if it was not better, in a cross-section study, to relate it to the deviations of these fundamentals from their mean values. He went on to argue that the lack of sufficient distinction between successful and unsuccessful attacks undermined the case that the fundamentals were important to speculative attacks.

Paul David pointed out that the underlying model assumed infinite elasticity of supply of speculative resources, constantly ready to attack currencies, with the only choice at any point being that of a currency to target. More realistically, if there were constraints on speculative resources, which limited the ability of speculators to attack more than one currency at the same time, there could be occasions on which suitable targets go unattacked. And at the same time, once speculators converged on a target its vulnerability would be self-reinforcing. This undermined the stated aim of the paper, which, in his opinion, was to separate the effect of the fundamentals from the self-fulfilling prophecy aspect of speculative attacks.

Paul Geroski took the view that the interesting issue was not the timing of crises, as the authors had made it out to be, but the within-crisis dynamics of the exchange rate. Given that exchange rates move all the time, the crucial question was: when is an exchange rate movement of a certain size likely to develop into a crisis? And, from a policy perspective, how should a government respond after the crisis has set in? Andrew Rose responded that the latter was exactly what they were hoping to get at: for instance, their analysis revealed that, when the root cause of crisis was believed to be the size of the budget deficit, austerity moves tended to follow.

Gilles Saint-Paul said that he could not understand the theoretical underpinnings of the idea that unemployment itself could trigger a crisis. This might conceivably emerge from the expectation that governments react to unemployment by devaluing, but, equally well, the government’s reaction in such situations could be to stimulate the economy fiscally; the latter would tend to increase the budget deficit, and thereby result in an upward rather than downward pressure on the exchange rate. Also, when the unemployment was a consequence of tight monetary policy, speculators would have no particular reason to believe that this policy would be relaxed in the future, and for that reason would not be any more likely to attack the currency. Charles Wyplosz pointed out that the crucial feature of tight monetary regimes was that it was hard to tighten them further; this could very well translate into an increased probability of attack.

Henri Pages wondered if there was a risk of underestimating the
number of crises by imposing too strong a criterion for identifying crises: in the paper a crisis was said to occur only when the index of speculative pressure exceeded its mean by two standard deviations. Andrew Rose stated that the choice of this high threshold was deliberate; they wanted to be very sure that what they picked up in their sample were, indeed, crises.

There was discussion of the ‘windowing effect’, an issue that had been raised earlier by Bernard Dumas. David Begg wanted to know if the stylized time profile of crises – typically an isolated occurrence, which was both preceded and followed by eight quarters of tranquillity – missed the possibility of repeated crisis. For instance, there had been an EMS realignment every six months for the first four years. Rose responded that they had experimented with alternative window sizes, and since this did not affect the conclusions too much, they had settled on a one-quarter window. Tryphon Kollintzas was perplexed that the graphs did not suggest any change in trend values of variables during the periods of tranquillity and during events, even as the non-parametric test on the mean values had allowed a rejection of the null hypothesis that they were indistinguishable in the two periods. Francesco Giavazzi wanted to know that the fall in the budget deficit ratios in the wake of devaluations was true even when the data were cyclically adjusted.

Georges de Menil was keen to know what the policy conclusions might be. Charles Wyplosz summed up the paper as an attempt to identify the indicators that governments could use as warnings of impending attacks, and also the possible policy responses that could be used in defence against attacks.

APPENDIX

Macroeconomic and financial data are mostly taken from the International Monetary Fund’s International Financial Statistics (IFS). The data set is quarterly, spanning 1959 to 1993 for twenty industrial countries. The data have been checked for transcription and other errors and corrected. For most purposes these variables are transformed into differential percentage changes by taking differences between domestic and German annualized first-differences of natural logarithms, multiplied by 100. We employ the following variables: total non-gold international reserves (IFS...
line 11d); period-average exchange rates (line rf); short-term interest rates (money market rates (line 60b) where possible, discount rates (line 60) otherwise); exports and imports (both measured in dollars, lines 70d and 71d respectively); the current account (line 77a.d, converted to domestic currency) and the central government budget position (line 80), both measured as percentages of nominal GDP (frequently line 99a); long-term government bond yields (line 61); a nominal stock market index (line 62, which sets 1990 = 100); domestic credit (line 32); M1 (line 34); M2 (line 35 + M1); the CPI (line 64); and real GDP (usually line 99a.r). We also use the real effective exchange rate as a measure of competitiveness (line reu, which uses normalized relative unit labour costs), although this variable is only available from 1975.

Data on total employment, the unemployment rate and the business-sector wage rate were drawn from the OECD’s *Main Economic Indicators*.49

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Budd, Christopher, Christopher Harris and John Vickers (1993). ‘A Model of the Evolution of Duopoly: Does the Asymmetry between Firms Tend to Increase or Decrease?’, *Review of Economic Studies*.


49 As an alternative measure of fiscal policy, we could employ the OECD’s measures of fiscal impulses. These data have advantages: they cover the entire government, are cyclically adjusted, and measure the primary budget position. On the other hand, they are only available annually, and were typically unavailable to market participants.


Rose, Andrew and Lars Svensson (1994). ‘European Exchange Rate Credibility Before the Fall’, European Economic Review.