CREDIBILITY OF POLICIES VERSUS CREDIBILITY OF POLICYMAKERS*

ALLAN DRAZEN AND PAUL R. MASSON

Standard models of policy credibility, defined as the expectation that an announced policy will be carried out, emphasize the preferences of the policymaker and the role of tough policies in signaling toughness and raising credibility. Whether a policy is carried out, however, will also reflect the state of the economy. We present a model in which a policymaker maintains a fixed parity in good times, but devalues if the unemployment rate gets too high. Our main conclusion is that if there is persistence in unemployment, observing a tough policy in a given period may lower rather than raise the credibility of a no-devaluation pledge in subsequent periods. We test this implication on EMS interest rates and find support for our hypothesis.

I. INTRODUCTION

There is now an extensive literature on policy credibility, credibility being defined as the expectation that an announced policy will be carried out. Much of this literature has emphasized the role of a government’s “type” (for example, the relative weights it puts on the losses from inflation versus unemployment) in determining the credibility of a policy. In this approach, introduced into the macroeconomics literature by Backus and Driffill [1985a, 1985b], a policymaker who assigns a relatively low cost to inflation may find it optimal to mimic the actions of a more inflation-averse policymaker to build “reputation.” Observed monetary policy choices are thus taken to provide information about the government’s (unobserved) inflation preferences, and they can therefore affect expectations about future policy. More specifically, when a policymaker delivers on an announced commitment to low inflation, this strengthens the belief that he really is inflation averse. Hence, a government that follows tough policies will see its reputation and the credibility of its commitment to anti-inflationary policies increase over time.1

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1. The basic approach of Backus and Driffill has been extended in several directions. Whereas they considered the case where the “tough” policymaker cares only about inflation, Vickers [1986] showed that if both tough and “weak” types care about unemployment, tough governments tend to be even more restrictive.

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Whether or not an announced policy is carried out, however, reflects more than the policymaker's intentions. The situation in which he finds himself can be as important. Since even a "tough" policymaker cannot ignore the cost of very high unemployment, he may renege on an anti-inflation commitment in sufficiently adverse circumstances, that is, in times of weak activity, when pressures to restore high employment are strong. In short, the credibility the public assigns to an announced policy should therefore reflect external circumstances as well.

In assessing the effect of observed policy choices on credibility, the role of external circumstances may be especially important when policies have persistent effects on the economic environment. The purpose of this paper is to investigate the effect of such persistence and to demonstrate that if tough policies constrain the room to maneuver in the future, then following a tough policy may actually harm rather than enhance credibility. For example, a tough anti-inflation policy today may raise unemployment well into the future, making the commitment to future anti-inflation policy less credible. Similarly, monetary tightening may increase government debt accumulation, making it more likely that an adverse shock will lead to a monetary easing in the future.

Our result may be illustrated by a simple story. One afternoon, a colleague announces to you that he is serious about losing weight and plans to skip dinner. He adds that he has not eaten for two days. Does this information make it more or less credible that he really will skip dinner? The model of types outlined in the first paragraph would imply that with each meal he skips, the "tough policy" of skipping the next meal becomes more credible, as each observation of playing tough raises the probability we assign to his being a fanatical dieter. Once we realize that his skipping one meal makes him hungrier at the next mealtime (i.e., that policy has persistent effects), we are led to the opposite conclusion, namely, that it becomes less likely he will stick to his diet the more meals he has skipped. We apply this point to the credibility of fixed parities in the European Monetary System. In the early years of the EMS, the willingness to accept the costs of unemployment in order to avoid realignments gave the system credibility by signaling the

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Persson [1988] and Rogoff [1987, 1989] provide excellent surveys of models of credibility and reputation. An alternative approach is to define strength in terms of ability to precommit to a particular policy, as in Cukierman and Liviatan [1991].

2. A related point, made by Flood [1983] and Blanchard [1985], among others, is that if policies are too tough then current policymakers may be removed from power, leading to an easing of policies.
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toughness of governments. More recently, however, mounting unemployment made it more likely that a further unfavorable shock would lead to a devaluation. Under these circumstances, the absence of a realignment, and the resultant further upward pressures on unemployment, were seen as lowering the credibility of fixed parities.\(^3\) This reasoning suggests that credibility need not monotonically increase with the length of time there has been no devaluation, as it would if uncertainty about the "type" of government were the only factor affecting credibility.\(^4\) Furthermore, interest differentials (taken as a measure of the credibility of the policy of fixed parities) should be interpreted as reflecting not only signaling, but also the perception that in certain circumstances, devaluation will be viewed as being desirable, even by a tough government.

In the next sections we consider the issue of signaling when effects of policy on employment are persistent. We show formally how persistent unemployment effects of a tough policy (maintaining a fixed parity), may lower rather than raise the credibility of a pledge of no devaluations in subsequent periods. In the final section we apply the theory to France. Regression results suggest that while the signaling model may apply in a period in the mid-1980s in which the stated priorities of the authorities changed, the alternative notion of credibility set out in the paper may help explain devaluation expectations and interest differentials in the late 1980s and early 1990s.

II. A Basic Model

To illustrate our points, we use a two-period open-economy version of the simple Barro-Gordon [1983a, 1983b] model, in which surprise devaluations decrease unemployment, but expected devaluations have no effect. (Modeling persistence requires a multi-period model; a two-period version is sufficient.) We use the Barro-

3. The paper was initially drafted in mid-1992. Events of September 1992 provide strong support for our contention that credibility is never definitively established because in some circumstances governments will choose to devalue.

4. Froot and Rogoff [1991] suggest a number of reasons why the credibility of the EMS may not be increasing monotonically over time. A recent paper by Chen and Giovannini [1992] presents empirical evidence which suggests that tough policy and lack of realignments have not enhanced the credibility of fixed exchange rates in the EMS. Klein and Marion [1992] use duration analysis to study the credibility of a fixed exchange rate as a function of the length of time since the last devaluation. They do not consider a persistence effect, however, and their model has the credibility of the no-devaluation policy rising over time the longer there has been no devaluation.
Gordon model to facilitate comparison of our results with the existing macroeconomic literature on credibility, in which this model has been used extensively. To model the importance of external circumstances, we add a stochastic unemployment shock to the Barro-Gordon model, so that the government’s choice of policy will depend on the realization of the shock, as well as the cost it assigns to inflation relative to unemployment. Our modeling of policy conditioned on the realization of shocks is based on Obstfeld’s [1991] model of escape clauses, a model also used by Flood and Isard [1989] and Lohmann [1990]. In these models the government chooses between following a no-devaluation rule and following a discretionary policy: in the latter case it optimally chooses the magnitude of devaluation as a function of the realized state of the world.

We depart from the basic escape-clause model by assuming that the choice is between the rule of a fixed parity, and the alternative of a devaluation of a fixed size. Formally, this is a state-contingent, two-part rule, so that devaluation at the preannounced trigger could be characterized as carrying out the “announced,” or at least implicit, policy. In our opinion, this view, though semantically correct, misses the point—that even a tough policymaker who plans ex ante to keep the fixed parity (and makes public statements to that effect) will devalue in adverse circumstances. We therefore take devaluation to represent departing from the announced (no-devaluation) policy.

For EMS countries it is probably reasonable to consider a devaluation of an exogenously fixed size as representing the alternative to no realignment, since the EMS puts constraints on the realignments that are possible. The problem of discretion always dominating does not arise here, since for small enough shocks, maintaining the existing parity will be preferred to a discrete devaluation. Moreover, limiting ourselves to two options does not change the qualitative nature of the results, and allowing other size realignments will leave our basic point intact.

5. For a general discussion of this type of model, one may refer to Persson and Tabellini [1989].

6. The policymaker is modeled as choosing between a rule and discretion on the basis of the realized state of the world, rather than as using a two-part rule, in order to capture the notion that all states of the world cannot be foreseen ex ante. Hence, a fully state-contingent rule cannot be specified. To avoid problems of time-consistency, it is assumed that the policymaker must pay a private fixed cost when choosing discretion. Otherwise a benevolent policymaker would always choose discretion ex post.

7. Throughout, references to the EMS should be taken to refer to the countries participating in the exchange rate mechanism of the EMS.
We begin by supposing that unanticipated inflation reduces unemployment $u_t$ relative to the natural rate $u_N$, where $u_t$ is also subject to a stochastic shock $\eta_t$ and is affected by its lagged value:

$$u_t = u_N + \eta_t - \sqrt{\alpha} \left[ (\pi_t - \pi^E_t) - \delta(u_{t-1} - u_N) \right],$$

where $\delta \geq 0$ is a measure of persistence in unemployment fluctuations ($\Delta = \delta \sqrt{\alpha}$ is the autoregressive coefficient). (In the initial period $t = 1$ of the two-period model, the inherited unemployment gap $u_o - u_N$ is assumed to be zero, so that persistence only affects unemployment in the second period.)

The government’s objective is to minimize an expected discounted loss function, where each period’s loss is quadratic in the deviation of unemployment from a target level below the natural rate, $u_N - K$ (where $K$ captures distortions leading to too high a natural rate), as well as in actual inflation. We assume that there can be different types of governments, implying possible uncertainty about the government’s objective function.

The tough government (with superscript $T$) cares about inflation with a weight $\delta^T$, while the weak government (superscript $W$) gives a lower weight $\delta^W$ to inflation in its objective function. The $i$-type government’s objective function conditioned on information available at $t = 1$ is

$$\Lambda^i = L_1^i + \beta E L_2^i = (u_1 - u_N + K)^2 + \theta^i(\pi_1)^2$$
$$+ \beta E_1 [(u_2 - u_N + K)^2 + \theta^i(\pi_2)^2].$$

Assume that the exchange rate is the policy instrument to influence the price level. For simplicity of exposition we suppose that the price level equals the exchange rate, so that if $e_t$ is the log of the

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8. We model persistent effects of policy in the equation summarizing the structure of the economy. Alternatively, one could model the effects of persistence in the preference equation, by putting lagged unemployment in the loss function (2). Much of the policy discussion in Europe which takes past policy choices as constraining current choices implicitly takes this second route. Our results would be the same under this alternative specification, the key point being that the probability of a devaluation in the second period may depend positively on first-period unemployment.

9. An alternative approach is to use a trigger-strategy model of expectations with uncertainty, along the lines of Canzoneri [1985]. Though this allows the government to depart from tough monetary policy in response to observable adverse shocks without losing credibility and may be simpler than the Kreps-Wilson [1982] framework for some purposes, it does not allow a simple comparison with the signaling-of-type motive for tough policy, which we feel is important in understanding devaluation expectations.
exchange rate at $t$, the inflation terms in (1) and (2) can be written as

$$\pi_t = e_t - e_{t-1}$$

$$\pi_t - \pi_t^E = (e_t - e_{t-1}) - (E_{t-1}e_t - e_{t-1})$$

$$= e_t - E_{t-1}e_t.$$

We also define the transformed variables $\kappa = K/\sqrt{a}$ and $\epsilon_t = \eta_t/\sqrt{a}$. It is assumed that wages are set before the shock $\epsilon_t$ is realized; $E_{t-1}e_t$ is conditioned on information available at the end of the previous period.

III. WILL A HISTORY OF TOUGH POLICY NECESSARILY RAISE CREDIBILITY?

The basic question is how the probability of a devaluation in the second period, denoted $\mu_2$, depends on the action of the government in the first period, once we consider not only the standard signaling of unknown government type, but also the effect of persistence. With uncertainty about types, we may write $\mu_2$ as

(3) $$\mu_2(j) = p_2(j) \rho^w_2(j) + (1 - p_2(j)) \rho^T_2(j);$$

where

$p_2 \equiv$ probability the government is of type $w$,

$\rho^w_2 \equiv$ probability a government of type $w$ will devalue (given the distribution of $\epsilon_2$),

$\rho^T_2 \equiv$ probability a government of type $T$ will devalue.

The argument $j$ ($= D$ or $F$) indicates whether the government devalued ($D$) or kept the exchange rate fixed ($F$) in period 1.

To calculate $\rho^j_2$, we start by solving the government’s second-period problem for given expectations of a devaluation $\mu_2(j)$. By substituting $\rho^j_2$ into (3), we can then solve for $\mu_2(j)$. The functional relation between policy choice and the realization of $\epsilon_t$ will become clear from this calculation. The public is assumed to know the values $\theta^T$ and $\theta^w$. We shall consider the case where the public does not observe the shock $\epsilon_t$. Let us denote the single-period loss function of a type $i$ government if it (for example) devalues in the second period by $L^j_{iD}(j)$ (where $j$ was the first period action). Then
the government will devalue in period 2 if $L_2^D(j) - L_2^F(j) < 0$. This defines a critical value of the shock $\hat{\epsilon}_2^i(j)$:

$$
\hat{\epsilon}_2^i(j) = \frac{(a + \theta^i)s}{2a} - \kappa - \mu_2(j)s - \delta(u_1 - u_N),
$$

where $s$ is the fixed devaluation size and where the critical value is dependent both on the type of government (via $\theta^i$) and on previously observed policy. If the realization of $\epsilon_2$ is below this critical value $\hat{\epsilon}_2^i(j)$, a policy of maintaining the fixed parity is optimal; if it is above, a devaluation is optimal. If the distribution of $\epsilon$ is uniform between $-\nu$ and $+\nu$, we have (for an interior solution)

$$
p_2^i(j) = \text{prob}(\epsilon_2 > \hat{\epsilon}_2^i(j)) = (\nu - \hat{\epsilon}_2^i(j))/2\nu.
$$

To calculate the probability of government type, we assume that the public uses a Bayesian approach, starting from uniform priors over the two types of governments. Expectations are conditioned on whether the government devalued or not in period 1, but not on the shock $\epsilon_1$, which we assume that the public does not observe. The probability that the government is weak conditional on its first-period action may then be written as

$$
p_2^i = \frac{1 - \rho_1^w}{\rho_1^w + \rho_1^T}, \quad p_2(F) = \frac{1 - \rho_1^w}{2 - \rho_1^w - \rho_1^T},
$$

when we start with uniform priors. Note that $p_2(D) > p_2(F)$ as long as $\rho_1^w > \rho_1^T$, that is, as long as the probability that a weak government will devalue in the first period is greater than the probability that a tough government will devalue.

The probability that a given type would devalue in the first period is derived in an analogous way to the above calculation for $p_2^i$. We calculate a critical value of the shock in the first period, namely $\hat{\epsilon}_1^i$, such that $\Lambda^i(D) = \Lambda^i(F)$. In the Appendix details of this calculation are shown. $p_1^i$, the probability that $\epsilon_1 > \hat{\epsilon}_1^i$, can then be calculated, assuming the same uniform distribution as above.

To calculate $\mu_2^i(D) - \mu_2^i(F)$, we combine equations (3), (5), and

10. One can do an analogous calculation in the case where the shock $\epsilon_1$ is observed (or can be inferred). For $\theta^W$ not close to $\theta^T$, there will be a separating equilibrium for some realizations of $\epsilon_1$: action would be fully revealing, with a weak government finding it optimal to devalue and a strong government not to devalue at those realizations. For other realizations of $\epsilon_1$, there would be pooling, with both types choosing the same policy, as would also be the case for all realizations of $\epsilon_1$ for $\theta^W$ close to $\theta^T$. $p_2(j)$ would equal zero or one in the relevant regions of separation and would equal the prior in the region of pooling.
to obtain, after some manipulation,

\[
\mu_2(D) - \mu_2(F) = \frac{1}{1 - s/2v} \times \left[ -\frac{\sqrt{a} s}{2v} + \frac{(\rho_1^w - \rho_1^T)(\theta^T - \theta^w)(s/4av)}{(\rho_1^w + \rho_1^T)(2 - \rho_1^w - \rho_1^T)} \right],
\]

where we have used \( u_1(D) - u_1(F) = -\sqrt{as} \). (Note that \( 1 - s/2v > 0 \), for otherwise, the devaluation size would exceed twice the maximum size of the shock it was aimed to offset.)

The persistence parameter \( \delta \) will affect both terms inside the brackets. The effect on \( \mu_1(i = T, W) \) arises because the critical level \( \xi_1 \) of the first-period shock depends on welfare in both periods and hence on \( \delta \). In the case of no persistence of unemployment effects across periods \( (\delta = 0) \), so that there is only a signaling effect, the first term in brackets disappears, and the expression in (7) is unambiguously positive. The standard result on signaling of types will then hold: observing a tough policy (no devaluation) in the first period will raise the probability of no devaluation in the second. That is, in this case we see from (7) that \( \mu_2(D) > \mu_2(F) \) as long as \( \rho_1^w > \rho_1^T \); that is, as long as a weak government is more likely to devalue in the first period. This will be true since \( \theta^T > \theta^w \). Hence absence of persistence and different preferences over inflation imply that the signaling motive alone contributes to the credibility of the fixed exchange rate, which is therefore enhanced in the second period if no devaluation was observed in the first.

To add persistence back in, set \( \delta > 0 \). The dependence of \( \mu_2(D) - \mu_2(F) \) on \( \delta \) is complicated, reflecting the contribution of both terms. Solving (7) with MATHEMATICA, one can show that for \( \delta \) sufficiently large, the persistence effect will tend to dominate the signaling effect, and (7) will become negative. This result is illustrated in Figure I for two sets of parameter values. In the two cases, the following values were imposed: \( \kappa = 0.02, s = 0.1, \alpha = 0.25, \nu = 0.15, \beta = 0.95, \theta^T = 1 \), and either \( \theta^w = 0 \) or \( \theta^w = 0.5 \).

Figure I then plots \( \mu_2(D) - \mu_2(F) \) as a function of \( \Delta = \delta \sqrt{a} \) in the interval \([0, 1]\). It can be seen that at about \( \Delta = 0.8 \) (when \( \theta^w = 0 \)) or \( \Delta = 0.45 \) (when \( \theta^w = 0.5 \)), \( \mu_2(D) = \mu_2(F) \), and for higher values of \( \Delta \), not devaluing in the first period lowers credibility in the second.

To summarize, positive persistence of unemployment implies that no devaluation in the first period may raise rather than lower the public’s expectation of a devaluation in the second period. Shocks that are not offset through a devaluation in period 1 have
Further unfavorable effects in period 2, increasing the probability that a government of either type will devalue. If these persistence effects are sufficiently strong (δ large), not devaluing in the first period will raise the probability of a devaluation in the second. Thus, credibility will not necessarily be enhanced by "playing tough" in period 1.11

V. EMPIRICAL EVIDENCE

We now turn to how one can empirically distinguish the two influences of tough policy on credibility—its role in signaling type versus its effect in constraining future room to maneuver due to persistence. The model we have developed above implies that the correlation between changes in unemployment rates and the expectation of a devaluation will be quite different depending on whether the signaling factor or the "external circumstances" factor in policymaking dominates. If there is great uncertainty

11. In the case where the shock is observed (see footnote 10), we shall see the same effect: if persistence effects are strong enough, playing tough in the first period will lower the credibility of the no-devaluation policy in the second.
about the government's type, then high unemployment may convincingly signal that the government is tough and determined to carry through on its policy commitment; therefore, policy credibility should improve. However, if the government's type is known (or if the difference in types is small), then increased unemployment reduces credibility, since it makes it less likely that either type of government will deliver on its policy commitments in the future.

The EMS provides a good application of the model, and interest rate differentials relative to Germany, the anchor for EMS monetary policy, provide a good proxy for expected devaluation, and hence for the lack of credibility of fixed parities. Received wisdom suggests that the EMS went from an initial stage of low credibility, lack of policy convergence, and relatively frequent realignments, to a later stage in which there was considerable policy convergence and realignments were infrequent or did not occur at all. Giavazzi and Spaventa [1990], for instance, refer to the latter period as the "New EMS." If there is a change in behavior along those lines, our model suggests that the partial effect of unemployment on the interest rate differential should be quite different in the different periods.

France may be an especially good case for examining alternative models of credibility. Between the formation of the EMS in March 1979 and the present, France has had six realignments relative to the deutsche mark (September 24, 1979; October 5, 1981; June 14, 1982; March 21, 1983; April 7, 1986; and January 12, 1987). While in the early part of the period the long-term interest differential between the franc and the DM rose, since the end of 1982, the interest differential has been falling steadily and, at the end of 1991, stood at less than half of a percentage point (Figure II).

In the early part of the EMS period, the socialist government which came to power in May 1981 followed strongly expansionary policies, making it clear that it had little commitment to fixed parities. Higher unemployment would signal the need to stimulate aggregate demand, and hence make a realignment more likely. It

12. Recent empirical analyses of EMS credibility include Bartolini and Bodnar [1992], Koen [1991], and Weber [1991, 1992]. Koen calculates credibility bands around interest differentials which take into account the freedom for exchange rates to change without realignments being necessary. For long-term interest rates, which we use in our empirical work, the bands are quite narrow, however.

13. It subsequently widened, in large part because of the considerations discussed in this paper.
should therefore have been associated with higher long-term interest rate differentials vis-à-vis Germany. However, there was an important change in behavior in June 1982, reinforced in March 1983, when France shifted to far tighter fiscal and monetary policies, the *politique de rigueur*. We would argue that this shift in policy was not immediately perceived as a long-term shift; that is, that it took time for policymakers to convince investors. They did so by showing that they accepted the unemployment costs without devaluing, and there were in fact no realignments for a three-year period, despite high unemployment, which rose above 10 percent (Figure III). The commitment to a strong franc made by the socialist government was reaffirmed by the conservatives, who were in power between 1986 and 1988. After returning to power in May 1988, socialist finance minister Bérégovoy further asserted that the franc would not be realigned against the deutsche mark in the future. The consistency in French policy no doubt helped to establish a reputation for toughness. However, unemployment remained a problem; after declining to about 9 percent, it rose once

14. The fact that Mitterand was still President guaranteed some continuity in exchange rate policy. Besides, the conservatives already had a reputation of support for a strong currency.
again to 10 percent as the economy slowed in 1990–1991. Though the reputation for toughness was established (so that \( p \) was close to zero), there may have been legitimate concerns that restrictive policies could not be maintained. In these circumstances, higher unemployment should once again tend to raise interest differentials, since even a tough government might devalue if the unemployment costs became too high.

Our theory therefore implies that the relationship between unemployment and long-term interest differentials should change over time, perhaps going through three phases. In the initial period following the election of François Mitterand as President and the formation of a socialist government, the authorities were perceived as being neither tough with respect to inflation nor committed to resisting realignments. They were willing to devalue, and the higher was the unemployment rate, the more likely was a realignment. After the 1982–1983 switch to a politique de rigueur, however, the absence of devaluations in spite of high unemployment helped signal to the public the change in the type of government, so that higher unemployment should have raised credibility (by lowering \( p \)) and hence led to declining interest
differentials relative to Germany. Once a reputation for toughness was established, devaluation in the face of an adverse shock or accumulated loss of competitiveness (as occurred in January 1987) should not have significantly damaged the credibility of the strong franc policy. However, despite this favorable effect on credibility, increases in unemployment would be associated with fears of an eventual devaluation (raising both $\rho_T$ and $\rho_w$) and hence would lead to higher interest differentials than would otherwise have prevailed.

This characterization of the difference in the relation between unemployment and interest differentials depending on which factor influencing credibility dominates suggests the following sort of empirical investigation: one can regress the long-term interest differential with Germany on variables which measure the policy stance to see how the relation changed over time. One can then ask whether such changes reflect political changes taking place in France which would operate in the direction predicted above.

Long-term interest differentials between France and Germany were regressed (using ordinary least squares in the first instance) on the unemployment rate and some other plausible measures of expected devaluation (see Panel A of Table I). These other indicators are a measure of competitiveness (the ratio of the CPI in France relative to that in Germany); the EC-wide interest differential (excluding France) with respect to Germany, which is intended to capture the overall credibility of the EMS commitment to fixed parities; and the lagged dependent variable, which can be expected to enter because the accumulation (or loss) of credibility can be expected to occur gradually.\footnote{15} (More general lag structures were tried, but in general other lagged dependent or independent variables were not significant.)

Changes in the relationship between the unemployment rate and interest differentials were examined in two ways. First, natural breaks in the series that correspond to the dating discussed above were imposed in estimation, using appropriately specified dummy variables. The discussion suggests an initial period ending in late 1982 or early 1983, a middle period extending to the most recent devaluation, in January 1987, and a final period since then. Second, tests of structural stability were performed, splitting the whole

\footnote{15. The variables included, in particular the interest differentials, competitiveness, and unemployment, are nonstationary, I(1), variables in our sample, but they are cointegrated. Our dynamic equation can thus be interpreted as an error-correction model.}
TABLE I
REGRESSIONS FOR THE FRENCH LONG-TERM INTEREST DIFFERENTIAL AGAINST GERMANY (ID), MAY 1979–DECEMBER 1991
(standard errors in parentheses)

\[ ID = a_1 LRP + a_2 IDEC + a_3 ID_{-1} + DUM1(a_4 UR + a_5) + DUM2(a_6 UR + a_7) + DUM3(a_8 UR + a_9) \]

### A. Ordinary least squares

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<th>Statistics</th>
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<td>0.265*</td>
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<td>(0.789)</td>
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|        |        |        |      |         |      |         |      |         | 0.985  | 0.267 | 1.18 | 8.21    | 25.7   | 17.9* |
|        |        |        |      |         |      |         |      |         | (0.956) | (0.059) | (0.047) | (0.522) | (0.072) | (0.778) | (0.070) | (0.804) | (0.084) |


|        |        |        |      |         |      |         |      |         | -0.670 | 0.359* | 0.717* | -3.449* | 0.425* | -0.333 | -0.026 | -2.486* | 0.207* | 0.982 | 0.262 | 0.96 | 9.40    | 29.3   | 23.5* |
|        |        |        |      |         |      |         |      |         | (1.044) | (0.060) | (0.043) | (0.828) | (0.120) | (0.694) | (0.057) | (0.707) | (0.075) |       |       |       |         |        |       |
### B. Instrumental variables

**Independent variables**

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<td>(0.024)</td>
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<td>0.691*</td>
<td>2.248*</td>
<td>0.263*</td>
<td>0.568</td>
<td>0.097</td>
<td>3.482*</td>
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<td>(0.962)</td>
<td>(0.059)</td>
<td>(0.048)</td>
<td>(0.526)</td>
<td>(0.073)</td>
<td>(0.793)</td>
<td>(0.072)</td>
<td>(0.821)</td>
<td>(0.085)</td>
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<td>0.365*</td>
<td>0.707*</td>
<td>3.756*</td>
<td>0.476*</td>
<td>0.221</td>
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<td>(1.052)</td>
<td>(0.060)</td>
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<td>(0.838)</td>
<td>(0.122)</td>
<td>(0.705)</td>
<td>(0.058)</td>
<td>(0.719)</td>
<td>(0.076)</td>
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*a. Variables names: LRP = log of French CPI relative to Germany's; IDEC = EC interest differential with Germany (excluding France); ID\(_{-1}\) = lagged dependent variable; DUM1, DUM2, DUM3 = dummy variables, equal to unity within the relevant subperiods, zero otherwise; UR = French unemployment rate.

b. Statistics: R\(^2\) = explained sum of squares as a ratio to total sum of squares; SER = standard error of regression; ARCH = autoregressive conditional heteroskedasticity test, distributed as F(1,150); LM(1,8) = Lagrange multiplier test for serial correlation, lags 1 to 8, distributed as \(\chi^2(8)\); Q(1,20) = Ljung-Box test for serial correlation, lags 1 to 20, distributed \(\chi^2(20)\); LR(4) = likelihood ratio test of structural break, distributed \(\chi^2(4)\), assuming that break points are known.

*Significant at 5 percent level.
sample into two subperiods by successively trying different break points. If breaks are significant at several dates, the one that gives the maximum value of the likelihood ratio is chosen. Then, each of the two subsamples is further tested for break points in the same fashion. In doing these tests, the coefficients of both the unemployment rate and the constant term were allowed to vary, but the remaining coefficients were assumed constant over the whole sample.\textsuperscript{16}

Using the first approach, the unemployment rate and the constant are entered with separate coefficients for the three subperiods discussed above (1979:05–1982:12, 1983:01–1986:12, and 1987:01–1991:12). The likelihood ratio test indicates that there is a significant difference in the regression coefficients on the unemployment rate and the constant across the three subperiods.\textsuperscript{17} In the first and third subperiods, higher unemployment is associated with higher interest differentials, reflecting increasing concern with the possibility of realignment. In the second subperiod, when the authorities were attempting to signal a change in the priorities of the government and gaining credibility for a “hard currency” policy, a higher unemployment rate is associated with lower interest differentials, as the discussion above suggested that it should. However, the coefficient is not strongly significant.

The size of the coefficients in the first and third subperiods is also of interest. If a government is considered to be less concerned about the exchange rate and inflation (i.e., weak), then it is expected to resist movements away from a lower target for the unemployment rate. In the model the target unemployment rate is given by the ratio of the coefficients on the dummy variable and the product of the latter with the unemployment rate. That is, grouping the terms multiplied by each of the dummy variables as $a_4 DUM_1 (UR + a_5/a_4)$, etc., then $-a_5/a_4$ is the level of unemployment rate in the first subperiod above which there is a positive effect on the interest differential, and similarly for the other subperiods. The values for the transformed constant term are, respectively, 8.78 and 11.2 for the first and third subperiods.

Thus, the target rate of unemployment is higher in the third subperiod, confirming the reasoning described above. As for the

\textsuperscript{16} Tests that allowed all of the coefficients to vary gave similar break points and test statistics.

\textsuperscript{17} On the assumption that the break points are known—see discussion below, however.
relative size of the unemployment rate effects (i.e., $a_8$ versus $a_4$),
there is no unambiguous prediction: a tough government could
conceivably be just as concerned about deviations of unemploy-
ment from its (much higher) target, and in fact, the estimates give
a somewhat higher value for the third subperiod than the first.

The second approach identified the break points on the basis of
the values of the likelihood ratio at the different dates (allowing for
different coefficients on the unemployment rate and the constant
before and after that date). The critical values of the likelihood
ratio when the break point is not known have recently been
tabulated by Andrews [1990]. For two degrees of freedom, they are
11.7 at the 5 percent level and 10.1 at the 10 percent level. Starting
with the whole sample, the maximum likelihood ratio statistic (a
value of 11.0) occurred when the sample was broken at 1986:9, and
this is significant at the 10 percent level. If we then treat the first
subperiod as a separate sample, the maximum likelihood ratio
statistic (a value of 13.5) occurs when a further break is made at
1981:9. Using the second subperiod as a separate sample, the
likelihood ratio has a maximum value of 8.1, well below the 10
percent critical value, suggesting no break point in this period.
Therefore, the coefficients on unemployment and the constant
were estimated over three subperiods: 1979:5–1981:9, 1981:10–
point is very close to that suggested by our historical discussion.

Again the unemployment coefficients evolve over time as our
model would suggest. Unemployment has a strongly significant,
positive coefficient in the early and late periods. In contrast, in the
middle period, when unemployment was rising strongly and the
government was trying to establish credibility for greater exchange-
rate stability and for limiting inflation, the coefficient is negative,
though insignificant. Again, the target unemployment rate is
higher in the third subperiod than in the first (12.0 percent versus
8.1 percent), though now the coefficient on unemployment is in fact
lower in the later period than in the earlier one.

In order to correct for the possibility that the unemployment
rate and the interest differential were jointly endogenous, instru-
mental variables estimation was also performed (see Panel B of
Table I). Instruments used were the other regressors, plus time
and the lagged unemployment rate. The results are very similar to
the OLS results, and confirm the qualitative conclusions discussed
above.
VI. Conclusions

The initial work on modeling credibility stressed a policymaker's intentions as summarized by his "type." It enabled macroeconomists to understand better how a "tough" policy could yield benefits well into the future via enhanced reputation. We were always uneasy, as were others, with the picture of a tough policymaker who would adhere to his anti-inflation policy no matter what was happening to the economy.

A more realistic picture is that of a policymaker who will renege on his commitment if circumstances are bad enough. Credibility, namely the expectation that an announced policy will be carried out, then reflects not only the policymaker's intentions, but also the state of the economy, where stochastic shocks will be important. The purpose of this paper was to show that this view of policymaking and credibility implies that tough policies may have adverse effects on credibility in the future if they severely constrain the choices of future policymakers. Policies that raise unemployment into the future, for example, will lower the "threshold" level of the random shock at which a future policymaker will find it optimal to devalue.

Using interest differentials relative to Germany as a measure of the perceived credibility of a country's pledge to maintain a fixed parity in the EMS, we found support for this alternative view in the effect of unemployment on credibility in France. In fact, though there was some weak evidence of the signaling role of unemployment in a period in the mid-1980s in which the priorities of the authorities had changed, in the earlier and later subperiods there seems to be clear evidence of a negative association between credibility and the unemployment rate. This suggests that both a policymaker's reputation for pursuing a hard-currency peg and durably lower unemployment are necessary to convince investors of the credibility of policy. The results are far from conclusive. But they indicate that modeling credibility solely in terms of a policymaker's preferences or intentions is seriously incomplete.

Appendix: The First-Period Decision Problem

The first-period decision for a government of type $i$ is to choose a critical value $\hat{\epsilon}_i$ such that $\Lambda^i(D) = \Lambda^i(F)$, where $\Lambda^i(\cdot)$ is defined by
Using (2), one finds that

\[(A1) \quad \hat{\epsilon}_1^i = -\kappa - \mu_1 s + \frac{a + \theta^i}{2a} s + \frac{\beta}{2as} [EL_2^i(D) - EL_2^i(F)],\]

where \(\mu_1\) is the probability of a devaluation in the first period, which depends on \(p_1^w, p_1^T\), and the uniform priors. To evaluate the terms in brackets, we use

\[(A2) \quad EL_2^i(j)\]
\[= \frac{1}{2v} \int_{\epsilon_2 = -\nu}^{\epsilon_2 = \nu} a[-\mu_2(j) s - \epsilon_2 - \kappa - \delta(u_1(j) - u_N)]^2 d\epsilon_2\]
\[+ \frac{1}{2v} \int_{\epsilon_2 = \hat{\epsilon}_2^i(j)}^{\epsilon_2 = v} (a[s - \mu_2(j) s - \epsilon_2 - \kappa - \delta(u_1(j) - u_n)]^2 + \theta^i s^2) d\epsilon_2.\]

For ease of notation, define \(m(j) = \mu_2(j) s + \kappa + \delta(u_1(j) - u_N).\)
Using the fact that \(\hat{\epsilon}_2^i(j) = -m(j) + (a + \theta^i)s/2a\), the integral (A2) may, after some manipulation, be evaluated as

\[(A3) \quad EL_2^i(j) = a(m(j) + \kappa)^2 + \frac{av^2}{3} - \frac{as}{2v}(v - \hat{\epsilon}_2^i(j))^2.\]

The term in brackets in (A1), \(EL_2^i(D) - EL_2^i(F)\) then becomes

\[(A4) \quad \frac{a(2v - s)}{2v} [(m(D))^2 - (m(F))^2] + \left(\frac{(a + \theta^i)s^2}{2} v - as + 2av \right) \times (m(D) - m(F)) = ((\mu_2(D) - \mu_2(F))s + \delta(u_1(D) - u_1(F)))\]
\[\times \left(1 - \frac{s}{2v}\right) [(\mu_2(D) + \mu_2(F))s + 2(\kappa - \delta u_N)\]
\[+ \delta(u_1(D) + u_1(F)) - s] + \frac{\theta^i s^2}{2av}.\]

\(\rho_1^w\) and \(\rho_1^T\) may then be calculated from (A1), using (A4) and the uniform distribution.

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