IMF WORKING PAPER

WP/89/36

INTERNATIONAL MONETARY FUND

European Department

Gaining Policy Credibility in the EMS: The Case of Ireland

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April 25, 1989

Abstract

This paper presents evidence that Ireland's disinflation policy has derived credibility from its participation in the exchange rate mechanism of the EMS. Before 1979, Irish inflation expectations followed mainly the expected movements of prices in the United Kingdom. Given the accommodating stance of exchange rate policy in the latter country, the influence of changes in international price competitiveness on expected inflation in Ireland was minor. In contrast, upon entry into the EMS the Irish expectations soon converged toward the expected price behavior of partners in the exchange rate mechanism, and competitiveness became an important influence on expected inflation in Ireland. A loss of competitiveness at the beginning of the disinflation seems to have been instrumental in establishing its credibility.

JEL Classification Numbers:
311, 431

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* The paper benefited from detailed suggestions for improvement made by L. Lipschitz, and from comments by D. Archer, N. Ericsson, P. Honohan, T. Lane, D. McAleese, M. Mecagni, L. Molho, and seminar participants at the IMF. Some of the data were kindly provided by B. Smith of the Irish Finance Ministry.

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Contents

Page

Summary

This paper presents empirical evidence that Ireland's disinflation policy during the 1980s has derived credibility from its participation in the exchange rate mechanism of the European Monetary System (EMS). Policy credibility is an important ingredient in a disinflation, since it may serve to moderate wage settlements and hence reduce the output cost associated with the disinflation.

The paper shows that before 1979 Irish inflation expectations followed mainly the expected movements of prices in the United Kingdom. Given the accommodating stance of exchange rate policy in the United Kingdom, the influence of changes in international price competitiveness on expected inflation in Ireland was minor.

In contrast, when Ireland joined the EMS, the inflationary expectations of the Irish soon moderated toward the price behavior expected of partners in the exchange rate mechanism (in which the United Kingdom does not participate). Competitiveness became an important influence on expected inflation in Ireland. The sharp loss of competitiveness in 1981-83 seems to have been instrumental in establishing the credibility of the disinflation.

I. Introduction and Synopsis

The desire to bring down inflation was an important motivation for inflation-prone countries such as Italy and Ireland to take part in the Exchange Rate Mechanism (ERM) of the European Monetary System (EMS). It is often argued that, given a necessity of disinflation, the participation in a mechanism of fixed but adjustable exchange rates with a group of low-inflation countries can provide a source of discipline, enhancing the disinflation's credibility and moderating its detrimental effects on the economy. Still, even though economic theory and public discussion have granted this role of policy credibility a degree of prominence, not much empirical research has been done to ascertain its practical relevance. 1/

Giavazzi and Giovannini (1987) conclude a theoretical review with the observation that, "if there is any advantage from pegging to a strong currency in a disinflation, [it] comes from a shift in price setters' expectations, which makes the output loss of reducing inflation smaller." For this argument to have empirical significance in the case of the ERM, two conditions must be satisfied. First, it must be true that the ERM has enhanced the credibility of disinflation, i.e., that it has reduced the expected rate of inflation. Second, it must be true that the expectation of lower inflation has led to a moderation of wage settlements. In a situation where wages are indexed on actual inflation, participation in a strong-currency club may produce lower inflation through the impact on wages of adverse developments in competitiveness and employment, without however reducing the output cost of disinflation.

This paper examines whether disinflation policy in Ireland has derived credibility from its participation in the ERM. Ireland's experience is of special interest in two respects. First, the Irish economy is relatively small and influences the rest of the ERM only to a limited extent. This facilitates the theoretical and empirical analysis. Second, Ireland's experience is particularly suitable for inference because its entry into the ERM constituted a very distinct change of exchange rate regime, more so than the entry of any of the other ERM participants. For over half a century the Irish pound had remained at a one-for-one no-margins parity with sterling; not only did Ireland's entry abruptly discontinue this parity, but, in addition, the United Kingdom decided not to participate in the ERM.

The analytical background of the paper is presented in Section II, which first summarizes theoretical arguments underlying the hypothesis that the ERM might help reduce the output cost of disinflation, and then briefly discusses how other studies have tested the empirical validity of this hypothesis. As the paper was motivated in part by a concern

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1/ See Driffill (1988) and Persson (1988) for reviews of the literature.

that some of the tests applied in the literature may produce misguided inference, Section III sets out an alternative approach to modelling the credibility effect. In Section IV this approach is applied to Irish data, producing strong evidence for the success of the authorities in deriving credibility for their disinflation from EMS membership. The means and speed by which credibility was gained are examined more closely in Section V. However, credibility alone is not sufficient for mitigating the output cost of disinflation; in fact, Dornbusch (1988b) considers the Irish stabilization in this broader sense a failure. The credibility effect identified in this paper is placed in a wider perspective in the concluding Section VI.

II. Analytical Background

At a theoretical level, some of the costs and benefits of ERM participation for a government that wishes to bring inflation down were analyzed by Giavazzi and Pagano (1988). In their model, the policymaker, on the one hand, is tempted to inflate so as to boost output, but, on the other hand, wishes to promote a low rate of inflation. 1/ The welfare gain of a credible participation in the ERM comes from the additional cost placed on inflation (loss of international competitiveness between realignments). Giavazzi and Pagano show that, given this policy configuration, the average rate of inflation of an inflation-prone participant will be lower than it would have been without the discipline of the ERM (but higher than that of its less inflation-prone partners) provided losses of competitiveness can be compensated by realignments at most to the extent necessary to ascertain purchasing power parity on average. Inflation differentials within the ERM will be related to the frequency of realignments; in the extreme case with no realignments at all, the balance of payments constraint would ultimately dictate full convergence of inflation (as under parity with sterling). 2/ This setup does not incorporate any strategic interactions between the investigated country and its partners in the ERM, which may be an acceptable simplifying assumption in the case of a relatively small economy such as that of Ireland.

The analysis so far is conditional on the assumption that credibility is established immediately. But in practice the building of a credible reputation for a new policy may take time and involve

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1/ The latter objective carries less weight, however, to the extent that the public budget relies on revenue from money seigniorage. By participating in the ERM, a country, to some extent, foregoes the liberty to determine the rate at which its government may collect seigniorage. Dornbusch (1988a) argues that several high-inflation ERM participants have underestimated the budgetary consequences of limiting this source of revenue. At the time of entry into the ERM, the Governor of the Central Bank of Ireland (Murray, 1979b) attached great importance to control over the public finances.

2/ This abstracts from relative price movements.

costs. To the extent that the inception of the ERM was accompanied by uncertainty about its robustness, and particularly about the prospects for frequent and sizable realignments, inflation expectations may have been slow to adjust to the equilibrium examined by Giavazzi and Pagano. An ensuing initial loss of competitiveness and, hence, of output, could have served to establish the new policy's credibility. 1/

To evaluate the benefit of the ERM for inflation-prone participants, it is therefore necessary to assess its success in reducing inflationary expectations. Giavazzi and Giovannini (1987,1988) address this issue by estimating vector autoregressions (VARs) for prices, wages, and output (conditional on lagged money and import prices) with data for the period preceding the ERM. Significant overprediction by this model of inflation during the ERM might have been consistent with a credibility effect, but, in fact, statistical tests can not reject parameter stability between these subperiods for any of the countries investigated. 2/ At a less formal level, Giavazzi and Giovannini find that dynamic simulations of their VARs tend to overpredict the actual paths of inflation, but only starting several years after the inception of the EMS. They interpret this as a belated credibility effect, but acknowledge that the evidence is tenuous since they have not computed the standard errors of the prediction errors and hence are unable to determine whether the overprediction is significant.

Perhaps more importantly, concern can be raised with respect to the reliability of VARs as vehicles for inference on the stability of specific structural parameters: it is difficult to associate instability of the coefficients of a VAR with specific changes in structural parameters. In particular, Giavazzi and Giovannini (1988, Table 2) note that the VAR for Ireland starts to overpredict price inflation more than three years after the inception of the EMS, while overprediction of wage inflation begins already in 1980. Would this imply that the Irish authorities managed to generate a redundant credibility effect two years after successfully moderating wage settlements, or might it instead reflect other, unidentified features of the underlying model? According to the analysis that follows in Sections IV and V, the latter appears to be the case.

1/ Driffill (1988) reviews the theoretical literature on the need to generate recession in order to establish a policy reputation. The Irish policymakers were well aware of such startup costs: "Given our past record, and the inflationary expectations which are now a part of our way of life, price stability, without pain, is as unattainable as taxation without tears" [Murray (1979b, p. 66)].

2/ The countries investigated are Denmark, France, Germany, Ireland, Italy, and the non-participating United Kingdom. The model for France seems to exhibit a significant parameter shift in 1979, but the presence of residual autocorrelation reveals more pervasive misspecification.

An approach more akin to that adopted below was taken by Artis and Ormerod (1987), who examine whether an autoregressive predictor of inflation in Germany contributes more to the explanation of inflation in other ERM countries after 1979 than before. The results are mixed, suggesting credibility effects in France and Italy, but not in Belgium and the Netherlands.

III. Specification of the Empirical Model

In this paper, consumer price inflation in Ireland is hypothesized to depend on two elements, namely on cost factors and on international price competition. Cost factors may influence price inflation in the nontradables sector, where international competitive pressure is not prominent [see, e.g., Bruno (1978) and Honohan and Flynn (1986)]. However, the tradables sector of the Irish economy is hypothesized to act largely as a price taker. In the presence of extensive international price arbitrage, highlighted by numerous authors, 1/ price expectations in this sector will be based predominantly on expected competitor prices (in Irish currency). Moreover, even in the nontradables sector Irish prices may remain related to those of foreign competitors if significant factor price arbitrage takes place and the productivity performance in Ireland is not dissimilar to that abroad.

Before Ireland joined the ERM, the Irish pound had been fixed at parity with sterling for over half a century, and no regulatory impediments had existed on capital movements between Ireland and the United Kingdom. The long-term fixity of the exchange rate, in combination with the freedom of capital movement, rendered Ireland's monetary policy and price behavior quite dependent on their respective counterparts in the United Kingdom. 2/ Hence, in a model of inflation expectations in Ireland one would anticipate a large weight on expected U.K. inflation.

The subsequent termination of the parity with sterling was motivated by the policy goal of reducing Ireland's inflation through stabilizating its exchange rate vis-à-vis the currencies of the low-inflation ERM countries. 3/ Should this policy have been credible, then one would anticipate a shift of weight in the inflation equation for Ireland away from expected U.K. inflation toward inflation expected for

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1/ E.g., McCormack (1979) and Walsh (1983).

2/ The lack of autonomy in the conduct of Irish monetary policy during this period is documented in Leddin (1986); Honohan and Flynn (1986) provide evidence (and further references) regarding the relation between Irish and foreign inflation.

3/ See McCormack (1979), Central Bank Governor Murray (1979a, b), and Walsh (1983). Other factors included the falling U.K. share in Ireland's external trade, and the prospect of resource transfers from ERM partners [McAleese (1987)].

the rest of the ERM, with, presumably, unchanged weights on the cost variables.

In addition to being influenced by expected foreign inflation, expectations are likely to reflect feedback from accumulated changes in the level of international price competitiveness (the real effective exchange rate) if the exchange rate is--at least to some extent--credibly fixed. To the extent that the policymaker refuses to (say) devalue in order to accommodate excessive inflation, a loss in the level of competitiveness will have to be recouped by a moderation of domestic inflation relative to foreign inflation, either through the direct influence of competitiveness on the process of wage formation, maintaining profitability intact, or through the indirect channel of initially deteriorating profitability and employment placing downward pressure on wages. 1/ Given that the primary motivation for Ireland's decision to join the ERM was the desire to terminate its participation in the inflation-depreciation spiral of the United Kingdom, a second sign of policy credibility in the ERM would be a stronger influence of competitiveness on expected inflation.

These theoretical ingredients are brought together in the following expression for inflation expectations in Ireland:

$$\pi_t^* = \underline{x}_t^* \underline{a}_1 + \underline{z}_{1t-1} \underline{a}_2 \qquad (1)$$

The variable π_t denotes Irish inflation; starred (*) variables denote expectations (based on information available at the end of the previous period); $\underline{x}_t^*$ is a (1x2) (row) vector of explanatory expectations variables (underlined symbols are vectors; x_{1t}^* equals inflation expected for the United Kingdom and x_{2t}^* equals inflation expected for the ERM excluding Ireland); $\underline{z}_{1t-1}$ is a (1xm) vector of lagged explanatory variables (cost factors and competitiveness); $\underline{a}_1$ and $\underline{a}_2$ are the corresponding (2x1) and (mx1) coefficient vectors.

It is assumed in this formulation that, in the nontradables sector, pricing is implemented such that the cost factors can be entered with at least a short lag (one quarter in the estimates below). For the sake of a transparent notation, the lag structure is kept as simple as possible in this section.

Expectations are assumed to be based on an efficient use of available information:

1/ As noted by D. Archer, the time lags involved in the former channel are likely to be shorter than those required by the second channel. Some suggestive evidence for this phenomenon will be presented in Section IV.

$$\pi_t^* = E(\pi_t|\underline{z}_{t-1}) = \pi_t - u_t$$

$$\underline{x}_t^* = E(\underline{x}_t|\underline{z}_{2t-1}) = \underline{x}_t - \underline{v}_t \qquad (2)$$

The notation $E(\cdot|\cdot)$ indicates the mathematical expectation of the first argument conditional on the information represented by the second argument. The (1x(m+n)) vector $\underline{z}_{t-1}=(\underline{z}_{1t-1},\underline{z}_{2t-1})$ includes all the information that is used; its second component contains the information underlying $\underline{x}_t^*$ (the determination of $\underline{x}_t^*$ is specified in (3) below). 1/ The disturbance vector $(u_t,\underline{v}_t)$ is assumed to be distributed independently over time (with zero mean and constant nonsingular variance matrix); it is also independent of $\underline{z}_{t-1}$.

The purpose of this paper is to conduct inference on the coefficients of (1); substituting (2) into (1), the latter can be expressed in terms of observable variables:

$$\pi_t = \underline{h}_t\underline{a} + w_t \qquad (1')$$

where $\underline{h}_t=(\underline{x}_t,\underline{z}_{1t-1})$, $\underline{a}=(\underline{a}_1',\underline{a}_2')'$, and $w_t=u_t-\underline{v}_t\underline{a}_1$. However, given (2), $\underline{h}_t$ and w_t are correlated and hence inference based on estimating (1') by ordinary least squares (OLS) would be unreliable (the estimate of $\underline{a}$ would be inconsistent). For consistency, account must be taken of the endogeneity of $\underline{x}_t$. For that purpose, assume that the expectations of $\underline{x}_t$ are formed according to:

$$E(\underline{x}_t|\underline{z}_{2t-1}) = \underline{z}_{2t-1}B \qquad (3)$$

B is the (nx2) coefficient matrix.

The model as it stands is of the type analyzed by Pesaran (1988, pp. 164-70), who discusses various estimation techniques. The most efficient approach would be to apply a full information method to the full model, (1') and (3) jointly. However, a disadvantage of this approach would be its sensitivity with respect to possible misspecification of (3). Limited information methods that do not rely on the full estimation of (3) are generally more robust to such misspecification [Pesaran (1988, p. 162)]. Given that the coefficients of present interest ($\underline{a}_1$) appear only in (1') and not in (3), this justifies a limited information approach. Specifically, $\underline{a}$ will be estimated by the Instrumental Variables (IV) estimator:

$$\hat{\underline{a}} = (H'P_QH)^{-1}H'P_Q\underline{\pi} \qquad (4)$$

$H=[X,Z_1]$ is the (Tx(2+m)) matrix of observations on $\underline{h}_t$ (T is the sample size); $P_Q=Q(Q'Q)^{-1}Q'$ is a (TxT) matrix projecting orthogonally onto the space spanned by the columns of the instrumental variables

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1/ For the exposition, $\underline{z}_{1t-1}$ and $\underline{z}_{2t-1}$ are assumed not to overlap, but this assumption is relaxed in the empirical application below.

matrix $Q=[Z_1,Z_3]$; Z_3 is the (Txq) matrix of observations on the instruments $\underline{z}_{3t-1}$ (all uncorrelated with w_t) included in addition to $\underline{z}_{1t-1}$; and $\underline{\pi}$ is the vector of observed Irish inflation.

Three aspects of this IV estimator are noteworthy. First, under the usual assumptions the estimates are consistent and asymptotically efficient [Bowden and Turkington (1984, pp. 110-1)]. In finite samples their efficiency will be enhanced by selecting $\underline{z}_{3t-1}$ as closely correlated with $\underline{z}_{2t-1}$ as possible [Bowden and Turkington (1984, Par. 2.5)]; for the identification of the coefficients of interest, the dimension of $\underline{z}_{3t-1}$ must be at least equal to that of $\underline{x}_t$ (i.e., $q \geq 2$).

Second, $\hat{\underline{a}}$ can be interpreted as a two-step estimator. In the first step, the explanatory variables of (1') are regressed (by OLS) on the instruments, producing fitted values $\hat{H}=P_Q H$. In the second step, the IV estimate of $\underline{a}$ is derived by regressing $\underline{\pi}$ on these fitted values:

$$\hat{\underline{a}} = (\hat{H}'\hat{H})^{-1}\hat{H}'\underline{\pi} \qquad (4')$$

Using the fact that P_Q is idempotent, it can easily be verified that the estimators in (4) and (4') are identical. If, for expositional purposes, it were assumed that $\underline{z}_{1t-1}$ was uncorrelated with both $\underline{x}_t$ and $\underline{z}_{3t-1}$ then (4') would simplify to: 1/

$$\hat{\underline{a}}_1 = (\hat{X}'\hat{X})^{-1}\hat{X}'\underline{\pi}$$

$$\hat{\underline{a}}_2 = (Z_1'Z_1)^{-1}Z_1'\underline{\pi} \qquad (4'')$$

where $\hat{X}=(Z_3'Z_3)^{-1}Z_3'X$. This simplification would offer the intuitive interpretation that the IV estimate of $\underline{a}_1$ had been obtained by first regressing the endogenous explanatory variables on a set of appropriate instruments (Z_3), and by subsequently regressing Irish inflation on the fitted values from this first-stage regression. The underlying assumption is, however, unlikely to be satisfied and, given that it is also unnecessary, the IV estimator (4) will be used below.

Third, it would be correct to interpret the first-stage fitted values $\hat{X}=P_Q X$ as expected values of X and the second-stage fitted values $\hat{\underline{\pi}}=P_{\hat{H}}\underline{\pi}$ as expected values of $\underline{\pi}$ only if the instrument set Q included all the information underlying X^* (i.e., Z_2). In practice it may be difficult to be sure that this condition is satisfied; evidence to the contrary might arise if diagnostic tests indicated that the regression of X on Q did not represent a proper model of expectations formed rationally (e.g., the presence of residual autocorrelation could suggest that relevant information had been omitted). The attraction of the IV approach is that even under those circumstances it allows

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1/ Cf. Pagan (1984, Theorem 4).

inference on the parameters of interest; in this paper the (marginal) models for U.K. and ERM inflation will not be scrutinized nor will any attempt be made to interpret fitted values as expectations.

IV. Empirical Results

In this section the model for inflation expectations expressed in terms of observable variables (equation (1')) is estimated with the Instrumental Variables method (4). The two explanatory expectations variables (inflation in the United Kingdom and in the rest of the ERM) are treated as endogenous (denoted, correspondingly, by an asterisk (*)). The choice of additional instruments ($\underline{z}_{3t-1}$ above) was based on some prior regressions for U.K. inflation (denoted in this section by Δp_t^{UK} 1/) [this suggested the following instruments: U.K. inflation lagged by one quarter; U.K. import price inflation lagged by one quarter (Δiuv_{t-1}^{UK}); world consumer price inflation lagged by four quarters (Δp_{t-4}^{W}); oil price inflation lagged by five quarters (Δp_{t-5}^{OIL})], and on some prior regressions for ERM inflation (denoted in this section by Δp_t^{ERM}) [this suggested as an additional instrument ERM inflation lagged by one quarter]. 2/ Data sources are in Appendix I.

Two types of exogenous explanatory variables ($\underline{z}_{1t-1}$ in the notation of Section III) were considered: lagged cost variables (wages, import prices, and oil prices) and lagged competitiveness (the real effective exchange rate). The precise lag structure was determined by first including a large number of lags (up to eight quarters) and subsequently selecting the lags that were plausible from a theoretical perspective, significant, and satisfactory in the light of diagnostic tests (for residual autocorrelation, non-normality, heteroscedasticity, and parameter instability; the reported tests are briefly explained in Appendix II). In all the specifications reported below, Irish import prices appeared to be insignificant.

This procedure yielded the following preferred model for Irish

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1/ All lowercase variables are in natural logarithms.

2/ Given that none of the data are seasonally adjusted, it appeared necessary also to include one seasonal dummy as instrument for the entire period (unity in the third quarter and minus unity in the fourth) and one seasonal dummy as explanatory variable for the ERM period (unity in the second quarter).

inflation (denoted in this section by Δp_t^{IR}) before the ERM: 1/2/

$$\Delta p_t^{IR} = \underset{(0.09)}{0.63}\ \Delta p_t^{UK*} + \underset{(0.08)}{0.21}\ \Delta p_t^{ERM*} + 0.14\ \Delta w_{t-1} + \underset{(0.008)}{0.019}\ \Delta p_{t-3}^{OIL}$$

$$- \underset{(0.07)}{0.15}\ \Delta\Delta(reer_{t-2}+reer_{t-4})/2 \qquad (5)$$

$T = 1965{:}1\text{-}1978{:}4 \qquad \hat{\sigma} = 0.0067$

$AR(8)_1^8 = 7.92\ (15.51) \quad AR(4)_1^4 = 2.24\ (9.49) \quad AR(1)_1^1 = 1.10\ (3.84)$

$NORM(2) = 1.68\ (5.99) \quad HET(12,36) = 0.71\ (2.04) \quad ARCH(4,42) = 0.95\ (2.60)$

$INSTR(5) = 3.85\ (11.07) \quad FOR(12)_{76:1}^{78:4} = 6.96\ (21.03)$

Estimated coefficient standard errors are in parentheses; $\hat{\sigma}$ denotes the estimated equation standard error; and reer denotes (the natural logarithm of) the real effective exchange rate of the Irish pound relative to the currencies of sixteen industrial trading partners (Irish relative to foreign consumer price level, corrected for exchange rate changes). In regression (5), and in all the regressions that follow, the inflation homogeneity restriction could not be rejected and was subsequently imposed. This restriction is common in the literature on wage-price dynamics [e.g., Bruno (1978, 1980), Grub et al. (1982, 1983), Artis and Ormerod (1987), Giavazzi and Giovannini (1988, 1989)]; it ascertains that in a hypothetical steady state growth equilibrium all price variables increase at the same rate. In (5), therefore, the first four coefficients sum to unity, and, reflecting the imposed restriction, one of the coefficients is reported without an estimated standard error. 3/

1/ The empirical results of this paper were obtained with PC-GIVE by D.F. Hendry and the Oxford Institute of Economics and Statistics; see Hendry (1989).

2/ All the regressions also include two unreported dummies associated with a sharp discontinuity in the Irish consumer price statistics in 1975-76. The first dummy is unity in 1975:1 and minus unity in 1975:2, and the second is unity in 1975:3 and minus one half both in 1976:1 and 1976:2 (both dummies are data-based and specified such that they have a mean of zero). See Appendix I and Honohan and Flynn (1986) on the need for these dummies.

3/ In the estimation, one of the explanatory inflation variables was deducted from the dependent variable and from each of the other explanatory inflation variables, and also, of course, included as an instrument.

Several features of (5) are noteworthy. First, it appears possible to estimate a parsimonious model for inflation expectations in the pre-ERM period specified along the lines discussed in Section III. All the diagnostic tests are satisfied at a significance level of 5 percent (test failures at 5 percent will be marked by asterisks). Second, the influence of expected U.K. inflation indeed appears to be dominant during this period, with an estimated coefficient three times as large as the estimated coefficient on expected ERM inflation. The fact that the latter is significant at all probably reflects some degree of fixity of sterling relative to other ERM currencies during part of the pre-ERM period (Bretton-Woods and the 'snake'). Third, the influence of cost factors (wages and oil prices 1/) appears to be relatively small. Fourth, only sharp movements in competitiveness were found to have a discernable effect on inflation expectations in pre-ERM Ireland; lags (up to eight quarters) of the level of competitiveness and of its rate of change turned out to be insignificant. This suggests that losses of competitiveness were not expected to be recouped by a moderation of domestic inflation, but rather by an accommodative stance of the (U.K.) exchange rate policy. Finally, none of the following additional variables appeared to be significant either: lagged values of Irish, U.K. and ERM consumer prices; lagged Irish import prices and world consumer prices; and further lags of wages and oil prices.

This model breaks down when extended beyond 1979. The estimate of (5) for the entire sample (1965:1-1986:4) fails almost all of the diagnostic tests:

$$\Delta p^{IR}_t = \underset{(0.11)}{0.72}\ \Delta p^{UK*}_t + \underset{(0.10)}{0.06}\ \Delta p^{ERM*}_t + 0.19\ \Delta w_{t-1} + \underset{(0.009)}{0.024}\ \Delta p^{OIL}_{t-3}$$

$$- \underset{(0.05)}{0.09}\ \Delta\Delta(reer_{t-2}+reer_{t-4})/2 \qquad (6)$$

$T = 1965{:}1\text{-}1986{:}4 \qquad \hat{\sigma} = 0.0094$

$AR(8)^{8}_{1} = 20.88^{*}\ (15.51) \quad AR(4)^{4}_{1} = 16.16^{*}\ (9.49) \quad AR(2)^{3}_{2} = 16.10^{*}\ (5.99)$

$NORM(2) = 15.45^{*}\ (5.99) \quad HET(12,68) = 0.46\ (1.90) \quad ARCH(4,74) = 10.02^{*}\ (2.50)$

$INSTR(5) = 12.85^{*}\ (11.07) \quad FOR(32)^{86:4}_{79:1} = 116^{*}\ (45)$

This regression suffers residual autocorrelation, non-normality, and heteroscedasticity; it fails the forecasting test for the ERM period; the instruments are correlated with the residuals; and the estimated residual variance for the total sample is nearly double that estimated for the pre-ERM period. The next step in the investigation is to find the source of this model breakdown.

1/ In Irish pounds.

The first issue to be addressed more precisely is whether the timing of the breakdown is related to Ireland's entry into the ERM in the first quarter of 1979. For that purpose, (5) is re-estimated by recursive IV, starting from the sample 1965:1-1972:4 and successively extending the sample by a single observation until the estimate for the total period 1965:1-1986:4 (i.e., model (6)) is reached. The resulting sequence of estimated equation standard errors and the corresponding one-step residuals 1/ are depicted in Chart 1. It turns out that the rise in $\hat{\sigma}$ occurred fairly soon after the inception of the ERM, in association with large positive one-step residuals in 1979:1 and from 1980:2 through 1982:2.

The positive sign of most of the one-step residuals during the first few years of the ERM indicates that inflation in Ireland initially was higher than predicted on the basis of the pre-ERM model. This may have reflected, in part, uncertainty about the new exchange rate policy: "During 1979 strenuous attempts were made to obtain an agreement on an incomes policy based on the expectation of inflation falling to single figures. The failure to obtain such an agreement was a clear indicator that expectations about inflation had not been radically changed as a result of EMS entry" [Walsh (1983, p. 173)]. Compounding the initial uncertainty, the Irish pound depreciated by almost 15 percent in nominal effective terms during the first two years of the ERM, reflecting the stabilization of its rate within the ERM in combination with the strengthening of the pound sterling (Chart 2). Rather than confirming the expectation that Ireland had switched to a harder currency peg, this development reinforced the inflationary spiral [Chart 3 and Walsh (1983)] while at the same time allowing Ireland to record a modest gain in competitiveness (Chart 4).

While the depreciation and the upsurge of inflation seemed to represent a setback for the authorities' disinflation policy, it should, as noted in Section II, perhaps not have come as a surprise that the establishment of credibility for the new policy took time and effort. Before focussing on the possible accrual of credibility (in Section V), it is first assessed on the basis of the entire ERM sample whether any credibility was ultimately gained at all. The evidence is afffirmative. Equation (7) reports an estimate of the expectations model for the entire sample, allowing shifts in the coefficients on U.K. and ERM inflation (as well as their instruments) and on competitiveness at the beginning of the ERM while retaining the (tested) homogeneity restraint

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1/ The sequence of one-step residuals consists of the last residual of each of the successive regressions. If they are to be normally distributed with zero mean, they must be close to zero and about 95 percent of them must lie within the band delimited by two estimated equation standard errors.

in each of the two subperiods. 1/2/

$$\Delta p_t^{IR} =$$

$$[\underset{(0.09)}{0.64}\ \Delta p_t^{UK*} + \underset{(0.07)}{0.20}\ \Delta p_t^{ERM*} + 0.14\ \Delta w_{t-1} - \underset{(0.06)}{0.14}\ \Delta\Delta(reer_{t-2}+reer_{t-4})/2\ ]\ D6578$$

$$+ [\underset{(0.08)}{0.70}\ \Delta p_t^{ERM*} + 0.28\ \Delta w_{t-1} - \underset{(0.04)}{0.20}\ \Delta\Delta reer_{t-1} - \underset{(0.02)}{0.11}\ reer_{t-2} + \underset{(0.11)}{0.51}\ ]\ D7986$$

$$+ \underset{(0.007)}{0.017}\ \Delta p_{t-3}^{OIL} \qquad (7)$$

$T = 1965{:}1\text{-}1986{:}4 \qquad \hat{\sigma} = 0.0066$

$AR(8)_1^8 = 6.72\ (15.51) \quad AR(4)_1^4 = 3.64\ (9.49) \quad AR(1)_1^1 = 2.56\ (3.84)$

$NORM(2) = 0.92\ (5.99) \quad HET(21,53) = 0.62\ (1.76) \quad ARCH(4,68) = 1.32\ (2.51)$

$INSTR(6) = 4.44\ (12.59)$

The variables D6578 and D7986 represent multiplicative dummies that take the value of unity for the subperiods 1965:1-1978:4 and 1979:1-1986:4, respectively, and zero elsewhere. Equation (7) satisfies all of the diagnostic tests, and, in contrast to (6), its estimated equation standard error is virtually identical to that estimated for the pre-ERM period (see (5)). The constant term was added for the ERM period in order to allow for the non-zero sample mean of the lagged level of competitiveness.

The evidence indicating the presence of a credibility effect is twofold. First, there is a sharp shift of weight from the coefficient on expected U.K. inflation to that on expected ERM inflation: more general regressions showed that the former became small and insignificant after 1979 (even when estimated for a very brief subperiod

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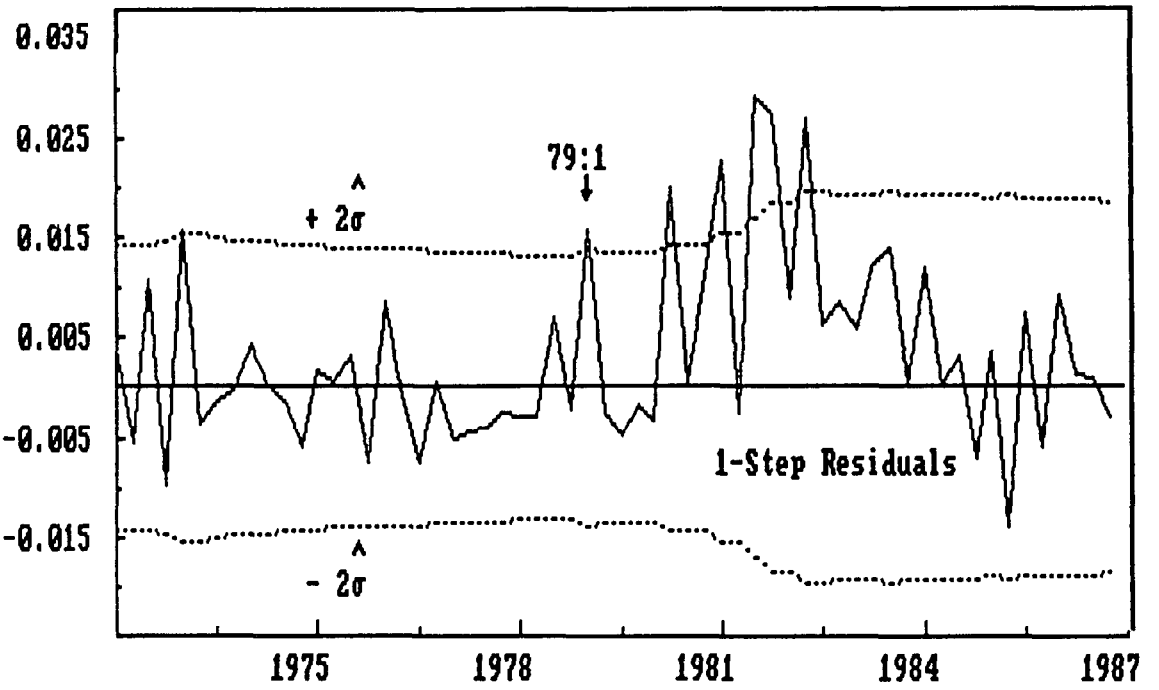
1/ The ERM came into operation in March 1979, following a resolution by the European Council on December 5, 1978. The coefficient shift in the expectations model is therefore placed immediately after 1978:4.

2/ Though not made explicit in (7), the lag of the oil price variable was raised to four quarters after 1979 as suggested by (unreported) more general regressions. Constancy of the coefficient on this compounded variable could not be rejected, and hence it was imposed. In accordance with Honohan and Flynn (1986), an (unreported) dummy was included in order to remove a large outlier in 1981:4.

Chart 1

IRELAND

Recursive Estimation of the Pre-ERM Expectations Model 1/



Source: Equations (5) and (6).

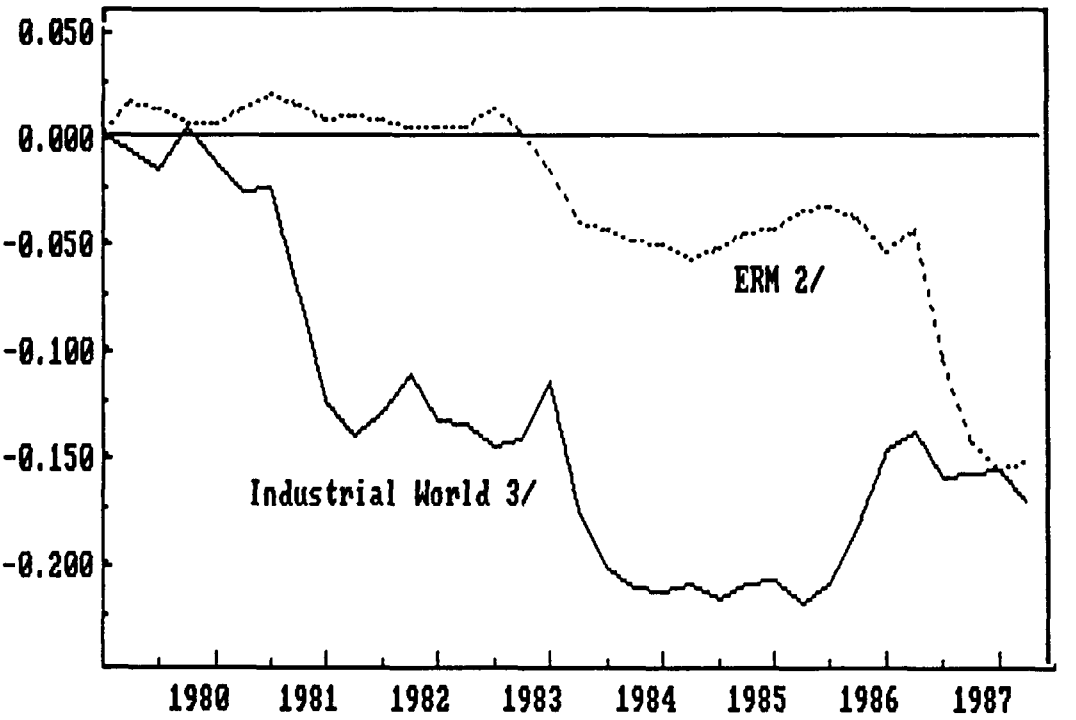
1/ This chart depicts the sequence of estimated equation standard errors and one-step residuals of the pre-ERM model, obtained by successively extending the sample by a single observation from 1965:1-1972:1 to 1965:1-1986:4. The estimate for 1965:1-1978:4 is given in equation (5), and that for 1965:1-1986:4 in equation (6).

Chart 2

IRELAND

Nominal Effective Exchange Rates 1/

In natural logarithm, 1979:1=0.



Source: Appendix I.

1/ Quarterly, for 1979:1-1987:2; foreign currency per Irish pound.

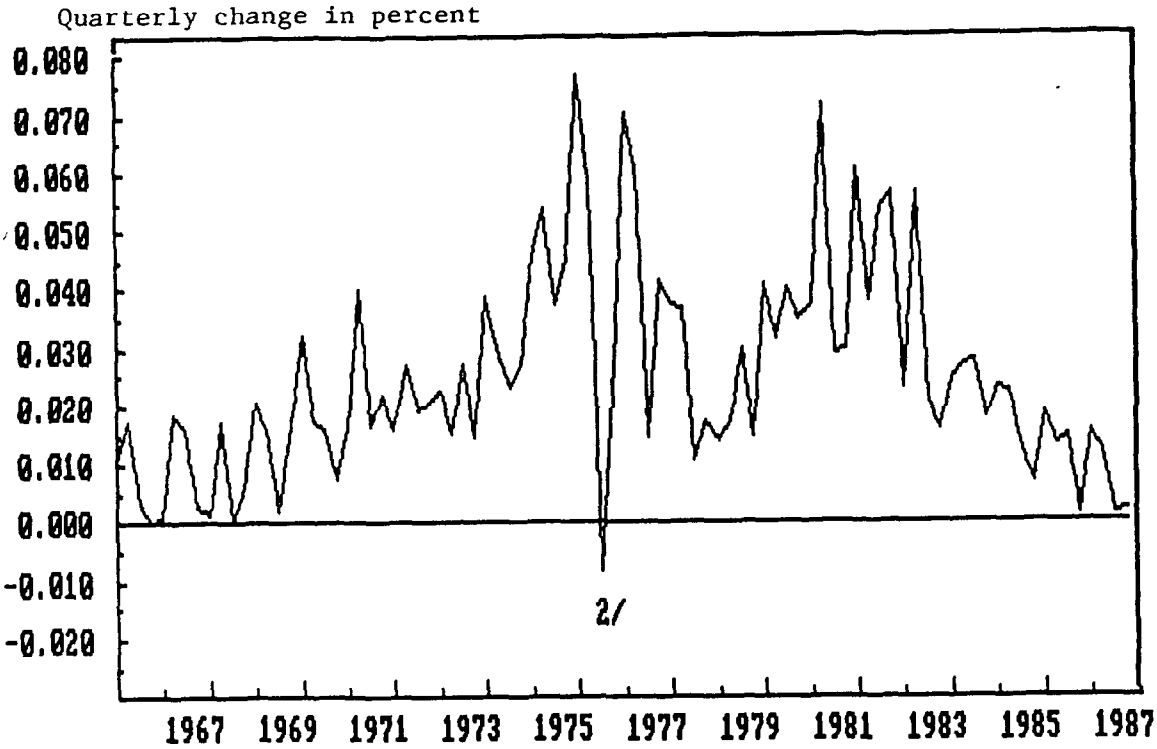
2/ Weighted average of the other ERM currencies.

3/ Weighted average of sixteen other industrial countries' currencies, including the ERM.

Chart 3

IRELAND

Inflation 1/



Source: Appendix I.

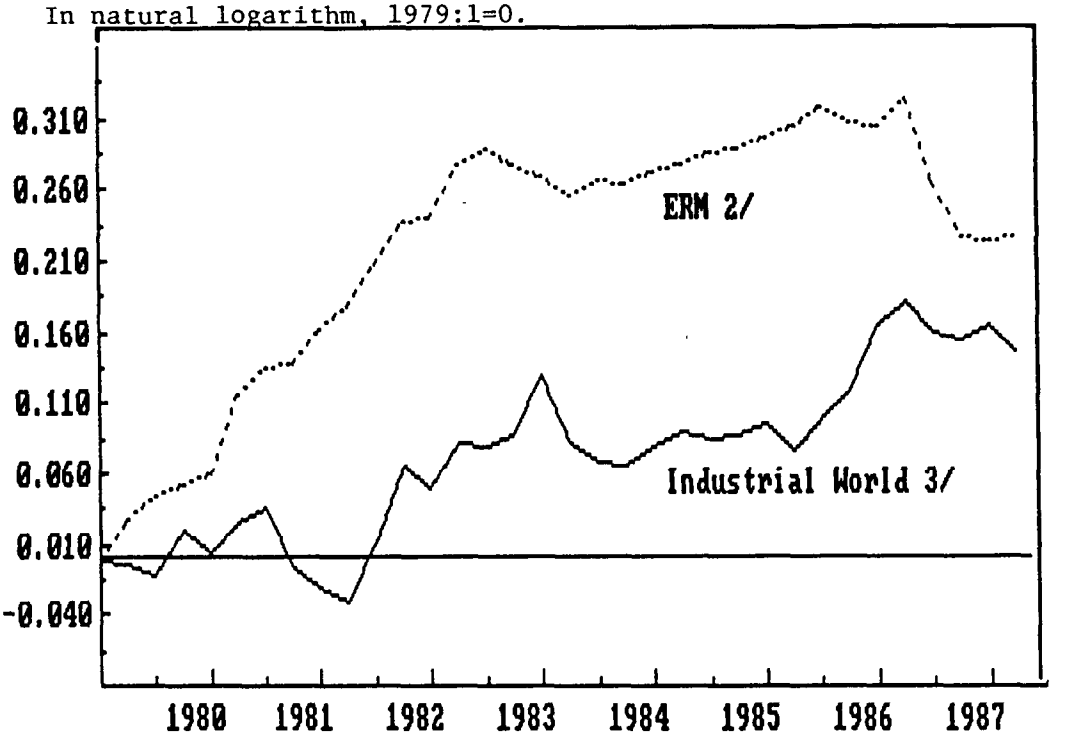
1/ Not seasonally adjusted; consumer price index.
2/ In 1975/6 there was a discontinuity in the Irish consumer price statistics (see Appendix I).

Chart 4

IRELAND

Real Effective Exchange Rates 1/

In natural logarithm, 1979:1=0.



Source: Appendix I.

1/ Quarterly, for 1979:1-1987:2; based on consumer price indices; a rise signifies a real appreciation of the Irish pound.
2/ Weighted average of the other ERM currencies.
3/ Weighted average of sixteen other industrial countries' currencies, including the ERM.

starting immediately in 1979:1), and hence it was dropped. Second, during the ERM the lagged level of competitiveness became an important determinant of expected inflation, with losses of competitiveness expected to be recouped by adjustments in Ireland's inflation. Taken together, these findings provide strong evidence that expectations did indeed adjust to the new exchange rate policy within the EMS: according to this model Irish inflation expectations became oriented toward inflation in the rest of the ERM rather than in the United Kingdom, and, in contrast to the pre-ERM period, the level of competitiveness was expected to have repercussions for inflation. It is interesting to note that the lag on the impact effect of changes in competitiveness became shorter as well; this may reflect a more direct sensitivity of wages to competitiveness (see Section III).

Given the constancy of the estimated coefficients (discussed in Section V), inspection of (7) suggests that the following three restrictions may be valid: (i) the coefficient on expected U.K. inflation and the coefficient on expected ERM inflation, both before the ERM, may sum to the coefficient on expected ERM inflation after 1979; (ii) the coefficient on lagged wage inflation before the ERM may equal the corresponding coefficient after 1979; and (iii) the coefficient on the lagged competitiveness acceleration variable before the ERM may equal the corresponding coefficient after 1979. As, indeed, a joint F-test could not reject these restrictions, they are imposed so as to arrive at a parsimonious preferred model for Irish inflation expectations before and during the ERM:

$$\Delta p_t^{IR} = [\underset{(0.09)}{0.59}\ \Delta p_t^{UK*} + 0.22\ \Delta p_t^{ERM*} - \underset{(0.03)}{0.19}\ \Delta\Delta(reer_{t-2}+reer_{t-4})/2\ ]\ D6578$$

$$+ [\underset{(0.02)}{0.81}\ \Delta p_t^{ERM*} - 0.19\ \Delta\Delta reer_{t-1} - \underset{(0.02)}{0.11}\ reer_{t-2} + \underset{(0.11)}{0.51}\ ]\ D7986$$

$$+ 0.17\ \Delta w_{t-1} + \underset{(0.007)}{0.020}\ \Delta p_{t-3}^{OIL} \qquad (8)$$

$T = 1965{:}1\text{-}1986{:}4 \qquad \hat{\sigma} = 0.0067$

$AR(8)_1^8 = 6.32\ (15.51) \quad AR(4)_1^4 = 4.12\ (9.49) \quad AR(1)_1^1 = 2.57\ (3.84)$

$NORM(2) = 0.88\ (5.99) \quad HET(17,59) = 0.81\ (1.80) \quad ARCH(4,70) = 1.50\ (2.50)$

$INSTR(7) = 6.79\ (14.07) \quad FOR(12)_{84:1}^{86:4} = 8.04\ (21.03)$

It should be pointed out, finally, that the validity of the expectations interpretation given to the current model is not affected by whether or not, around 1979, a regime shift occurred in the process generating U.K. inflation. Such a possible regime shift might affect the correlation between the instruments used and (endogenous) U.K.

inflation, but given that the instruments are lagged and no residual autocorrelation is apparent in the estimated equations for Irish inflation, the validity of the current approach would not be impaired. 1/ A rigorous treatment of these issues can be found in Hendry (1988).

V. The Process of Gaining Credibility

In order to examine more closely the accrual of credibility for Ireland's disinflation in the ERM, two aspects of credibility are distinguished: the public's estimate of the parameters underlying the new policy regime, and the degree of uncertainty attached to that estimate. The process of gaining credibility thus has two dimensions: the policymaker must make the public aware of the new policy, and reduce the uncertainty that may initially surround it.

How this can be done depends on the policymaker's reputation. A policymaker with an impeccable reputation of reliability may need to do no more than announce the new policy; even if the policy is an arduous one, such as a disinflation, the public may believe the announcement without reservation. If the policymaker's reputation is not all that strong, the public may accept the announced policy as its best guess, but attach considerable uncertainty to it. If the policymaker is even less credible, the public may expect policy outcomes that are significantly different from the announcement. In the latter two cases detrimental economic effects may occur; in a disinflation, a lack of policy credibility may undermine the public's willingness to moderate wage settlements. The question then arises as to how uncertainty can be reduced and credibility gained. One strategy could be to just stick to the announced policy and let uncertainty subside as time passes by. However, it might be preferable to speed up this process by addressing the source of uncertainty more directly.

In the theoretical model of Vickers (1986), which is particularly relevant in the present context, the public is uncertain whether the monetary policymaker is a "dry" (with a low tolerance for inflation) or a "wet" (with a high tolerance for inflation). The uncertainty arises from the wet's incentive to pose initially as a dry, raising the scope for an output-boosting inflationary shock sometime in the future. If in those circumstances the cost of initially generating a recession in order to gain credibility were smaller than the output cost of a long-drawn lack of credibility, it would be profitable for a dry government to initially act dryer than a wet government would be prepared to do,

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1/ Such a regime shift might of course affect the quality of the instruments (the degree of correlation with the endogenous variable) while leaving their validity intact. Some allowance for this possibility was made by allowing shifts of coefficients both in the estimated equations (7)-(8) and in the corresponding auxiliary regressions in 1979, as Ireland joined the EMS.

thus revealing its identity and dissolving the uncertainty.

Hence, in order to be able to reap the benefits of the ERM the Irish authorities may have tried to first build up a certain level of credibility by adopting a tough stance on the exchange rate and tolerating an initial loss of competitiveness. Only once that level had been reached would the model of Giavazzi and Pagano (1988) become relevant; in that model (as discussed in Section II) there is no need for competitive losses (other than temporarily between realignments) once credibility has been established.

This scenario appears to fit the data rather well: Chart 2 shows that the nominal effective exchange rate of the Irish pound relative to the other ERM currencies was kept constant during the first four years of the system, even though inflation was much higher in Ireland than elsewhere. This produced a steady pattern of real effective appreciation relative to the rest of the ERM, totalling almost 30 percent (Chart 4). However, the policy was ineffective initially due to the sharp appreciation of sterling: during 1979 and 1980 Ireland's exchange rate constraint in fact became less binding (see Section IV). But in the course of 1981 and 1982 the Irish pound appreciated by about 15 percent in real effective terms relative to sixteen industrial competitor countries (including the ERM); this sharp loss of competitiveness was followed by several years of real exchange rate stability. 1/

Have these exchange rate developments helped to inform the public of the disinflation policy, and to reduce the uncertainty that may have surrounded it at the outset? Some light may be shed on this issue by re-estimating the model for inflation expectations (7) by recursive IV, starting with a minimal number of observations needed for estimating the post-1979 coefficients. 2/ The resulting time patterns of estimated coefficients and standard errors pertinent to the credibility effect are

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1/ The real effective appreciation of 1985-86 reflected the decline of the U.S. dollar rather than a deliberate Irish exchange rate policy. This loss of competitiveness was recouped entirely in subsequent years, helped by the 8 percent devaluation of the Irish pound within the ERM in August 1986. In October 1988, the real effective exchange rate based on consumer prices had fallen below the peak reached in the first quarter of 1983; developments of competitiveness based on labor costs were much more advantageous [IMF, International Financial Statistics, and Mayer (1989)].

2/ There are four independent post-1979 coefficients and one overidentifying instrumental variable; starting the estimation with a sample up to 1980:4 thus leaves three degrees of freedom to begin with. For this exercise the full-sample coefficient estimate was imposed on the dummy for 1981:4.

shown in Charts 5 and 6. 1/ Three features are noteworthy. First, there is no evidence of significant parameter instability (at no point do the estimates of either of the two coefficients move out of any of the previous 95 percent confidence intervals). Second, already before the real effective appreciation of the Irish pound the estimated coefficient on expected ERM inflation was significantly larger than that for the pre-ERM period (Chart 5), suggesting that the government's intention to disinflate was perceived relatively early on. However, the width of the 95 percent confidence interval suggests that considerable uncertainty initially surrounded the new policy; the subsequent real appreciation in 1981-82 coincided with a reduction of this uncertainty. Third, by the end of 1980, after two years of experience in the ERM, the estimated coefficient on lagged competitiveness was still virtually identical to zero; moreover, at that time the associated 95 percent confidence interval was still very large (Chart 6). But in the course of 1981-82, as Ireland incurred a sharp loss of competitiveness, the estimated coefficient on this variable became negative and the uncertainty surrounding it fell rapidly until, by the middle of 1982, it had become significantly different from zero. 2/ Only a moderate further reduction of uncertainty appears to have occurred since 1982. Hence, the process of gaining credibility seems to have taken place in various stages throughout the period 1979-82; both the entry into the ERM in 1979 and the competitive loss incurred in 1981-82 seem to have served an important purpose as signalling device.

VI. Conclusions

This paper presents evidence that Ireland's disinflation policy has derived credibility from its participation in the exchange rate mechanism of the EMS. Before 1979, Irish inflation expectations followed mainly the expected movements of prices in the United Kingdom, and the influence of changes in international price competitiveness on expected inflation was minor. In contrast, upon entry into the ERM those expectations soon reflected the expected price behavior of partners in the ERM, and competitiveness became an important determinant of expected inflation in Ireland. The process of gaining credibility seems to have taken place in various stages throughout the period 1979-82, rather than several years after the start of the ERM as argued by Giavazzi and Giovannini (1988); both the entry into the ERM and the competitive loss incurred in 1981-82 seem to have played an important role.

In a broader perspective, the Irish disinflation formed part of a

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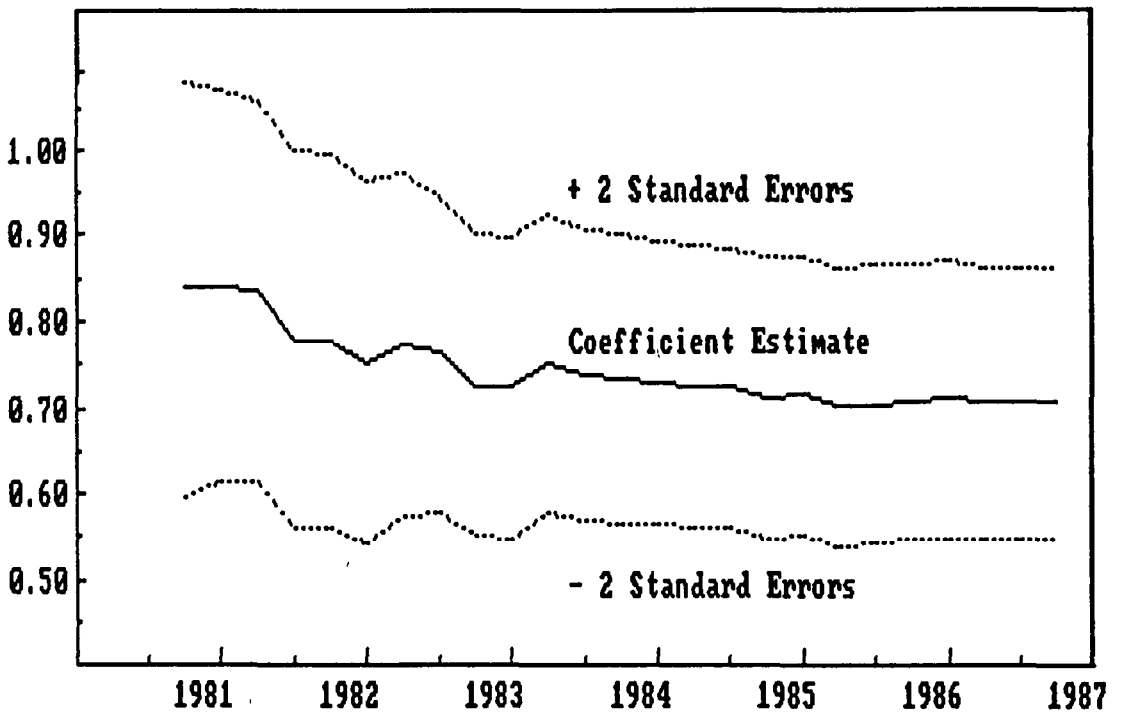
1/ A Bayesian counterpart to this classical approach is applied by Baxter (1985) to the credibility of exchange rate policy in Chile and Argentina during the 1970s.

2/ Dornbusch (1988b) notes that, in addition to foregoing at two ERM realignments the opportunity to devalue the Irish pound, the government in 1982 also took steps to begin the process of fiscal adjustment.

Chart 5

IRELAND

Recursive Estimation of the Coefficient on Expected ERM Inflation 1/



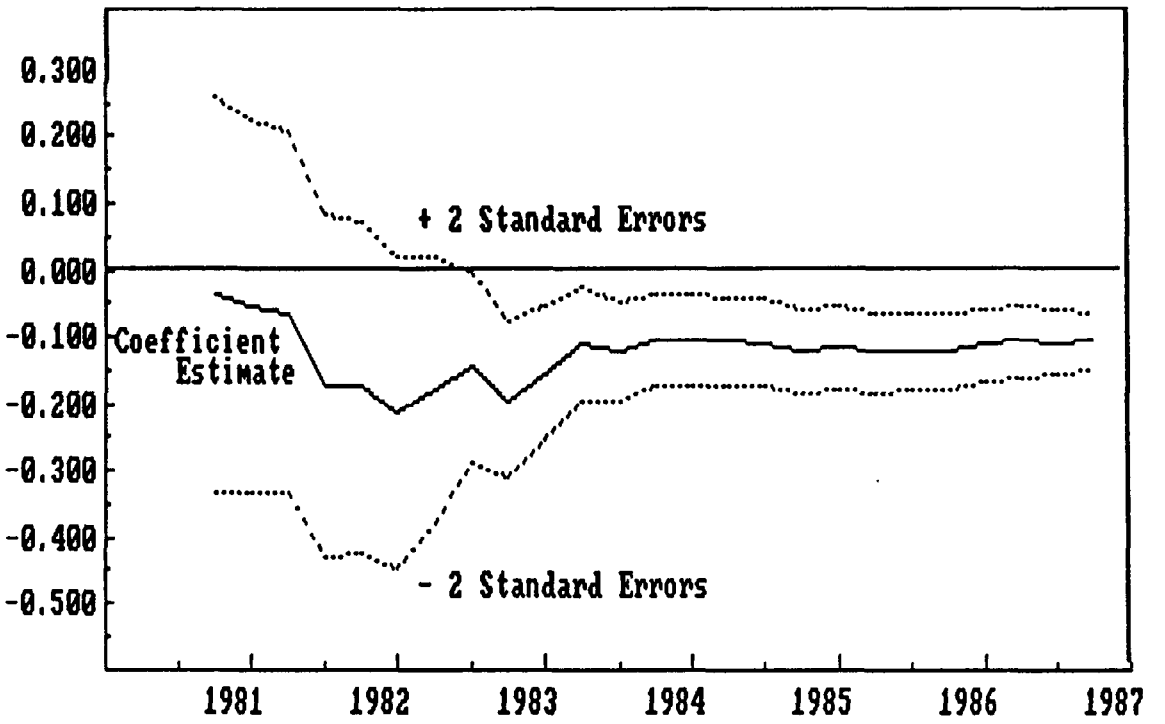
Source: Equation (7).

1/ This chart depicts the sequence of estimates of the coefficient on expected ERM inflation, obtained by estimating equation (7) by recursive IV successively extending the sample by a single observation from 1965:1-1980:4 to 1965:1-1986:4.

Chart 6

IRELAND

Recursive Estimation of the Coefficient on Lagged Competitiveness 1/



Source: Equation (7).

1/ This chart depicts the sequence of estimates of the coefficient on lagged competitiveness, obtained by estimating equation (7) by recursive IV successively extending the sample by a single observation from 1965:1-1980:4 to 1965:1-1986:4.

stabilization policy that also included a program of fiscal consolidation, limiting the room for using demand management to alleviate the output cost of gaining credibility for the disinflation. The fiscal contraction under a fixed exchange rate would ideally have been accompanied by moderation in wages, so that the expenditure reduction brought about by fiscal consolidation could have been matched by expenditure switching (toward exports and import substitution) brought about by a gain in competitiveness. Dornbusch (1988b) considers the Irish stabilization in this broader sense a failure, for two principal reasons. First, he notes that the labor market did not deliver the competitive gain necessary to induce expenditure switching. Second, at times monetary policy needed to be tightened in order to counteract private capital outflows reflecting slippages in the process of fiscal consolidation. As a result of these developments, employment in manufacturing fell at an average annual rate of about 2 percent during the period from 1979 to 1987, and unemployment rose from 8 percent of the labor force in 1978 to over 18 percent in 1987 while at the same time emigration accelerated. The need to maintain short-term interest rates at a high level aggravated the fiscal difficulties and further inhibited economic growth; the ratio of government debt to GNP doubled from about 75 percent in 1978 to about 150 percent in 1987. 1/

The findings of this paper give rise to two footnotes to this assessment. First, given the history of Ireland's inflation performance it is not surprising that perfect credibility for the disinflation was not forthcoming immediately upon entry into the ERM. This does not imply, however, that participation in the ERM failed to help reduce the output cost of disinflation. Without the ERM, the performance of the Irish economy during the disinflation might have been even worse. The evidence of this paper indicates that the ERM did help to influence inflation expectations downward, which is consistent with the decline in long-term interest rates noted by Dornbusch. The question remains whether this in turn helped to moderate wage settlements; while more detailed research is required, the breakdown of the vector autoregression for Irish wage inflation reported by Giavazzi and Giovannini (1988) suggests that the wage formation process did indeed change after the inception of the ERM.

Second, Dornbusch argues that the Irish stabilization should have begun with a major real depreciation in order to offset the fiscal consolidation. It must be noted, however, that the Irish pound entered the EMS at a relatively favorable central rate [van Ypersele (1985, p. 89)], and that during the first two years of the system it depreciated by almost 15 percent in nominal effective terms (Chart 2). It was precisely the lack of policy credibility that apparently doomed to failure the strenuous attempts during 1979 at implementing an incomes

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1/ This also reflected the fall in government revenue from money seigniorage that resulted from the successful disinflation.

policy [Walsh (1983, p. 173)]; 1/ thus the nominal depreciation was reflected almost entirely in higher inflation and hence in a more arduous disinflation.

Perhaps, therefore, some loss of competitiveness at the beginning of the disinflation was inevitable, in which case the question remains why it turned out to take so long to recoup the initial loss of competitiveness. 2/ The Irish economy seems to have turned around only very recently: since 1987 interest rates have come down, private capital outflows have stopped, fiscal adjustment has firmed, exports and investment have picked up, wages have moderated, and the decline in employment has come to a halt [Bacon (1988), ESRI (1988), and McAleese (1989)]. Further research could therefore examine more closely the influence of slippages in fiscal policy on the credibility of disinflation, and identify the factors determining how credibility, once established, can be translated rapidly into lower wage inflation.

1/ Persson and van Wijnbergen (1988) find, at a theoretical level, that wage controls may help to establish credibility for a disinflation program, but only if accompanied by recessionary monetary policy. They assume that wage controls carry microeconomic costs, but they do not consider the case, apparently more relevant in the Irish context, where the incentive for the social partners to accept wage controls is related to the credibility of the disinflation.

2/ Suggestive empirical support for the proposition that the ERM has allowed inflation-prone participants to recoup temporary competitive losses can be found in Mayer (1989).

APPENDIX I

Data Sources

Data sources are given below (all in natural logarithms). All data are available from the author.

p^{IR}: Consumer price index for Ireland: International Financial Statistics (IFS), line 64. There was a break in the data in 1976:1 (see the Irish Statistical Bulletin of March 1976 for details).

p^{UK}: Consumer price index for the U.K.: IFS, line 64.

p^{ERM}: Consumer price level for ERM countries excluding Ireland: Weighted average of consumer price indices taken from IFS, line 64; the weights are described in the text.

p^{W}: World consumer price level: IFS, line 64 x, Industrial Countries (code 110).

p^{OIL}: World oil price level: Based on the export unit values of oil exporting countries (see IMF World Economic Outlook, October 1987, Chart 6).

iuv^{IR}: Unit value of Irish imports: IFS, line 75.

iuv^{UK}: Unit value of U.K. imports: IFS, line 75.

reer: Real effective exchange rate relative to sixteen industrial countries: Based on consumer price indices from IFS, line 64; exchange rates from IFS, line rh; the weights reflect bilateral trade and competition in third markets [source: IFS and McGuirk (1987)]. All the nominal and real effective rates shown in Charts 2 and 4 are based on the same data and weights.

w: Hourly earnings in Irish manufacturing: For 1965:1-1979:4, weekly earnings (IFS, line 65ey) adjusted for weekly hours from OECD, Main Economic Indicators. For 1980:1-1986:4, same data but after removal of the so-called "modern" manufacturing sectors (Chemicals, Office Machines, Instrument Engineering); for the underlying data, see the Irish Statistical Bulletin; for the rationale behind removing these sectors, see National Economic and Social Council, A Strategy for Development, 1986-1990, Dublin, 1986, pp. 14-15, and pp. 113-118.

Test Statistics

This Appendix contains brief descriptions of the reported diagnostic tests, with degrees of freedom in brackets. Further background on these tests can be found in Hendry (1989). In the text, each reported statistic is followed (in brackets) by its 5 percent critical value.

Autocorrelation

$AR(n)_i^j$ = Lagrange Multiplier test for residual autocorrelation from lags i to j (j-i+1=n), χ^2-form. Computed by regressing the residuals on all the regressors of the original model and the lagged residuals for lags i to j, and testing the joint significance of the latter [Godfrey (1978)].

Normality Residuals

NORM(2) = χ^2-test. Based on the estimated skewness and kurtosis of the residuals compared to their counterparts for the normal distribution [Jarque and Bera (1980)].

Heteroscedasticity

HET(.,.) = Lagrange Multiplier test for heteroscedasticity associated with squares of the explanatory variables. Computed by regressing the squared residuals on the original regressors and all their squares and testing their joint significance [White (1980)].

ARCH(n,.) = Lagrange Multiplier test for n-th order AutoRegressive Conditional Heteroscedasticity, F-form. Computed by regressing the squared residuals on the lagged squared residuals up to lag n and testing their joint significance [Engle (1982)].

Validity Instruments

INSTR(n) = χ^2-test of whether the n overidentifying instruments are independent of the equation error; also interpretable as a test of whether the structural model (1) correctly encompasses the general reduced form (π_t on z_{1t-1} and z_{3t-1}; notation of Section III) [Sargan (1964)].

Parameter Constancy

$FOR(n)_i^j$ = χ^2-test of whether the model parameters remain constant in the forecast period (from period i to period j, with j-i+1=n). Computed by comparing within-sample and post-sample residual variances [Hendry (1989)].

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