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# Devaluation and Competitiveness in a Small Open Economy: Ireland 1987-1993

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## Abstract

This paper studies market expectations of a devaluation of the Irish pound from 1987 to 1993 and relates them to the evolution of Ireland's competitiveness over the same period. Changes in expectations of the currency's devaluation can be explained largely by developments outside Ireland, particularly by past and anticipated movements of sterling. The evolution of Ireland's real exchange rate over the same period is also found to be strongly linked to sterling's fluctuations, even after adjusting for sterling-insensitive trade between Ireland and the United Kingdom, and despite the significant progress toward trade diversification recorded by Ireland during the 1980s. The devaluation of the Irish pound in January 1993 is estimated to exceed investors' realignment expectations at that time as well as the loss of Irish competitiveness since the beginning of the ERM crisis in the summer of 1992. This "excess devaluation" helps explain subsequent large capital inflows and the Irish pound's smooth transition to the wide ERM band in August 1993.

JEL Classification Numbers:

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# I. Introduction

Beginning in 1987, a concerted social effort was undertaken in Ireland aimed at stabilizing monetary and fiscal aggregates, reducing inflation and public debt, increasing competitiveness, and, ultimately, leading to a more stable, growth-oriented economic environment. In pursuit of these objectives, the ERM link to core European currencies was seen as central: only by explicitly committing to maintaining the value of the Irish pound within the ERM narrow band was the Irish government successful in securing the consensus on wage moderation, fiscal restraint, and price stability on which the Programme for National Recovery of 1988-90 and its successor, the Programme for Social and Economic Progress of 1991-93, were based.

In the event, several external developments contributed to the success of Ireland's stabilization effort from 1987 to 1992. On the real side, economic growth in Ireland's main trading partners proceeded--at least until 1990--at a relatively fast pace, thus stimulating exports and encouraging emigration. On the monetary side, seemingly-unchallenged progress towards EMU and entry of sterling into the ERM provided the necessary external conditions for exchange rate and price stability. In this bright outlook, the clearest sign of success of Ireland's stabilization strategy was the steady decline of Irish-German interest differentials, which fell from about 10 percent after the devaluation of January 1987 to less than 1/2 percent in May 1992. On the other hand, elements of domestic uncertainty were apparent. After declining for about half a decade, unemployment had resumed its upward trend in 1991 and its further anticipated increase undermined the sustainability of interest rate policies aimed at fending off potential speculation against the Irish pound, especially in light of the removal of residual capital controls due by end-1992. Similarly, public debt--despite having declined significantly from its peaks of the mid-1980s--remained one of the highest among industrial countries as a share of GDP.

In this light, the timing and nature of the ERM crisis of 1992-1993 seem to have provided a clear test of Ireland's commitment to exchange rate and price stability. Weakening expectations of European growth overlapped with the turbulence of EC currency markets between the Danish and French votes on EMU in the summer of 1992 and led to widespread speculative pressure on European currencies and to withdrawal of sterling and lira from the ERM. To many observers, sterling's exit from the ERM and its sharp depreciation thereafter appear to have played a crucial role in leading to the devaluation of the Irish pound in January 1993. An alternative view would downplay the role of the United Kingdom in Irish trade and emphasize instead how speculation in the EMS crisis of 1992-93 had moved in self-fulfilling steps with little regard to competitiveness or other "fundamental" considerations. Yet, another view would downplay the role of external factors in the Irish pound crisis altogether: pointing at the differences between the Irish pound and other European currencies that were able to withstand or completely avoid speculation, many observers have

emphasized the role of domestic factors such as unemployment, public debt, and Ireland's uncertain political commitment to its ERM parity.

The analysis of this paper aims at shedding some light on these alternative interpretations. As a first step, a recent technique suggested by Bertola and Svensson (1991) and Rose and Svensson (1992) is used to estimate market-based measures of expected devaluation of the Irish pound and of its main ERM partners from January 1987 to July 1993. The cross-country comovements of the resulting series are then examined, jointly with the evolution of Ireland's competitiveness over the same period, and anticipated devaluations of the Irish pound are interpreted in light of their forward- and backward-looking links to Irish competitiveness.

The paper's main findings can be summarized as follows. The variability of the expected devaluation series of the Irish pound over the period considered can be largely explained by developments external to Ireland, particularly by recorded and anticipated changes of the sterling/Deutsche mark exchange rate. This finding is close in spirit--but rather different in perspective--from those of Walsh (1993) and Honahan and Conroy (1993), who have studied the links between Irish pound and sterling without distinguishing between transitory and permanent components of exchange rate dynamics, and focused only on past--rather than anticipated--exchange rate changes. The behavior of Ireland's real exchange rate over the same period also reveals a close relationship between the estimated series of Ireland's competitiveness and sterling fluctuations, even after adjusting the competitiveness weights for Ireland's exchange rate-insensitive trade with the United Kingdom and the rest of the EC. More generally, the analysis reveals a close link between the estimated series of expected rates of devaluation and recorded and anticipated dynamics of Ireland's real exchange rate. These relationships are consistent with a broadly "fundamental" behavior of speculators in the Irish pound market, as well as with Ireland's nature of a small open economy with sluggish price adjustment. Finally, the paper's analysis is useful in explaining developments in Irish capital markets after the devaluation of January 1993: investors' expectations of an Irish pound realignment at the beginning of 1993 are estimated to be roughly of the same magnitude as Ireland's loss of effective competitiveness since the beginning of the ERM crisis, but smaller than the actual devaluation of January 30, 1993. This "excess" devaluation, combined with the subsequent strengthening of sterling, helps explain the rapid reflow of capital in the period following the devaluation, the sharp fall of interest differentials, and the smooth transition of the Irish pound to the wide-ERM band in August 1993.

## II. Market-Based Estimates of Expected Devaluations

A simple technique to extract market-based estimates of expected devaluation rates for currencies moving within an exchange rate band has been suggested by Bertola and Svensson (1991) and implemented empirically in a number of recent papers, including Rose and Svensson (1991), Svensson

(1993), Caramazza (1993) and Thomas (1993). In these studies, rational investors are assumed to form expectations about future changes of the exchange rate. Specifically, anticipated changes of a currency regulated within a target zone are thought as coming from anticipated movements of the exchange rate inside its band, and from expected shifts of the band itself. Thus, under the assumption of uncovered interest rate parity, an estimate of investors' expectations of ERM realignments can be obtained by subtracting from the interest rate differential an estimate of the expected depreciation of the given currency within its fluctuation band. 1/

Formally, let $x_{it}$ denote the (log) exchange rate of currency $i$ with respect to the reference currency (the Deutsche mark, in the present case), measured as the domestic price of a unit of foreign currency. Also, let $c_{it}$ denote the midpoint of the bilateral band of fluctuation between currency $i$ and the reference currency, and let $r_{it}^{\Delta t}$ and $r_{Nt}^{\Delta t}$ denote the $i$-th country's and reference country's interest rates on deposits maturing at time $t+\Delta t$. The exchange rate $x_{it}$ can be written as:

$$\begin{aligned} x_{it} &\equiv [x_{it} - c_{it}] + c_{it} \\ &\equiv \tilde{x}_{it} + c_{it} \ , \end{aligned} \tag{1}$$

where $\tilde{x}_{it} \equiv x_{it} - c_{it}$ denotes the position of the exchange rate in the band with central parity $c_{it}$.

Taking first differences of equation (1), and taking expectations as of information available at time $t$, gives

$$E_t[\Delta x_{i,\,t+\Delta t}] = E_t[\Delta \tilde{x}_{i,\,t+\Delta t}] + E_t[\Delta c_{i,\,t+\Delta t}] \ . \tag{2}$$

If uncovered interest parity (UIP) holds, 2/ then the interest rate

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1/ While the Bertola-Svensson technique has been suggested in the context of a model of an exchange rate band, the same technique is applicable to a variety of seldom-moving targets, including crawling exchange rate bands (such as those implemented in Israel, Mexico and Chile) and gold standard intervention rules.

2/ Data from free-floating exchange rates traditionally provides evidence against UIP (see, for instance, the surveys by Hodrick (1987) and Boughton (1988)). Svensson (1992), however, has shown that risk premia for currencies regulated within a relatively small target zone are likely to be small: even for extreme parameter values and for currencies subject to realignment risk, the premium should be not greater than 1/5 of the whole interest differential. Thus, apparent interest parity failures for ERM currencies are more likely to reflect a special type of 'peso problem',

differential with country $N$ (the reference country) measures the expected change of the exchange rate:

$$[r_{it}^{\Delta t} - r_{Nt}^{\Delta t}]\Delta t = E_t[\Delta x_{i,t+\Delta t}] \ . \tag{3}$$

Using (2), yields:

$$E_t[\Delta c_{i,t+\Delta t}] = [r_{it}^{\Delta t} - r_{Nt}^{\Delta t}]\Delta t - E_t[\Delta \tilde{x}_{i,t+\Delta t}] \ . \tag{4}$$

Given an estimate of $E_t[\Delta \tilde{x}_{i,t+\Delta t}]$, equation (4) can be used to obtain market-based estimates of the expected realignment $E_t[\Delta c_{i,t+\Delta t}]$ from interest differentials. 1/ To estimate $E_t[\Delta \tilde{x}_{i,t+\Delta t}]$, this paper follows Rose and Svensson (1991) and Svensson (1993) in considering a linear regression of the form:

$$\Delta \tilde{x}_{i,t+\Delta t} = \beta_{i0} + \beta_{i1} z_{it} + \epsilon_{it} \ , \tag{5}$$

where $z_{it}$ is a set of variables that may explain anticipated changes of the position of the exchange rate in the band, $\Delta \tilde{x}_{i,t+\Delta t}$.

While previous literature has been concerned mainly with estimating equations such as (5) for individual currencies, this paper's focus on the correlation of expected devaluation between the Irish pound and its ERM partner currencies suggests to estimate simultaneously one such equation for each currency in the sample. To this end, it is convenient to use a generalization of Zellner's Seemingly Unrelated Regressions method which also allows for serially-correlated and heteroskedastic errors, a common feature of empirical work that uses data with overlapping observations. Details on the estimation are provided in the next section.

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i.e., investors' expectation of large realignments which may or may not occur in any given sample. The technique described in the text is aimed exactly at measuring investors' expectations of these infrequent events.

1/ More precisely, $E_t[\Delta c_{i,t+\Delta t}]$ gives an estimate of the expected *size* of the realignment multiplied by its *probability rate*. Further restrictions on the behavior of the exchange rate at the time of a realignment would be necessary to disentangle these two components. For the present analysis, as in much of the related literature, only the product of the two matters.

## III. Data and Estimation of Expected Realignments

The sample extends from January 12, 1987 to July 30, 1993. Daily spot exchange rates against the dollar of the Irish pound, Deutsche mark, British pound, French franc, Danish krona, Italian lira, Dutch guilder, and Belgian franc, as well as three-month and Euro-market interest rates for the same currencies, were obtained from the Bank of England and from DRI. Daily observations were sampled at the London market closing time, except for Irish domestic interest rates and Euro-interest rates on sterling, which were sampled at the Dublin close and Paris close, respectively. Cross-currency rates were obtained by taking the mid-point of the bid-ask spread of the corresponding rates against the dollar.

Before analyzing devaluation expectations along the lines described above, it is useful to address the conjecture that the announced (and then implemented) removal of residual exchange controls in Ireland on January 1, 1993, may have played an independent role in spurring expectations of capital outflows and, in turn, of Irish pound devaluation. To this end, the top panel of Figure 1 plots the differential between offshore and onshore three-month interest rates from July 1987 to July 1993. As is apparent from the figure, the potential return from borrowing Irish pounds on the domestic market and investing them on the Euromarket was almost always negative since the beginning of 1990, after transaction costs are accounted for. 1/ The only important exceptions to this pattern occurred in the period from September 1992 to mid-December 1992, when the Central Bank of Ireland tightened existing restrictions on short-selling of Irish pounds *after* the EMS crisis erupted in September. Overall, the behavior of the offshore-onshore interest differential provides evidence that residual exchange controls in Ireland have been essentially non-binding since (at least) mid-1990. Accordingly, it seems very unlikely that their anticipated removal by end-1992 may have independently spurred expectations of capital outflows and, in turn, of exchange rate devaluation.

Notwithstanding the evidence of very close integration of onshore and offshore Irish pound markets during the sample, the use of Euro-market data is advisable to ensure the greatest possible homogeneity and comparability of data across currencies, particularly with respect to sampling time, location, and taxation of interest earnings (which is practically nil on Euro-markets). In using Euro-market data, the risk of sampling data from thin markets was minimized by using data from the three-month market, which is typically the most liquid Euro-market for currency deposits. Nonetheless, one may suspect that even the three-month Euro-Irish pound market may be insufficiently liquid to eliminate monopoly profits in a market dominated by a few large dealers, so that Euro-Irish pound data may

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1/ Most of the transaction costs faced by investors borrowing on the domestic market and lending on the Euro-market can be captured by defining the interest differential as the difference between the offshore bid rate and the onshore ask rate.

be inadequate to provide information on investors' expectations of exchange rate changes. One way to assess whether market thinness may be a drawback for the analysis is to compare bid-ask spreads on offshore rates with the corresponding spreads on onshore rates. The bottom panel of Figure 1 shows that there was very little difference between the quoted spreads on 3-month rates during the sample considered: the daily differences are both very small and about zero on average (again, with the only exception of the September-December 1992 period). Taken in isolation, spreads in the Euro-market for Irish pound deposits averaged about 10-15 basis point over the sample (excluding the September 1992-January 1993 period), a very typical value for this type of contract. There seems to be, overall, little reason to worry about the use of Euro-market data for the purpose of the present analysis.

Following the previous discussion, seven equations such as (5) were estimated for the Irish pound/DM exchange rate and for the other six cross-currency rates included in the sample, using the Two-Step-Two-Stage Least Squares (2S2SLS) method of Cumby, Huizinga and Obstfeld (1983). By selecting the instruments in each equation to be the same as the right-hand side variables, the 2S2SLS estimates reduce to Zellner's Seemingly Unrelated Regressions estimates. Simultaneous estimation by 2S2SLS, however, allows consistent estimation of the standard errors under heteroskedasticity, autocorrelation 1/ and cross-equation correlation of the regression errors. High correlation among regression errors for different currencies' equations is bound to arise given the high degree of integration of European currency markets.

Because sterling and lira did not participate in the ERM during a significant part of the sample, initially a five-equation system including all other currencies over the whole January 1987-July 1993 sample was estimated. The parameters for the lira model were then estimated over the sample January 1987-September 1992 by including in the sample the five "core" currencies and the lira itself. Finally, the parameters for the sterling model were estimated over the October 1990-September 1992 sample by including all seven currencies in the system.

The choice of the variables to be included in $z_{it}$ to describe central banks' intervention policy is essentially an empirical issue. As in all of the related literature, a simple regression including as independent

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1/ Since the regressors in equation (5) are defined over overlapping intervals of 65 observations, the regression errors follow a moving average process of order 65 even if the underlying errors are i.i.d., and therefore exhibit high serial correlation of the residuals. The 2S2SLS estimator corrects for serial correlation and heteroskedasticity by weighing sample covariances at different lags as described in Newey-West (1987). Note that consistent estimation of the standard error of the estimates is necessary to guide selection of the final regression, but is irrelevant for the analysis that follows.

variables a constant term, a regime-shift dummy and the position of the exchange rate in the band produced the most satisfactory estimates. 1/ Additional variables tested in equation (5) included quadratic and cubic terms of $x_{1t}$ and various lags of interest differentials (with respect to Germany). None of these variables proved statistically significant. 2/ To account for institutional changes that may have occurred during the sample, a small set of constant shift dummies was allowed for. One of these variables identified the period of sterling's participation in the ERM and proved statistically significant in the Irish pound and French franc equations. A variable identifying the period when the lira was in the ERM proved significant in the Dutch guilder's equation. A variable identifying the period during which the onshore Belgian market was subject to a dual exchange system proved statistically significant in the Belgian franc equation. Finally, dummies identifying the periods following the Irish pound's realignment of January 1993 and the lira's shift to the narrow ERM band in January 1990 were allowed in these two currencies' equations, but proved insignificant after allowing for the other regime changes described above. 3/

The results of the estimation are reported in Table 1. To interpret the estimated equations, note that a negative estimate of the coefficient of the exchange rate position in the band $\hat{x}_{1,t}$ implies that appreciation inside the band should be expected for a weak currency and a depreciation for a strong currency. Thus, all exchange rates considered in this estimation display evidence of a tendency to revert toward the center of the band during the sample.

Subtracting the estimated series of the rates of depreciation within the band from the interest differential (see equation (4)), yields estimates of time-varying series of expected devaluation for the seven currencies, which are discussed in the next section.

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1/ The simple statistical model described above is not designed to describe jumps of the exchange rate position in the band that may occur at the time of a realignment. Therefore, the estimated devaluation series is inclusive of changes of the exchange rate inside the band at the moment of a realignment. See Svensson (1993) for a detailed discussion of this point.

2/ Classical statistical analysis is appropriate for hypothesis testing: the position of the exchange rate in its ERM band is defined over a finite interval, and hence cannot contain a unit root, while interest differentials among industrial countries are well known to be stationary (for Ireland, see Honahan and Conroy (1993)).

3/ The shift dummies may capture other effects than the institutional changes they are designed for. The significance of the lira dummy in the Dutch guilder model, for instance, is more likely to capture the regime shift induced by the ERM crisis in September 1992 than the effects of the withdrawal of the lira from the system.

Table 1. Estimation of Expected Depreciation in the Band 1/

| Country | Ireland | France | Italy | Netherlands | Belgium | Denmark | United Kingdom |
|---|---|---|---|---|---|---|---|
| Constant | .0007 | .0044 | .0105 | -.0021 | -.0015 | .0044 | .0142 |
| | (.0010) | (.0015) | (.0026) | (.0006) | (.0004) | (.0013) | (.0055) |
| $\tilde{x}_{i,t}$ | -.667 | -.552 | -.785 | -.589 | -.756 | -.518 | -.877 |
| | (.184) | (.120) | (.142) | (.249) | (.126) | (.106) | (.180) |
| $dum_{i,t}$ | .0036 | .0025 | -.0090 | .0019 | .0140 | .0023 | -- |
| | (.0017) | (.0017) | (.0034) | (.0008) | (.0028) | (.0018) | |
| $R^2$ | .38 | .35 | .31 | .36 | .24 | .30 | .35 |
| Std.Err.Reg. | .005 | .006 | .011 | .001 | .005 | .006 | .016 |
| N | 1594 | 1594 | 1368 | 1594 | 1594 | 1594 | 429 |

1/ Table Notes: The dependent variable is the change of the (log) position of the exchange rate in the bilateral band with the Deutsche mark over the next three-months, $\Delta\tilde{x}_{i,t+65}$. The independent variables are $\tilde{x}_{i,t}$, the (log) position of the exchange in the band, a constant, and a country-specific dummy (see the text for a description). N is the number of observations. Estimation is by Two-Step-Two-Stage Least Squares with Newey-West-corrected standard errors (reported in parenthesis). The sample periods are as follows: for Ireland, France, the Netherlands, Denmark, and Belgium-Luxembourg, from January 12, 1987, to July 30, 1993; for the United Kingdom: from October 8, 1990, to September 15, 1992; for Italy: from January 12, 1987, to September 12, 1992. The three months preceding the end of the sample, the ERM withdrawal of Italy and the ERM United Kingdom were used to generate $\Delta\tilde{x}_{i,t+65}$ but were excluded from the samples for all countries, for Italy and the United Kingdom, respectively.

## IV. Analysis of Evidence on the Expected Devaluation of the Irish Pound

The estimated series of expected devaluation of the Irish pound is plotted in the top panel of Figure 2. For reference, the bottom panel of the same figure plots the sterling/Deutsche mark exchange rate, while the expected devaluation series for the other ERM currencies are plotted in Figure 3. All the series display a sensible pattern, their peaks and troughs corresponding to well known periods of exchange rate uncertainty and calm, respectively. All the series except those for the Dutch guilder and the Belgian franc display sharp spikes in proximity to the currency crisis of the fall of 1992 and then again, for several series, in proximity to the crisis of the summer of 1993. The series describing the expected rate of devaluation of the Irish pound, in particular, reaches its highest peaks in November, December and then again in January. The series eventually settles at lower values after the 10 percent devaluation of January 30, 1993. 1/

Although the estimated series of expected rates of devaluation display considerable noise, a marked positive correlation among most series is apparent. The cross-currency correlation is confirmed in Table 2, which reports simple and partial correlation coefficients among the estimated series of expected devaluation on the Irish pound with the estimated series for the other currencies from October 1990 to September 1992--the period during which sterling participated in the ERM--and over the whole sample (thus excluding lira and sterling). Confirming the visual evidence provided by Figures 2 and 3, the estimated series of expected realignments for Ireland is highly correlated with the corresponding sterling series and, to a lesser degree, with the French franc, krona, and lira series. The correlation with the stronger ERM currencies, the guilder and the Belgian franc, is weaker. Overall, analysis of the comovements among the estimated series of expected devaluation reveals that a large fraction of the total variance of Irish devaluation risk may be explained by anticipated movements in other ERM currencies. In particular, the partial correlation coefficients between the estimated series reported in Table 2 indicate that correlation with sterling contributes to explaining 12 percent of the total variance of the Irish expected devaluation even after taking into account the correlation with all other currencies in the sample.

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1/ Note that the level of the estimated expected devaluation series is defined with respect to the specific (three-month) term of the contract, and measures expected devaluation by multiplying a *probability* of devaluation by the expected *size* of the devaluation. Illustratively, during the period October 1992-January 1993, investors were expecting a 4-6 percent devaluation of the Irish pound over the next three-months, which may be interpreted as a sure devaluation of 4-6 percent, or as a 50 percent probability attached to a realignment of 8-12 percent and a 50 percent probability attached to no realignment at all, etc.

Table 2. Correlation of Expected Devaluation of the Irish Pound with Expected Devaluation of Other ERM Currencies

| | UK in ERM | | Full Sample | |
|---|---|---|---|---|
| | Simple Correlation | Partial Correlation | Simple Correlation | Partial Correlation |
| British pound | .68 | .12 | -- | -- |
| French franc | .49 | .06 | .43 | .01 |
| Belgian franc | .47 | .02 | .36 | .01 |
| Dutch guilder | .41 | .01 | .24 | .01 |
| Italian lira | .51 | .01 | -- | -- |
| Danish krona | .39 | .04 | .43 | .02 |
| Expl. Variance | .62 | -- | .42 | -- |

Two reasons underlie the predominant role of sterling in explaining the variability of Irish pound devaluation risk. The first reason is purely statistical: during the period considered, sterling was more volatile around its central ERM parity than the other ERM currencies. 1/ The second reason, further discussed in the next section, is the larger weight of sterling in Irish trade. Anticipating a realignment of sterling in response to its weakness, investors will also anticipate a significant loss of Irish competitiveness. This, in turn, raises expectations of a devaluation of the Irish pound. This interaction can be expected to hold, more generally, in an imperfect-substitute world with sluggish price adjustment, where the real exchange rate (measured with respect to a common currency) of countries producing similar output, or trading in more integrated good and factor markets, will tend to be more correlated. If prices adjust sluggishly, the same correlation should be expected among *nominal* exchange rates. The specific link between sterling and Irish pound is explored in greater detail in the next section.

## V. Competitiveness Indicators for Ireland and Developments Since 1987

### 1. Country weights

The weighing scheme developed in McGuirk (1987) for the 17 most industrialized countries, including Ireland, provides a useful starting point for analysis of Ireland's competitiveness. That scheme forms the basis of the IMF's Information Notice System of competitiveness indicators. In McGuirk's study, weights reflecting relative competitiveness of Ireland with its trading partners are derived from a disaggregated system of demand equations encompassing trade relations at home, in each competitor's domestic market, and in third-country markets. 2/ In that system, a country with little direct trade with Ireland may receive a large competitiveness weight if its export to third-country markets is in direct competition with that of Ireland. In contrast, a country with large export to Ireland may receive a relatively small competitiveness weight if that export includes few goods produced by Irish firms.

Since McGuirk's study adopted a detailed 3-digit SITC analysis, and as data availability and cross-country comparability are a major concern, only trade and price data for manufacturing goods are used. However, to the extent that manufacturing goods represent the bulk of international trade among industrialized countries, and to the extent that price movements in

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1/ Recall that sterling was fluctuating in a wide 6 percent band during its participation in the ERM.

2/ The theoretical model underlying the analysis of McGuirk (1987) is the imperfect substitute model of Armington (1969), where the demand for each country's output is obtained by a two-step maximization with a CES utility function.

other sectors are highly correlated with those in manufacturing, weights constructed from manufacturing data can be usefully combined with more accurate and timely deflators, such as the CPI. For the purpose of the present study, and subject to the caveats outlined below, the main drawback of McGuirk's study lies less in its reliance on manufacturing data than in its use of data from 1980. Since Ireland's trade structure has changed substantially during the early 1980s (though much less since the mid-1980s), some adjustment to McGuirk's weights must be made.

Because the competitiveness weights are estimated simultaneously for all countries, considerable data and modelling requirements place a complete update of McGuirk's weights beyond the scope of this study. However, a reasonable correction of Ireland's competitiveness weights can be obtained by adjusting McGuirk's weights linearly with updated trade shares, an adjustment that effectively assumes the income-compensated substitutability of Ireland's output with its competitors' output to have remained the same as in 1980. Specifically, let $w_i^{80}$ denote McGuirk's competitiveness weight of country $i$'s export to Ireland, let $s_i^{80}$ denote the share of country $i$'s export to Ireland in 1980, and let $s_i^{91}$ denote the same share in 1991. Because the direct effect of a change in trade shares on the competitiveness weights is linear (see McGuirk (1987), Appendix I), the new weights can be approximated by $w_i^{91}=w_i^{80}s_i^{91}/s_i^{80}$ (all weights are then renormalized to sum to unity). The new competitiveness weights in the domestic market of Ireland's competitors and in third-country markets are approximated in the same way. The three vectors of weights measuring competitiveness in import, bilateral export and third-country exports are then aggregated into a *total competitiveness* vector, using McGuirk's estimates of the relative importance of these three components in Ireland, namely, 0.294, 0.410, and 0.296. 1/ The original weights estimated by McGuirk (1987) and the adjusted competitiveness weights are reported in columns (1) and (2) in Table 3. It is apparent that the main effect of the update is to reduce the weight of the United Kingdom in Irish trade, and correspondingly increase the weights of most EC countries, the U.S. and Japan. Notwithstanding its significant reduction, the weight of the United Kingdom in Irish trade remains by far the largest.

In addition to the standard aggregation problems discussed above, assessment of Ireland's competitiveness is complicated by the special nature of much of its trade, which is priced in currencies different from those of their destination (or source) countries. While the currency denomination of trade may be irrelevant per se, it becomes significant if the speed of

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1/ These weights mainly reflect the overall degree of openness of the economy, which has remained virtually the same in Ireland (at 115 percent) when measured by the share of exports plus imports over GDP. To the extent that Ireland's exports have grown slightly more than its imports, the approximation in the text may tend to slightly overestimate the current importance of domestic competition with respect to competition in export markets.

Table 3. Ireland. Total Competitiveness Weights 1/

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| United Kingdom | 38.5 | 28.2 | 27.4 | 24.9 |
| Austria | 0.9 | 1.0 | 1.1 | 1.1 |
| Belgium | 3.2 | 2.9 | 2.9 | 3.0 |
| Denmark | 1.1 | 1.2 | 1.2 | 1.2 |
| Finland | 0.6 | 0.6 | 0.6 | 0.5 |
| France | 7.5 | 7.3 | 7.1 | 7.4 |
| Germany | 15.3 | 17.1 | 17.1 | 17.7 |
| Italy | 5.1 | 5.8 | 5.9 | 6.1 |
| Netherlands | 3.6 | 3.8 | 3.7 | 3.8 |
| Norway | 0.6 | 1.1 | 1.1 | 1.2 |
| Spain | 1.3 | 1.9 | 1.9 | 2.0 |
| Sweden | 1.7 | 1.8 | 1.8 | 1.9 |
| Switzerland | 1.7 | 2.3 | 2.4 | 2.5 |
| United States | 13.4 | 17.0 | 17.6 | 18.2 |
| Canada | 1.6 | 1.2 | 1.2 | 1.4 |
| Japan | 3.9 | 6.8 | 7.0 | 7.1 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 |

1/ Table Notes. The weights are defined as follows:
(1) McGuirk (1987)'s total competitiveness weights; 1980 data;
(2) adjusted McGuirk's weights with Direction of Trade data for 1991;
(3) baseline weights: adjusted McGuirk's weights minus CAP trade;
(4) baseline weights minus SITC-5,-75,-76,-77 export to the U.K.

adjustment of prices to exchange rate changes differs by currency. As discussed in a recent Central Bank of Ireland study (McGuire (1993)), in particular, two aspects of Irish trade deserve special attention. First, a significant proportion of Ireland's agricultural trade with EC countries is conducted at fixed ECU prices under the Common Agricultural Policy (CAP) of the EC and, accordingly, should be removed from the computation of competitiveness shares. This is because agricultural goods traded under the CAP are essentially sold into a single EC market at a minimum price fixed in ECUs at the beginning of each year. The ECU price is converted into national currencies at fixed exchange rates ("green rates"), and any shortfall of market prices with respect to the intervention prices are met by EC purchase of the commodity and storage into "intervention stock." Whereas in the past the "green" rates were kept fixed even for relatively long periods, they are now being adjusted much more frequently, and in effect kept fairly close to market exchange rates. This mechanism effectively assures almost immediate erosion of devaluation gains.

According to McGuire (1993), Ireland's exports to the United Kingdom falling under CAP rules can be estimated at 3.6 percent of all exports (to all destinations), or at 40.0 percent of Ireland's agricultural exports to the United Kingdom. Assuming the proportion of Ireland's CAP trade in agricultural exports and imports with the other EC countries to be the same, a set of weights reflecting the incidence of CAP trade on Ireland's competitiveness can be obtained by subtracting 40 percent of Ireland's SITC-1 trade with each EC country. The resulting vector of total competitiveness weights, which represents the baseline for the subsequent analysis of real exchange rate developments, is reported in column (3) of Table 3.

Next, we may consider correcting Ireland's competitiveness weights to account for Irish manufacturing exports to the United Kingdom that is carried out at dollar prices by multinational corporations (see McGuire (1993) for a discussion). The prices of these exports are typically set at world market levels and respond very little to fluctuations of the sterling/Irish pound exchange rate, given the limited extent of British competition in the industries where much of Irish manufacturing export is concentrated (mainly chemicals, office equipment and electronics). 1/

While the concerns expressed in McGuire (1993) on the use of aggregate trade data for assessment of industry-level competitiveness are generally correct, this problem was--at least in principle--already addressed by the

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1/ The British Central Statistical Office estimates overall import penetration in the United Kingdom in 1989 at 95 percent in office machinery and data processing, 52 percent in electrical and electronic engineering and 60 percent in instrument engineering. In the chemical sector, British domestic producers tend to be concentrated in the industrial chemical sector, rather than in pharmaceuticals, where much of Ireland's chemical production is concentrated. See McGuire (1993) for a discussion.

sub-industry-level analysis of McGuirk (1987). Accordingly, the estimated competitiveness weights presented above should be regarded as possibly attaching excessive importance to the United Kingdom only to the extent that the update of McGuirk's weights involved only aggregate trade shares $s_i^{80}$ and $s_i^{91}$. However, even if we follow McGuire (1993) and adjust Ireland's total competitiveness weights by removing sectors SITC-5 (chemicals) and SITC-75,-76,-77 (office, telecommunications, and other electrical equipment) from Ireland's exports to the United Kingdom, the resulting total competitiveness weights (see column (4) in Table 3) do not differ by much from those computed above. We shall regard this adjusted vector as providing a lower bound to the vulnerability of Ireland to sterling competition.

2. Developments in the real exchange rate

Standardized 1/ monthly real effective exchange rates (REER), constructed by averaging Ireland's and its partners' consumer price indices (CPIs), 2/ are plotted in the top panel of Figure 4 from February 1987 (the first month after the ERM realignment of January 12, 1987) to July 1993. 3/. The top panel of Figure 4 displays two series: one is based on the competitiveness weights reported in column (3) in Table 3 (which are corrected for CAP trade), the other is based on the weights reported in column (4) in the same table (which are corrected also for sterling-insensitive manufacturing exports to the United Kingdom). The two series move very closely together, displaying some visible divergence only during periods of relative sterling turbulence. Accordingly, the rest of the discussion will be based on the weights reported in column (3) in Table 3.

Several features are apparent from Figure 4. First, although the behavior of Ireland's competitiveness from February 1987 to May 1992 was erratic, the overall gain of competitiveness over that period was only 3 percent. The bottom panel of Figure 4, which reports the baseline REER series together with the estimated expected devaluation rates (ignore for the moment the series of partner currencies' expected rate of devaluation), also reveals a remarkable similarity between these two series, while the

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1/ Both series have been normalized by measuring their level as a percentage deviation from the mean level in the period.

2/ Besides the greater timeliness and accuracy of CPIs with respect to other deflators, manufacturing-based deflators (such as common unit labor cost deflators) tend to be particularly unreliable in Ireland. The shift of the Irish manufacturing basis toward more capital intensive high-technology production implies that the large decline of unit labor costs in Ireland since the early 1980s reflects more a compositional effect, rather than the relative decline of unit labor costs of a constant basket of goods.

3/ CPI data is from the International Financial Statistics of the IMF. When unavailable (as in the case of Ireland), monthly series were obtained as weighted moving averages from the published quarterly series.

role of sterling in the evolution of Irish competitiveness and Irish pound devaluation series is easy to spot by comparing the top panel of Figure 4 with the bottom panel of Figure 2. More generally, Figure 4 suggests strong concordance between the behavior of speculators in the Euro-Irish pound market and recorded changes of Ireland's competitiveness.

Examination of the events during the EMS crisis of 1992-93 highlights the link between anticipated devaluation of the Irish pound and developments in Irish competitiveness, and the crucial role played by sterling. As shown in Figure 4, Ireland's effective competitiveness worsened by about 6 percent from June to October 1992. This was largely the effect of sterling's slide within its wide ERM band from June to September and of its sharp depreciation after its withdrawal from the ERM: over the period July-October 1992 alone, sterling depreciated by about 20 percent, thus leading to a loss of Irish competitiveness of more than 5 percent. Ireland's real effective exchange rate was then broadly stable until mid-January, when a 5 1/2 percent decline of sterling was triggered by a further cut of the key Minimum Lending Rate in Great Britain. On January 30, following another attack on the Irish pound, the Central Bank of Ireland devalued the Irish pound/ECU central parity by 10 percent. In the three months preceding the devaluation, the estimated series of expected devaluation hovered around 4-6 percent (on three-month contracts, not annualized), while the loss of Irish competitiveness with respect to the pre-crisis period (end-May 1992) was 5-5 1/2 percent. As it turned out, the effect of the realignment was to devalue the Irish pound by about 7 1/2 percent, as a result of the 10 percent change of the central parity and a revaluation inside the new band of about 2 1/2 percent. Thus, the devaluation of the Irish pound in January 1993 appears to have exceeded both investors' expectations at that time, and the loss of competitiveness accumulated since the beginning of the crisis in June 1992. 1/

The analysis of subsequent events reinforces this interpretation. While the Irish pound stabilized around the middle of its new band, sterling began to recover some of the losses recorded since the summer of 1992. Thus, the same link with sterling that had worked against the Irish pound in the fall of 1992, was now working in its favor, in combination with the under-valuation effects induced by the realignment of January 1993. The anticipated appreciation of the Irish pound manifested itself on a wide front: large reflows of private capital, record accumulation of official reserves, and a rapid decline of interest rate differentials, to the point that the Irish pound-DM short term differential became negative in May of 1993. In fact, as speculative pressure mounted in the ERM in July 1993, the real exchange rate of the Irish pound was 4 percent lower than its post-

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1/ June 1992 represents a natural benchmark to date the beginning of the Irish pound crisis. That month marks the reversal of the flow of Irish official reserves, the upturn of interest rate differentials, the beginning of sterling's slide within its ERM band and the consequent beginning of the appreciation of Ireland's real exchange rate.

devaluation level. In the event, the Irish pound joined the Deutsche mark and the Dutch guilder at the top of the ERM grid, and recorded a smooth, speculation-free transition to the wide ERM band in August.

3. Forward- and backward-looking components of anticipated devaluations

The previous sections have highlighted the strong correlation between estimates of market-based expectations of Irish pound devaluations and corresponding estimates of the pound's partner currencies, as well as the correlation between expectations of Irish pound devaluations and accumulated losses of competitiveness. This informal evidence can be made more precise by considering an empirical model of the form:

$$E_t[\Delta x_{0,t+\Delta t} - \Delta p_{0,t+\Delta t}] = \beta_0 + \beta_1 E_t \sum_{i=1}^{N-1} \gamma_i [\Delta x_{i,t+\Delta t} - \Delta p_{i,t+\Delta t}] + \beta_2 \ln(REER_t) \quad . \qquad (6)$$

In equation (6), $\gamma_i$ is the competitiveness weight of currency $i$ in Irish trade ($i$=0 for Ireland) and $p_i$ is the (log) price level in country $i$. Thus, $\sum_{i=1}^{N-1} \gamma_i [\Delta x_{i,t+\Delta t} - \Delta p_{i,t+\Delta t}]$ is an index of effective real devaluation of the Irish pound's partner currencies (with respect to the $N$-th currency). The *real effective exchange rate* (REER) is defined as in the previous section. Thus, equation (6) captures forward and backward-looking Purchasing Power Parity (PPP) links, by relating expected devaluations of the Irish pound to anticipated devaluations of its partner currencies as well as to accumulated losses of competitiveness (measured by the current level of the REER).

While a comprehensive examination of the long-run properties of Ireland's real exchange rate remains beyond the scope of this paper, equation (6) is suitable to test the main predictions of a simple PPP model of commodity arbitrage, in the form of a test of the hypothesis that the coefficients $\beta_1$ and $\beta_2$ are positive. Indeed, equation (6) is consistent with recent research studying the cointegrating properties of real exchange rates in a number of industrial countries, 1/ insofar it can be rewritten as a (one-period-ahead) error correction equation of the form:

$$E_t[\Delta x_{0,t+\Delta t} - \Delta p_{0,t+\Delta t}] = \beta_1 E_t \sum_{i=1}^{N-1} \gamma_i [\Delta x_{i,t+\Delta t} - \Delta p_{i,t+\Delta t}]$$

$$+ \beta_2 \left[ (p_{0,t} - p_{N,t} - x_{0,t}) - \sum_{i=1}^{N-1} \gamma_i (p_{i,t} - p_{N,t} - x_{i,t}) - \kappa \right] , \qquad (7)$$

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1/ Several recent papers have provided strong evidence in favor of a long-run tendency of most exchange rates to revert to Purchasing Power Parity (PPP), based on cointegration methods and long series of historical data. See Taylor (1993) for a survey of the literature.

where $\kappa \equiv -\beta_2/\beta_1$ and $\ln(\text{REER}) \equiv \sum_{i=1}^{N} \gamma_i [x_{i,t} - x_{0,t} + p_{0,t} - p_{i,t}]$. 1/ Thus, a positive estimated value of $\beta_2$ would support the notion that (real) anticipated devaluations are driven by a long-run tendency of real exchange rates to revert to PPP in equations (6) and (7). A positive estimated coefficient $\beta_1$ would capture the short run competitive impact of a devaluation of Ireland's partner currencies.

In constructing the REER term, data from Ireland's sixteen main trading partners was aggregated using the set of weights (3) from Table 3. The weights $\gamma$ were also set to the same vector of weights to form the composite 'foreign' expected rate of devaluation term, $E_t \sum_{i=1}^{N-1} \gamma_i [\Delta x_{i,t+\Delta t} - \Delta p_{i,t+\Delta t}]$. To compute this term, the expected rates of devaluations estimated in Section III were used for the six ERM currencies (and for the Irish pound on the left-hand side of (6)). Expected devaluation of the free-floating U.S. dollar and yen were obtained as the unfiltered series implied by the respective series of three-month interest differential with Germany. 2/ Similarly, expected devaluation rates for lira and sterling when these two currencies were not participating in the ERM were obtained directly from the corresponding interest differentials.

Table 5 reports regression results of several variants of model (6), all of which exhibit the same qualitative results. The estimated slope coefficients display the predicted positive sign at relatively high levels of significance, even after adjusting the estimated standard errors to correct for the serial correlation induced by the use of overlapping observations. The regressions also show that much of the variance of the expected rate of devaluation of the Irish pound can be explained by the simple PPP-based model described in equation (6).

Several specification checks were considered. First, it seemed useful to verify the robustness of the model's qualitative results to the specification of inflation expectations. One would not expect the estimates to be very sensitive to this specification: with sluggish price adjustment, anticipated real devaluations over three months should reflect mainly anticipated changes of nominal exchange rates, much less anticipated changes of inflation. Table 5, which reports three different specifications of the inflation forecast method, confirms this conjecture. Model (1) in Table 5 estimates future inflation using the AR(3) process presented in Table 4.

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1/ Note that all exchange rates in (6) and (7) are defined in terms of currency $N$ (the Deutsche mark), so that $(x_{0,t} - x_{i,t})$ represents the (log) exchange rate of the Irish pound with currency $i$.

2/ More than 90 percent of Ireland's trade is accounted for by including in the sample the six ERM currencies studied in Section III, the dollar and the yen (in addition to the reference Deutsche mark).

Table 4. Domestic and (Weighted) Foreign Inflation 1/

| Model | Ireland | Composite Foreign |
|---|---|---|
| Constant | .0014<br>(.0005) | .0007<br>(.0002) |
| $\beta_1$ | 1.485<br>(.085) | 1.636<br>(.058) |
| $\beta_2$ | -.844<br>(.112) | -.788<br>(.075) |
| $\beta_3$ | .169<br>(.072) | .050<br>(.052) |
| $R^2$ | .84 | .94 |
| Std. Err. Reg. | .001 | .001 |
| N | 79 | 79 |

1/ Notes: The dependent variables are the 3-month rate of inflation in Ireland and in its main trading partners, the latter being aggregated with the set of weights (3) from Table 3. The independent variables are three lags of inflation (further lags were insignificant) and a constant. N is the number of observations. Estimation is by Ordinary Least Squares with Newey-West-corrected standard errors (reported in parenthesis). The sample includes monthly data from October 1986 to July 1993. When unavailable, monthly observations were obtained as weighted moving averages from the published quarterly data from the International Finance Statistics.

Table 5. Ireland: Real Exchange Rate and Expected Devaluation 1/

| Model | (1) | (1) | (2) | (2) | (3) | (3) | (1) (IV) | (1) (IV) |
|---|---|---|---|---|---|---|---|---|
| Constant | .0027 | .0020 | .0037 | .0022 | .0072 | .0029 | .0020 | .0024 |
| | (.0018) | (.0017) | (.0019) | (.0015) | (.0033) | (.0012) | (.0018) | (.0018) |
| $\beta_1$ | .515 | .793 | .869 | .848 | .184 | .926 | .333 | .977 |
| | (.396) | (.290) | (.227) | (.217) | (.622) | (.342) | (.390) | (.297) |
| $\beta_2$ | .180 | .080 | .181 | .105 | .199 | .100 | .192 | .058 |
| | (.072) | (.033) | (.052) | (.030) | (.067) | (.035) | (.073) | (.036) |
| DUM | -- | .025 | -- | .024 | -- | .024 | -- | .026 |
| | | (.002) | | (.002) | | (.002) | | (.006) |
| $R^2$ | .38 | .73 | .46 | .77 | .37 | .72 | .37 | .64 |
| Std. Err. Reg. | .008 | .005 | .008 | .005 | .008 | .005 | .008 | .006 |
| N | 78 | 78 | 78 | 78 | 78 | 78 | 77 | 77 |

1/ Table Notes: The sample includes monthly data from February 1987 to July 1993. The dependent variable is the real expected devaluation of the Irish pound/DM bilateral parity over the next three months, $E_t[\Delta c_{0,t+3} - \Delta p_{0,t+3}]$. The independent variables are the composite devaluation rate (measured as described in the text), Ireland's real effective exchange rate index, a shift dummy for the October 1992-January 1993 period, and a constant term. Model (1) estimates expected inflation by the AR(3) model presented in Table 4; model (2) uses actual inflation; model (3) assumes constant inflation differentials, so that the model reduces to one with nominal expected devaluations. *N is the number of observations.* Estimation is by Ordinary Least Squares, except as noted. The lagged composite expected devaluation rate was used as an instrument for the corresponding contemporaneous term in the IV estimation. Newey-West-corrected standard errors are reported in parenthesis.

Model (2) assumes perfect inflation foresight and thus uses *actual* inflation. At the opposite extreme, model (3) assumes expectations of constant inflation differentials, thus specifying equation (6) as an error-correction form for *nominal* exchange rates. As shown in Table 5, the three models gave very similar results.

Next, a constant shift dummy was allowed for, to capture the large outliers recorded in the October 1992-January 1993 period. This procedure effectively recognizes the inability of the simple linear PPP model to capture much of the spikes estimated for the expected devaluation series during these four months. On the other hand, the correction highlights the large proportion of the variance captured by the model during the remaining part of the sample and the robustness of the statistical significance of the slope coefficients.

Finally, the term $E_t\sum_{i=1}^{N-1}\gamma_i[\Delta x_{i,t+\Delta t}-\Delta p_{i,t+\Delta t}]$ is a generated regressor, and it may--in principle--be subject to measurement errors. If this is the case, instrumental variable estimation is necessary to obtain consistent estimates of the coefficients. However, instrumental variable estimation of model (1)--using the lagged term $E_t\sum_{i=1}^{N-1}\gamma_i[\Delta x_{i,t+\Delta t}-\Delta p_{i,t+\Delta t}]$ as an instrument--gave very similar estimates as OLS estimation, thus suggesting that measurement errors should not be a reason of particular concern. 1/

In summary, the regression results reported in Table 5 indicate that market-based expectations of Irish pound devaluations display strong evidence of backward and forward-looking linkage to competitiveness: the coefficients attached to its short-run and long-run determinants are consistent with those predicted by a simple PPP-based model, and confirm the visual evidence provided by Figure 4. This finding is consistent with Ireland's nature of a small open economy, and its consequent high vulnerability to competitiveness losses. A large fraction of the in-sample variance of the estimated rate of expected devaluation from 1987 to 1993 can be explained by the PPP model considered here, although only about half of the large values recorded in the October 1992-January 1993 period can be captured within this simple model.

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1/ One reason why measurement errors may not be a problem in the present specification is that these errors are likely to largely wash out when forming the composite indicator of foreign expected devaluation. Note that measurement errors in the dependent variable do not affect consistency of the estimation, since they are absorbed in the regression error.

## VI. Concluding Remarks

This paper has provided empirical evidence on a simple notion: a small open economy with sluggish price adjustment--such as that of Ireland--is bound to face speculative pressure on its nominal exchange rate target whenever exchange rate movements in its main trading partners lead to cumulative and anticipated losses of its competitiveness. While this may not be a surprising conclusion, the link established in this paper between market-based estimates of expected devaluation and changes of Ireland's competitiveness points at two less obvious considerations. First, speculation in the Irish pound market from 1987 to 1993 was driven mainly by changes in Ireland's "fundamentals"--namely, the evolution of its real effective exchange rate. This finding is consistent with the predictions of imperfect substitute trade models and with recent empirical evidence in support of long-run PPP, but not so with the predictions of many models of self-fulfilling speculative attacks, 1/ and with often-heard statements arguing that foreign exchange speculation is typically unwarranted and destabilizing, as it is not generally based on economic fundamentals.

Second, external factors appear to have played an essential role in the evolution of speculative pressure on the Irish pound, while elements of domestic pressure, such as high unemployment and public debt, have probably been secondary. A comprehensive counterfactual analysis would require formulating a statistical model linking exchange rate developments to unemployment and debt service. The lack of a well specified theoretical model of this type, and the mixed results presented in this respect by related studies for other currencies (Caramazza (1993), Thomas (1993)), suggest that this exploration may be left beyond the scope of the present study. Nevertheless, it seems clear that domestic factors are bound to fare poorly in explaining speculative activity in the specific case of Ireland: Ireland's public debt has been on a downward trend since 1987 and unemployment has been increasing steadily since 1990; neither development can explain both the upswing in speculative pressure and interest differentials observed since June of 1992 and their downswing since February 1993.

With specific reference to the 1992-1993 currency crisis, the paper has highlighted how market-based expectations Irish pound devaluations have been highly correlated with corresponding expectations of sterling devaluations in the period preceding the crisis. Thus, notwithstanding Ireland's significant trade diversification since the mid-1970s, the Irish pound-sterling link remains strong. Finally, the actual depreciation of the Irish pound following the realignment of January 30, 1993, is estimated to have exceeded both investors' expectations and the loss of competitiveness recorded since the pre-crisis period. This "excess" devaluation, coupled with the following appreciation of sterling leading to further

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1/ See, for instance, Obstfeld (1986), Flood and Garber (1984), and the subsequent related literature.

competitiveness gains, seems to largely explain the prompt market acceptance of the new band. The restoration of exchange rate credibility helped Ireland avoid renewed speculative pressure, favored the rapid reflow of capital, the fall of interest differentials to below their pre-crisis level, and eventually a smooth, speculation-free, transition to the wide ERM band in August 1993.

## References

Armington, P.S., "A Theory of Demand for Products Distinguished by Place of Production," IMF Staff Papers No. 16, (1969) pp. 159-78.

Bertola, G., and L.E.O. Svensson, "Stochastic Devaluation Risk and the Empirical Fit of Target Zone Models," NBER Working Paper No. 3955, (1991), forthcoming in Review of Economic Studies.

Boughton, J.M., "The Monetary Approach to Exchange Rates: What Now Remains?" Princeton Studies in International Finance No. 171, (1988).

Caramazza, F., "French-German Interest Rate Differentials and Time-Varying Realignment Risk," International Monetary Fund, Staff Papers No. 40, (1993), pp. 567-583.

Central Statistical Office of the United Kingdom, Monthly Digest of Statistics, No. 568, (1993), April, London.

Central Statistical Office of Ireland, Trade Statistics, various issues, Dublin.

Cumby, R.E., J. Huizinga, and M. Obstfeld, "Two-Step Two-Stage Least Squares Estimation in Models with Rational Expectations," Journal of Econometrics No. 21, (1983), pp. 333-355.

Flood, R.P., and P. Garber, "Gold Monetization and Gold Discipline," Journal of Political Economy, No. 92, (1984), pp. 90-107.

Honohan, P., and C. Conroy, "Sterling Movements and Irish Pound Interest Rates," Economic and Social Research Institute, mimeo, (1993).

Hodrik, R.J., The Empirical Evidence on the Efficiency of Forward and Futures Foreign Exchange Markets, London, Harwood, (1987).

McGuire, M., "Irish Trade Exposure to Fluctuations in the Irish Pound/Sterling Exchange Rate," Economic Affairs Department, Central Bank of Ireland, mimeo, (1993).

McGuirk, A.K., "Measuring Price Competitiveness for Industrial Country Trade in Manufactures, IMF, Working Paper 87/34, (1987).

Newey, W.K., and K. West, "A Simple, Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix," Econometrica No. 55, (1987), pp. 703-708.

Obstfeld, M., "Rational and Self-fulfilling Balance of Payment Crises," American Economic Review No. 76, (1986), pp. 72-81.

Rose, A., and L.E.O. Svensson, "Expected and Predicted Realignments: The FF/DM Exchange Rate during the EMS," Board of Governors of the Federal Reserve, International Finance Discussion Papers, No. 395, (1991).

Svensson, L.E.O., "The Foreign Exchange Risk Premium in a Target Zone with Devaluation Risk," Journal of International Economics No. 33, (1992), pp. 21-40.

Svensson, L.E.O., "Assessing Target Zone Credibility: Mean Reversion and Devaluation Expectations in the EMS," European Economic Review, No. 37, (1993), pp. 763-802.

Thomas, A., "Expected Devaluation and Economic Fundamentals," IMF, mimeo, (1993).

Taylor, M.P., "Exchange Rate Behavior Under Alternative Exchange Rate Arrangements," paper presented at the Fiftieth Anniversary Conference of the Princeton Essays in International Finance, Princeton University, (1993)

Walsh, B., "Credibility, Interest Rates and the ERM: The Irish Experience, 1986-92," University College, Dublin, Department of Economics WP 93/1, (1993).

Wickham, P., "A Cautionary Note on the Use of Exchange Rate Indicators," IMF, Paper on Policy Analysis and Assessment 93/5, (1993).