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"Irish Exchange Rate Policy Under Wide ERM Bands"

by Rodney Thom

Working Paper WP95/15

November 1995

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1. Introduction.

In August 1993 participants in the Exchange Rate Mechanism agreed to replace the existing 2.25% and 6% fluctuation bands with a wider band which permits a maximum deviation of 15% on either side of the central rate in the European Monetary System. From an Irish perspective this decision presented the monetary authorities with options previously denied to them. Prior to August 1993, the Irish Pound (IRE) participated in the narrow 2.25% band which constrained the extent to which the Irish authorities could manipulate the value of the IRE against other ERM currencies, especially the deutsche Mark (DM), so as to offset variations in sterling exchange rates. For example, if sterling (£) were to depreciate by more than 2.25% against the DM, participation in the narrow band implied that the IRE had to appreciate against sterling with a consequent loss of competitiveness. On at least two notable occasions, August 1986 and January 1993, weakness of sterling against ERM currencies proved to be a decisive factor in forcing an IRE devaluation within the EMS.

The switch to a wider 15% band has subsequently given the Irish Central Bank a greater degree of flexibility in determining exchange rate policy. Further, this enhanced flexibility is symmetric in the sense that the wider bands give the Central Bank greater discretion on the direction in which they may wish to react to movements in sterling. To illustrate the symmetry, consider a situation in which sterling depreciates against the DM. Under the old narrow bands, commitment to ERM parities implied a maximum compensating IRE depreciation of 2.25%. If sterling depreciated further speculative pressures typically built up against the IRE, forcing a realignment as in 1986 and 1993. However, with the new fluctuation bands the Central Bank can, if it wishes, permit a maximum 15% depreciation within the ERM to compensate for sterling’s weakness. Alternatively, as wider fluctuation bands reduce the probability of a change in the market exchange rate after a realignment, and
hence the probability of speculative pressures, the Central Bank has greater discretion to permit an appreciation against sterling by maintaining a strong DM-peg. That is, with wide fluctuation bands there is an lower probability that the market exchange rate will have to 'jump' into the new bands following a realignment. Hence, if the IRE is permitted to appreciate against sterling the probability of an actual devaluation, and speculation on an IRE realignment to restore competitiveness, is reduced the wider the permitted fluctuation bands. Consequently when sterling depreciates against the DM, the wider fluctuation bands allow the Central Bank to either compensate for any loss of competitiveness by an accommodating depreciation within the ERM or, permit an appreciation against sterling by maintaining a strong DM-peg.

Figure 1 uses weekly data to illustrate the behaviour of the IRE/DM and IRE/E exchange rates over the period August 1993 to October 1995. While it is clear that the IRE has tracked movements in sterling, it is also notable that the Central Bank has permitted a prolonged appreciation against sterling following the latter's sharp depreciation in early 1995. This pattern is reflected by Figure 2 which charts movements in the IRE/E and IRE/DM exchange rates. As the difference between these two rates reflects sterling's depreciation against the DM it is clear that the Central Bank has neither fully accommodated weakness in sterling or followed a rigid DM-peg. Rather, policy appears to be based on a rule which attempts to balance a commitment to ERM parities against the desire to maintain a competitive position for the IRE.

In what follows I attempt to formalise this analysis by modelling the Central Bank's behaviour in an optimising framework. The following section presents a model of exchange rate policy in which the Central Bank is assumed to choose a value for the IRE/DM exchange

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1See De Grauwe (1994) p. 118.
rate which reconciles possibly conflicting objectives - commitment to ERM parities and maintaining a competitive position against sterling and the DM. The model yields a relation ship between the IRE/DM and £/DM exchange rates which can be estimated as a standard error correction model. The estimates suggest that, on average, the Central Bank accommodates a depreciation in sterling against the DM by permitting offsetting movements in the IRE/DM and IRE/£ exchange rates. Specifically, a 1% depreciation in sterling is accommodated by permitting a 0.5% depreciation against the DM and a corresponding 0.5% appreciation against sterling.

2. Modelling Exchange Rate Policy.

This section attempts to rationalise exchange rate policy by constructing a formal model to explain variations in the IRE/DM nominal exchange rate. The DM exchange rate is, of course, linked to the sterling exchange rate via the arbitrage condition:

\[ s_{s_4} - s_{s_2} = s_{s_1} \]  

(1)

Where \( s_{s_1} \) is the logarithm of the IRE/DM rate (DM’s per IRE), \( s_{s_2} \) is the logarithm of the IRE/£ rate (£’s per IRE) and \( s_{s_3} \) is the logarithm of the £/DM rate (DM’s per £). As the £/DM rate can be assumed exogenous to Irish policy decisions, (1) implies that the Irish Central Bank has one degree of freedom. That is, it can either target the DM rate or the sterling rate but not both. Given Ireland’s commitment to both the ERM and the Maastricht convergence criteria I will assume that exchange rate policy targets the DM rate. Hence, given the £/DM rate, the Central Bank can influence the IRE/£ rate only by manipulating the IRE/DM rate.

Exchange rate policy is modelled by assuming that the Central Bank chooses a value for the IRE/DM nominal exchange rate which reconciles the following objectives. First, to meet ERM commitments and to conform with the Maastricht convergence criteria the Bank wishes to minimise variations in the value of the IRE against the DM. Second, the Bank wishes to maintain a competitive position against the currencies which are most important for Irish trade - sterling and the DM. More formally, policy is modelled by determining the IRE/DM exchange rate so as to minimise the following one-period loss function.

\[ L_r = \frac{1}{2}(e_{s_4} - c)^2 + \frac{1}{2}\lambda(e_{s_1} - \bar{e})^2 + \theta(e_{s_1} - e_{s_1})(\bar{e}_{s_1} - e_{s_1}) \]  

(2)

Where, \( c \) is the IRE/DM central ERM rate, \( e_i \) is a measure of the competitive position against the DM and sterling and \( \bar{e} \) is the equilibrium or desired level of \( e \). The first two terms in (2) model the possibly conflicting objectives of maintaining the DM-peg and a desired level of competitiveness. As the loss function is normalised on the second term, the parameter \( \lambda \) measures the loss associated with a divergence from the desired competitive position relative to a divergence from the IRE/DM central rate. Hence, it indicates the relative importance of competitiveness in determining exchange rate policy. The third term implies that the loss is reduced if \( e_i \) is changing in the ‘right’ direction. For example, if, in period t-1, the IRE is over-valued, the loss will be attenuated if the currency is depreciating relative to the DM and sterling.²

For simplicity I assume that the ‘effective exchange rate’ \( e_i \) is a weighted average of the nominal exchange rates against the DM and sterling. That is:

\[ e_i = (1 - \alpha)e_{s_4} + \alpha e_{s_1} : 0 < \alpha < 1 \]  

(3)

²Including this type of term in the loss function has been suggested by Hendry and von Ungern-Sternberg (1981). However, Nickell (1985) expresses reservations.
Substituting from (1) and (3) into (2) gives:

\[ L_s = \frac{1}{2}(e_{s_{t-1}} - c)^2 + \frac{1}{2}(e_{s_{t-1}} - \sigma_{s_{t-1}} - \bar{e})^2 - \theta(e_{s_{t-1}} - \sigma_{s_{t-1}} - \bar{e}_{s_{t-1}})(\bar{e}_{s_{t-1}} - s_{t-1} - \bar{e}_{s_{t-1}}) \]  
\[ (4) \]

Minimising (4) with respect to \( s_{t-1} \) gives the following solution for the IRE/DM exchange rate.\(^3\)

\[ \Delta s_{t-1} = \beta_1 \Delta s_{t-1} + \beta_2 s_{t-1} + \beta_3 s_{t-2} + \beta_4 \Delta s_{t-2} + \epsilon_t \]
\[ (5) \]

or:

\[ \Delta s_{t-1} = \beta_1 \Delta s_{t-1} + \beta_2 (s_{t-1} - \mu s_{t-1}) + \beta_3 s_{t-2} + \epsilon_t; \quad \mu = \frac{\beta_1}{\beta_2} \]
\[ (6) \]

Where:

\[ \beta_1 = \frac{c + \vartheta + \lambda \bar{e}}{1 + \lambda}, \quad \beta_2 = \frac{-\theta(1 + \lambda)}{1 + \lambda}, \quad \beta_3 = \frac{\sigma + \lambda \vartheta + \lambda \mu}{1 + \lambda}, \quad \beta_4 = \frac{\sigma + \lambda \vartheta + \lambda \mu}{\theta + (1 + \lambda)} \]

Equation (6) is a standard error correction model which explains observed changes in the IRE/DM exchange rate in terms of prior differences from equilibrium, contemporaneous changes in the £/DM exchange rate and a random disturbance \( \epsilon_t \). The implied long-run equilibrium relationship between \( s_{t-1} \) and \( s_{t-1} \) is given by:

\[ s_{t-1} = \gamma + \mu s_{t-1}; \quad \gamma = \frac{\beta_1}{\beta_2} \]
\[ (8) \]

Further, the parameters of the loss function (2) can be retrieved from (5) as:

\[ \lambda = \frac{-\theta(1 + \beta_2)}{\beta_3 + \beta_4 \beta_2}; \quad \alpha = \frac{(1 + \lambda) \beta_4}{\lambda} \]

Note that both the short-run (\( \beta_4 \)) and equilibrium (\( \mu \)) responses to a depreciation of sterling against the DM are increasing functions of the loss function parameters \( \lambda \) and \( \alpha \). Hence the degree to which the Bank accommodates a depreciation of sterling against the DM increases with the relative importance of competitiveness in determining exchange rate policy and the weight given to sterling.

3. Estimation.

Statistical validity of the error correction model requires that all variables are either stationary or non-stationary but integrated of the same order and cointegrated. Table 1 gives Dickey-Fuller and Augmented Dickey-Fuller test statistics for the hypotheses that the IRE/DM and £/DM exchange rates are non-stationary and are not cointegrated. The sample data uses 115 weekly observations over 6 August 1993 to 13 October 1995. The first four columns suggest that the levels of each exchange rate are non-stationary but that the first differences are stationary. That is, the variables are integrated of order 1, or I(1). The final column uses residuals from a least squares regression of \( s_{t-1} \) on \( s_{t-1} \) to test the hypothesis of no cointegration. As this hypothesis is rejected at the 10% significance it appears valid to estimate the error correction model (5).\(^4\)

\(^3\)The IRE/DM central rate, \( c \), and the 'effective exchange rate', \( \bar{e} \), are assumed constant.

\(^4\)Lags in the ADF regressions were insignificant in all cases and residuals from DF (lags=0) regressions showed no evidence of serial correlation.
Table 1. Dickey-Fuller Tests For Non-Stationarity and Cointegration.

<table>
<thead>
<tr>
<th>Lags</th>
<th>$s_n$</th>
<th>$s_m$</th>
<th>$\Delta s_n$</th>
<th>$\Delta s_m$</th>
<th>$\hat{u}_t$</th>
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<tbody>
<tr>
<td>0</td>
<td>-1.594</td>
<td>-0.933</td>
<td>-12.354</td>
<td>-12.282</td>
<td>-3.063</td>
</tr>
<tr>
<td>1</td>
<td>-1.360</td>
<td>-0.607</td>
<td>-8.690</td>
<td>-8.976</td>
<td>-2.675</td>
</tr>
<tr>
<td>2</td>
<td>-1.177</td>
<td>-0.606</td>
<td>-5.920</td>
<td>-5.771</td>
<td>-3.253</td>
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Note: Lags are the number of lags in the Augmented Dickey-Fuller (ADF) test. $\hat{u}_t$ is the residual from the cointegrating regression. Critical values for DF and ADF (lags > 0) I(1) tests on $s_n$ and $s_m$ are -2.877 (5%) and -2.580 (10%). Critical values for DF and ADF (lags > 0) cointegration tests on $\hat{u}_t$ are -3.391 (5%) and -3.046 (10%).

Table 2. Estimates For Error Correction Model (5).

$$
\Delta s_t = 0.029 - 0.069 s_{t-1} + 0.035 s_{m-1} + 0.851 \Delta s_{m-1} 
$$

(2.612) (2.904) (2.566) (27.847)

Numbers in parenthesis are t-ratios.

$R^2 = 0.88$, $\chi^2_{LM}(1) = 3.298[0.069]$, $\chi^2_{LM}(2) = 3.715[0.156]$, $\chi^2_{LM}(3) = 5.647[0.227]$, $\chi^2_{ARCH}(1) = 3.854[1.446]$, $\chi^2_{ARCH}(2) = 0.017[0.897]$, $\chi^2_{ARCH}(3) = 0.587[4.447]$. Numbers in parenthesis are degrees of freedom. Marginal significance levels are given in square brackets.

The least squares estimate for (5) is given in Table 2. The $\chi^2 (j)$ are diagnostic statistics with marginal significance levels given in square brackets. LM is a lagrange multiplier test for serial correlation of order j, $\chi^2_{ARCH}$ is Engle's ARCH test and CHOW is a Chow-test for parameter stability. The long-run, or equilibrium, solution for the IRE/DM rate is:

$$
 s_t = 0.420 + 0.507 s_{m_t} 
$$

Hence, a 1% depreciation of sterling against the DM is accompanied by a contemporaneous 0.85% depreciation of the IR£ against the DM and a 0.15% appreciation against sterling. In the longer run, the Central Bank appears to accommodate a sterling depreciation by permitting offsetting adjustments in the IR£/DM and IR£/€ exchange rates. That is, a 1% depreciation of sterling against the DM is accommodated by permitting a 0.5% depreciation in the IR£/DM rate with an equal appreciation against sterling. Further, the implied estimates for $\lambda$ and $\alpha$ are 33.4 and 0.88 suggesting that deviations in competitiveness are considerably more important than the ERM commitment for exchange rate policy and that sterling has the greatest weight in determining the competitive position of the IR£.


The move to wide ERM bands in August 1993 has given the Irish Central Bank greater flexibility in determining exchange rate policy. Not only can the Bank permit larger depreciations against the DM but it can also permit an appreciation against sterling with a

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$2$ The Chow test breaks the sample at the first week of March 1995 when the IR£ and € depreciated against the DM by 3.31% and 4% respectively.
reduced probability of triggering speculative pressures against the IRE. The results presented in this paper suggest that the Central Bank has taken full advantage of this enhanced flexibility by pursuing a policy which places greatest emphasis on maintaining the competitive position of the IRE against sterling and the DM. This is, of course, in direct contrast to the policy which the Bank followed in the years preceding the ERM currency crisis of September 1992. During that period the Bank adopted a 'franc fort' strategy based on a rigid peg to the DM and total commitment to ERM parities. Unfortunately when sterling left the ERM in September 1992 and depreciated against the DM the 'franc fort' policy was shown to lack credibility and speculative pressures forced a devaluation of the IRE in January 1993. However, this policy option remains open to the Central Bank in that the move to wider ERM bands does not require that any currency must abandon a rigid link to the DM. Hence the evidence suggests a fundamental change in Irish exchange rate policy since the ERM crisis and the subsequent move to wider ERM bands.

References.

