THE ECONOMIC AND SOCIAL RESEARCH INSTITUTE

Excess Returns on Irish Pound Assets in the EMS

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March 1994

Working Paper No. 47

ESRI Banking Research Centre

November 1993

Abstract

This paper examines the relation between Irish and foreign short-term interest rates from the perspective of the expectations approach to understanding interest rate determination. In particular it addresses the question of whether Irish money market interest rates have been in some sense "too high" during the EMS period. This answer depends on whether the comparison is made with German or UK interest rates. Appealing to recent developments in the theory of international interest rate linkages, we argue that German rates are the more relevant comparator. It follows that Irish money market interest rates appear to have been "too high" on average.

EXCESS RETURNS ON IRISH POUND ASSETS IN THE EMS

1 *Introduction*

The role of expectations has taken centre stage in the analysis of interest rates, and more generally of the determination of asset prices. The demand for an interest-bearing asset will depend not only on the promised interest rate, but also on an assessment of the future price of that asset in comparison with alternatives. For short-term Irish interest rates, the obvious alternative assets against which comparison may be made are the short-term interest rates denominated in alternative currencies such as the Deutsche Mark or sterling. For long-term Irish securities, an obvious comparison is between the return (interest plus capital gain) on holding such securities for a short period with the interest on a short-term security maturing in the same period. Analysis of such asset return differentials or "excess returns" allows us to infer the links between foreign and domestic interest rates, and between short and long-term rates.

This paper presents a conceptual framework for exploring what the data on these excess returns can tell us about interest rate determination. Section 2 defines how excess returns are measured and presents summary statistics. Section 3 describes the benchmark expectations hypotheses regarding excess returns. Section 4 presents econometric results. Section 5 discusses the implications of transactions costs for interpreting the econometric findings. Section 6 presents some concluding remarks. Some of the matters discussed in the paper take up issues which have most recently been discussed in the Irish literature in papers by Leddin (1988, 89), Lucey (1989) and Nugent (1990).

2 *Measuring excess returns*

(a) The theory

The excess return on short-term Irish pound securities against foreign short-term securities may be measured by reference to another currency i using the formula:

$$\lambda_t^i = r_t - r_t^i - \frac{S_{t+1} - S_t}{S_t}, \qquad (1)$$

where S is the spot exchange rate (Irish pound cost of an unit of foreign exchange), r are interest rates.

(b) Summary statistics

Table 3 shows the mean value and other summary statistics of λ for the Irish pound against sterling, the Deutsche mark and the US dollar during the EMS period. The table indicates positive average excess returns over the whole period for each of the comparisons shown, with the holder of Irish short-term assets coming out ahead of those holding other currencies. On the other hand, the table also reveals the high volatility of these excess returns by comparison with the mean returns - the sterling figures indicate a coefficient of variation of about 2500 per cent. Accordingly none of the mean excess returns figures are significantly different from zero.

Figures 1-3 show quarterly excess returns for Irish pound securities against Sterling, DM and US$ securities respectively for the period 1971-92. Beginning with Sterling (figure 1), it is clear that excess returns become important only after the break in the sterling link (early 1979). This reflects the universal fact that short-term movements in excess returns are driven by exchange rate movements much more than by interest rate movements. The fact, already commented upon, that that volatility in excess returns is much more important than any trend, is clearly evident from this figure (as from the others). The maximum excess return was over 10 per cent in the second quarter of 1981, whereas the minimum was minus 11 per cent in the first quarter of 1983 - the quarter of the St. Patrick's day devaluation.

Turning to figure 2 and the excess returns against the DM, there is an unsurprising contrast in that excess return volatility pre-EMS appears much higher than later. Indeed the standard deviation in the EMS period is only 2.0 per cent per quarter - less than a half of what it was pre-EMS. Furthermore, in the EMS there was - before 1993 - only one really big outlier, minus 8 per cent in the third quarter of 1986 (the unexpected August devaluation). But the mean excess return in the EMS period was about 0.6 per cent per quarter.

Excess return volatility against the US dollar (figure 3) is somewhat higher in the EMS than it had been before: a standard deviation of over 6 per cent compared with 4 per cent before. The mean also jumps, from 0.2 per cent before to more than 0.6 per cent in the EMS.

The correlation between the excess returns on the different currencies depends only on developments in those currencies, and has nothing to do with Irish pound interest rates or the exchange rate of the Irish pound. Still it is interesting to note that the correlations are rather low: the highest in the EMS period being that between the dollar and sterling at less than 0.3.

The high volatility of excess returns tends to mask the cumulative trends in the quarterly plots. These trends are seen more clearly in figure 4, which plots the cumulative excess returns, measured as a percentage deviation from the start of the EMS. (Thus, for example the 85% for the DM at the beginning of the sample indicates that a holder of German marks from 1971 would have been 85% better off by the start of EMS than the holder of Irish pounds over that period). The main patterns evident from this figure are:

- the large negative excess returns vis-a-vis DM until late 1976, reflecting the low real sterling interest rates during this period and the rapid depreciation of sterling against the DM;

- a long period of generally positive, though modest, excess returns against the DM in the EMS period, significantly interrupted only by the mid-1986 devaluation, giving a cumulative excess return of over 40 per cent by 1992;

- a low frequency oscillation against sterling during the EMS, beginning with a sustained period of negative excess returns until late 1981, followed by mostly positive excess returns until mid-1986, with lesser cumulative fluctuations thereafter;

- the pronounced V-shape against the US dollar in the 1980s: reflecting the sustained strength of the dollar against most currencies in the first half of the decade, and its reversal thereafter.

Which of these phenomena need to be explained in terms of Irish developments? After all, we could focus on the sterling relationship and point out that, though volatile, excess returns averaged out at close to zero in the EMS. On the other hand, we could decide to focus on the DM relationship which is considerably less volatile, but shows a cumulative excess return at the rate of over 2.5 per cent per annum.

Thus we find that the Irish investor in DMs suffered a considerable loss relative to Irish pounds, but experienced relatively low volatility[1]; the Irish investor in sterling suffered little, but experienced high volatility. What appears to be happening is that the DM currency link implicit in the EMS ensured that Irish pound deposits would have to pay a small but steady premium above DM interest rates (adjusted for expected exchange rate change). In contrast, the volatility of the sterling rate meant that, even after adjusting for changes in expected exchange rate) there was no close link between Irish pound interest rates and those in the UK.

(c) Stationarity of excess returns

An important statistical characteristic of any time series is whether it is non-stationary or not. A stationary series has the characteristic that any disturbance to the series will eventually tend to be reversed. Furthermore, the variance of the difference between the value of a stationary series at two points in time will not tend to diverge as the time-gap increases. Non-stationary series have no tendency to revert to a mean value or trend. The validity of many econometric inference procedures depends on whether the relevant series are stationary or not.

Among the standard methods of assessing stationarity is the Dickey-Fuller test. Table 4 shows the values of this test in its normal and augmented forms for the raw interest rates and for the excess returns. Even adopting the rigorous 1 per cent significance level, we can reject the hypotheses that the excess returns are non-stationary. The evidence is not so conclusive for the raw interest rates: non-stationarity can be rejected at the 5 per cent level for the short rate, but the test statistics for the long rate does not quite reach the 5 per cent significance level. Still, because of the known low power of these tests, we should not jump to the conclusion that the long interest rate was non-stationary.

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[1]Almost all exchange risk in the EMS relates to realignment risk, very little to the risk arising from movements within the band (Cf. Svensson, 1992a).

The conclusion that excess returns are stationary is encouraging encourages us to explore more specific hypotheses about them.

3 *Benchmark hypotheses on excess returns*

(a) Expectations hypothesis

The international literature considers two main benchmark hypotheses concerning these excess returns. First, the *Fisher Open Parity* hypothesis states that the expected value of λ is zero, i.e. that there is no expected arbitrage profit to be made by borrowing in one currency and lending in another. This hypothesis is based on the idea that well-financed and risk-neutral speculators who agree on the prospects for exchange rates would seize any opportunity offered by nonzero expected λ and thereby drive interest rates and exchange rates back to the position where λ was zero. The second condition is the *Pure Expectations* hypothesis about long-term interest yields, and it states that the expected value of μ is zero. Essentially the same type of reasoning about expected future yields and well-financed risk-neutral speculators applies: because of their actions, they cannot expect any gain by borrowing at short-term to acquire long-term bonds.

Now while these benchmarks exist as a matter of theory, and they provide a starting point for the evaluation of interest rate movements, in practice many studies have shown that they are not strictly true[2]. While λ for most major currencies (vis-a-vis each other) has tended to be approximately zero on average, and not significantly autocorrelated, nevertheless, many recent studies have adduced evidence that λ is predictable - indeed that it is predictable simply by the raw interest differential uncorrected for expected exchange rate change. So far as the expectations theory is concerned, it has long been held that there is a tendency for long-term yields to be persistently higher than short-term yields, and that μ is on average positive. Furthermore, the yield gap can help to predict the excess yield μ.

Most explanations of the divergence from open parity and pure expectations are based on the idea that there are not sufficient risk-neutral speculators. Therefore, there is thought to be a risk-premium attached to interest rates. The variation over time of this risk premium could depend on varying degrees of uncertainty, i.e. variations in perceptions of the magnitude of the risk. Another explanation for such variations could be varying capacity of speculators to bear risk[3]. Finally, exogenous factors may influence the degree of risk being absorbed by speculators at any given level of μ or λ. Thus in particular, a current account balance of payments deficit may result in a higher expected value of λ emerging, as speculators will have to absorb more domestic assets to achieve the same expected value of λ. Official intervention in the domestic money market or the

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[2]A useful review of empirical research in this area is contained in MacDonald and Taylor (1992).

[3]For instance, exchange controls might limit the degree to which speculators are able to exercise their role.

foreign exchange market can have the same effect.

Related to this is a model where there are two classes of investors, seen as domestic and foreign respectively. The two classes of investors differ in both their wealth and in either their perception of risk[4], in the information and transactions costs which they face, or in their degree of risk aversion. With low levels of government borrowing, domestic investors will dominate in the market for domestic government securities, but with higher levels of government borrowing, the risk premium required for domestic borrowers will become so great that foreign borrowers will become interested[5].

(b) The risk premium theory
If excess returns are not unpredictable, the predictable component could be attributable to a changing risk premium ρ. Thus at time *t* against currency *j*:

$$\lambda_t^j = \rho_t^j + \varepsilon_t^j \tag{4}$$

where ε is the unpredicted disturbance term. The risk premium is known at time *t*, and if we model it as a linear projection on some known variables *X*:

$$\rho_t^j = X_t \alpha_j + u_t^j \tag{5}$$

we can substitute for the unobserved ρ to obtain:

$$\lambda_t^j = X_t \alpha_j + u_t^j + \varepsilon_t^j \tag{6}$$

The two disturbances are not separately identifiable, though in some circumstances, for example where we have monthly data on assets with a three-month maturity, a particular pattern of autocorrelations is expected for ε (a second order moving average in the case mentioned).

By including a suitable list of regressors *X*, the hypothesis of an unchanging risk premium can be tested by regressions of equation (6). We did so for Irish pound returns against the pound sterling and the DM. The results are shown in Table 1 and 2.

[4] In this case they cannot both have rational expectations.

[5] Something of this sort is implicit in FitzGerald, 1986.

4 *Testing international interest parity on the Irish data*

(a) Fitting an equation to the excess returns

Our strategy in implementing equation (6) was to include four categories of variables in an over-fitted regression, and then to test down. The four categories[6] are: seasonal dummies, raw interest differentials (equivalent to forward premia), other available quarterly variables in Ireland, and pre-realignment dummies. The regressions shown are generally over the whole narrow-band EMS period, or ending in mid-1992 before the final EMS crisis began. Apart from the yield gap (in the UK equation) and Irish industrial production (in the German equation), none of the "other variables" is significant. The three major pre-realignment dummies, covering the 1983, 1986 and 1993 devaluations, are all very significant. The third quarter seasonal dummy is sometimes close to significance in the UK equation. Otherwise, only the IR£/sterling exchange rate and (for the German equation) the forward premium are significant.

All equations with pre-realignment dummies included are significant implying violation of uncovered interest parity and providing a predictable excess return or risk premium[7]. If pre-realignment dummies are excluded, leaving only the

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[6]One theoretically attractive idea is that the risk premium may evolve in accordance with the volatility of the excess returns themselves. Thus we could have:

$$\mu_t = \psi_t + u_t$$

where:

$$\psi_t = \alpha_0 + \alpha_1 \sigma_t^2$$

is the risk premium, dependent on the time-varying variance of the disturbance u_t. Such a hypothesis can be estimated using what is known as a GARCH-m model. However, despite the plausibility of this approach, we were unable to detect any stable relationship of this kind.

[7]But we need to be careful about jumping to this interpretation. After all, the determination of risk premia depends on a general equilibrium in which the correlation of prices and exchange rates is taken into account, cf. Engel (1992). If it were just a question of exchange rate volatility, it is not obvious *a priori* whether it is domestic or foreign interest rates that should increase to compensate for the risk.

It could also reflect a "peso effect", where a small but not negligible perceived risk of a large devaluation affects interest rates even though the frequency of large devaluations in the sample is lower than predicted. The point here is that large devaluations occur so rarely that a much longer time series would be needed to falsify the hypothesis of a peso factor. These issues are reviewed in Agenor, Bhandari and Flood (1992). Quasi-peso effects might be said to prevail over sub-periods if there is a sequence of positive excess returns.

IR£/sterling rate and the forward premium to remain, the German equation becomes insignificant implying no predictability and allowing uncovered interest parity to hold. The UK equation remains significant, however, implying violation of uncovered interest parity.

(b) Are the results consistent across countries?
In estimating the parameters α of equation (6), we imposed no cross-country restriction. However, as shown by Gibbons and Ferson (1985) and Cumby (1988) many standard models of international capital asset pricing predicts that the vector α_j should be the same for each j up to a constant of proportionality. One such argument is as as follows: in an analogous development to the domestic capital asset pricing model (CAPM), the international asset-pricing model (Stulz, 1981, 1984) makes sufficient assumptions (especially assumptions on either the distribution of asset returns or on continuous trading to ensure that mean-variance portfolio selection applies) to obtain the familar CAPM-type equation for the expected returns on a given asset:

$$\rho_t^j = \beta_t^j \, \mathscr{E}[\lambda_t^p - \lambda_t^z]$$

Where β is the 'beta'[8] on forward speculation in currency j, λ^p is the excess return on the total market portfolio and λ^z is the excess return on a 'zero-beta-portfolio. But if the beta is constant (or if the beta's for different currencies move proportionately, this equation implies that the ratios of expected returns:

$$\rho_t^j / \rho_t^k$$

must also be constant, implying proportionality of the vectors α.

More generally, if the expected returns follow any common factor model such as the Arbitrage Pricing Theory, with constant coefficients, the vectors α should be proportional.

We tested these restrictions of proportionality on three currencies (£, DM, $). A Wald test for proportionality of the coefficients yielded a χ^2 of 180.3 with 32 degrees of freedom, easily rejecting the hypothesis at the one per cent level. Thus the findings do not support the theory: the risk premia vary in ways that are not consistent with a common factor theory with constant ('beta') coefficients.

The inclusion of "pre-realignment" dummies serves to focus only on observations when a realignment was not in fact imminent (even if anticipation of a realignment may have been built into asset prices).

[8]This is more often developed in terms of real returns, and the 'consumption beta'. For the currencies we are looking at, inflation is so low that real and nominal *excess* returns are essentially equivalent. For Ireland, we do not have quarterly consumption data nor any plausible proxy.

This leads us to a general conclusion: the variation over time in excess returns is partly predictable. However, the pattern of predicted variations differs across countries in ways which cannot be accounted for by simple models. One possibility for resolving this gap is to take account of the wedge that transactions costs may place in the interest parity conditions (even as modified by risk aversion).

5 *Transactions costs and hysteresis bands*

Recent developments in the literature[9] take explicit account of the fact that full arbitrage might entail speculators having to shift frequently in and out of different currencies. If such transactions are costly, then they may not be undertaken for small expected values of λ. The higher the switching costs κ (assumed to be proportional to the size of transaction) and the higher the variance σ^2 of the stochastic process determining the expected value of λ, the wider the possible deviations from the parity conditions discussed above. Investors will only move when the expected excess return is materially greater or materially less than zero: and the width of band of indifference or "hysteresis" is surprisingly wide. In one specific model (Baldwin, 1990), where the $\mathcal{E}(\lambda)$ process is a Wiener process, the width of the hysteresis band is given as approximately[10]:

$$2\left(\frac{3}{2}\frac{\sigma^2\kappa}{r}\right)^{1/3}$$

Because of the cube root, even a small value for the terms within brackets can lead to a large hysteresis band. (Conversely, a doubling of the variance will widen the band by a factor of only 60 per cent). Note, however, that the relevant process is not that of λ itself, but of its expectation[11].

The underlying mathematics of these models of sunk costs (introduced by Dixit, 1989) need not concern us here, but some intuitive account of why the bands are so wide may be in order. The essential idea is that switching the currency of investment can be done at any time to take advantage of an expected flow excess return. But the decision to switch now (and to incur fixed switching costs) must

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[9] Notably Baldwin, 1990.

[10] This argument is based on exogeneity of the expected return process, but Baldwin (1990) has also developed a general equilibrium model.

[11] Thus even if the standard deviation of sterling excess returns is only twice that of DM returns, still the variance of the predicted sterling excess returns could be many times higher than the variance of the DM predictions.

be weighed against the possibility that one may wish to switch back later[12]. If expected returns are volatile, this possibility is a real one, and while it is of no significance of there are no fixed switching costs, it becomes materially important as soon as they enter. Even a tiny switching cost[13] will be larger than the expected excess return over the next day or so, why not wait to see if the expected rate of return gets bigger before committing myself? The optimal decision rule is to switch only when the expected excess return is bigger than a trigger value which depends on the variance of the expected return and the switching cost.

In order to assess the quantitative relevance of the hysteresis model, we need estimates of the variance of the expected return. We have already presented estimates above of a model[14] of the time-variation in the expectation of λ. The time-variation of the fitted values provides an estimate of the variance σ^2. Of course it is a lower estimate, since the variance of the projection error u is not taken into account, but if this is small, the ratio of the variances for different currencies may give a reasonable indication of the ratios of the standard errors.

Ignoring over-fitted equations and those with dummies for realignment quarters, leaves us with equations such as (1.6) for the UK and (2.8) for Germany in Tables 1 and 2. The standard deviation of the fitted values in these two equations is 1.65 per cent and 0.58 per cent respectively, implying a ratio of the variances of 8.05. Taking this to the third power gives a ratio of just two. Thus if the transactions costs are similar, the formula provided for the width of the hysteresis band implies a hysteresis band for sterling that is twice as wide as that for the DM.

Alternatively, we may note that the F-statistic in equation (2.8) is not significantly different from zero: if we reasonably draw the conclusion that the excess return against Germany is not predictable at all, we obtain a zero hysteresis band for Germany, whereas for the UK, the hysteresis band derived from the formula, (assuming that the transactions cost is 5 basis points and the domestic interest is 7 per cent per annum) comes out at 19 per cent per annum!

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[12]Another way of looking at this is that, if I am holding Irish pounds now, I have the option to buy DM's: this option is valuable, but could become more so, I will only exercise it when it is very valuable.

[13]The derivative of the trigger value of excess return (see below) with respect to switching cost at a value of zero is infinite.

[14]The hysteresis models do hinge essentially on the ability to trade frequently. If trading is only possible once a quarter, then the width of the hysteresis band reduces to just twice the switching cost. Thus is may be strictly inappropriate to base our calculations on three-month interest rates, but in practice the approximation may not be too bad, because daily rates are quite closely correlated with quarterly.

We draw a number of conclusions. First, the variance of the sterling predictions is high, and that means that the band of indifference proposed by the new theory discussed above could be quite large, thereby weakening the link between sterling interest rates and those on Irish pounds. Likewise, expected exchange rate changes vis-a-vis sterling are unlikely to be decisive in determining Irish interest rates. This is less so for the DM predictions: expected exchange rate change against the DM is thus likely to be a more powerful force in influencing Irish interest rates than expectations about sterling. Second, as a corrollary of this, we conclude that, since the DM is the relevant comparator, systematic positive excess returns have been earned on Irish pounds over the EMS period, suggesting a long-term peso factor or a substantial risk premium. Third, a short-term quasi-peso-factor, reflected by the significance of the sterling exchange rate, is an important element in the apparent predictability of excess sterling returns; but this does not show up in the DM excess returns.

The variation of the pure risk premium resulting from the variations in the volume of exposure to exchange risk (which might vary to the extent that the Irish government, seen as an exogenous borrower, was borrowing) are not easily detected through such variables as the Exchequer borrowing requirement.

6 Concluding remarks

Participation in the EMS has allowed a certain flexibility in Irish interest rates[15]. This may have proved to be a curse rather than a blessing. In this paper we have shown that Irish pound short-term interest rates have been higher than necessary to compensate investors for actual exchange rate changes. While this may have also have been influenced by the level of Government borrowing during the 1980s, or by monetary policy actions at home[16], it seems clear that the exchange rate regime itself has played an important part in generating these excess returns. There were no significant excess returns against sterling during the sterling link period. The change from an absolutely fixed exchange rate peg to the more flexible and crisis-prone EMS appears to have brought with it a cost in terms of higher real interest rates.

[15]Indeed, Svensson (1992b) argues that preserving this flexibility may be the main advantage of having a margin of fluctuation.

[16]The role of monetary policy in influencing interest rates will be explored in a further paper.

Excess Returns on Irish pound short-term assets			
Summary statistics, 1978:Q4-1993:Q1 (% per quarter)			
vis-à-vis:	UK£	US$	DM
Mean	0.27	0.39	0.59
Std. Dev.	4.26	6.56	1.96
Variance	0.18	0.43	0.04
Max Return	13.96	15.28	5.47
Min Return	-8.62	-12.44	-8.46

IRL - Average Yield 3-mth exchequer bills; Central Bank Quarterly Report
UK - 3-mth T-Bills ; Bank of England Quarterly Report
US - Federal Funds ; IFS 60b
GER - Call Money Rate; IFS 60b

End of period

TABLE 1: REGRESSION RESULTS: IRISH-UK SHORT-TERM EXCESS RETURNS

Equation no.	1.1		1.2		1.3		1.4		1.5		1.6	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Explanatory variables												
Intercept	0.24	(2.8)	0.26	(3.5)	0.22	(3.4)	0.23	(3.2)	0.16	(2.3)	0.18	(2.8)
Quarter 1	0.003	(0.2)										
Quarter 2	0.02	(1.0)										
Quarter 3	0.02	(0.8)	0.01	(1.3)	0.02	(1.9)						
IR£/£stg Exchange Rate	-0.27	(2.8)	-0.29	(3.5)	-0.25	(3.4)	-0.26	(3.2)	-0.18	(2.3)	-0.20	(2.9)
Short-term interest diff - UK	-0.32	(1.2)										
Short-term interest diff - DM	0.2	(0.6)										
Inflation diff - UK	0.11	(0.7)										
Inflation diff - DM	0.11	(0.8)										
Yield Gap (Ireland)	-0.1	(0.2)	0.16	(1.9)	0.16	(1.9)						
Dummy 92 qtr2	0.12	(2.9)			0.15	(4.1)					0.15	(4.0)
Exchequer Borrowing	0.03	(0.1)										
Industrial production	-0.75	(0.2)										
RSQ / DW	0.43	1.68	0.24	1.73	0.37	1.80	0.16	1.80	0.09	1.70	0.29	1.87
F / d.f.	2.84	12,45	5.16	3,50	7.72	4,53	9.99	1,52	5.31	1,56	11.38	2,55
Method / No. of obs	OLS	58	OLS	54	OLS	58	OLS	54	OLS	58	OLS	58
Sample period	78 Q4 -	93 Q1	78 Q4 -	92 Q1	78 Q4 -	93 Q1	78 Q4 -	92 Q1	78 Q4 -	93 Q1	78 Q4 -	93 Q1

TABLE 2: REGRESSION RESULTS: IRISH-GERMAN SHORT-TERM EXCESS RETURNS

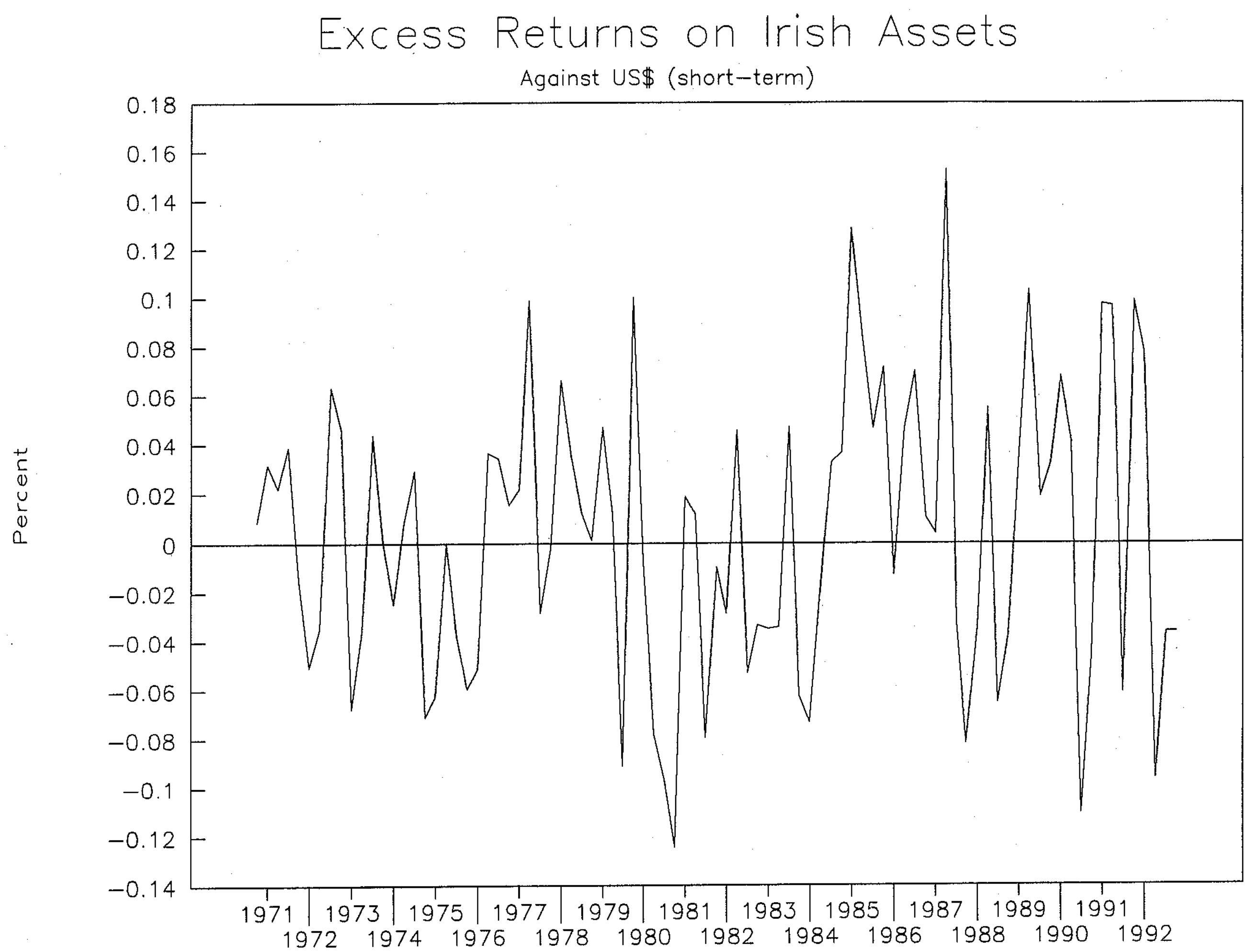
Equation no.	2.2		2.3		2.4		2.5		2.6		2.7	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Intercept	-0.04	(1.6)	-0.05	(2.4)	-0.05	(2.6)	-0.05	(2.4)	0.003	(0.1)	-0.05	(2.5)
Quarter 1	0.004	(0.7)										
Quarter 2	-0.002	(0.4)										
Quarter 3	0.001	(0.1)										
IR£/£stg Exchange Rate	0.04	(1.4)	0.06	(2.4)	0.05	(2.5)	0.06	(2.4)	-0.01	(0.2)	0.05	(2.4)
Short-term interest diff - UK	0.01	(0.2)										
Short-term interest diff - DM	-0.25	(2.8)	-0.21	(3.9)	-0.23	(4.7)	-0.21	(3.8)	-0.16	(2.3)	-0.23	(4.4)
Inflation diff - UK	0.03	(0.7)										
Inflation diff - DM	0.002	(0.1)										
Yield Gap (Ireland)	-0.01	(0.1)										
Exchequer Borrowing	-0.01	(0.1)										
Industrial production	1.29	(1.1)	0.01	(2.5)	0.01	(2.5)						
Dummy 82 qtr4	-0.04	(3.8)	-0.05	(4.3)	-0.05	(4.4)	-0.04	(4.0)	-0.04	(2.8)	-0.04	(4.0)
Dummy 86 qtr2	-0.09	(7.9)	-0.09	(8.9)	-0.09	(9.0)	-0.09	(8.4)	-0.09	(6.0)	-0.09	(8.4)
Dummy 92 qtr4	-0.08	(5.9)			-0.09	(7.6)					-0.08	(6.9)
RSQ / DW	0.773	1.96	0.71	1.83	0.758	1.84	0.567	1.67	0.48	1.96	0.727	1.79
F / d.f.	10.47	14,43	23.47	5,48	26.57	6,51	21.85	3,50	12.00	4,53	27.69	5,52
Method / No. of obs	OLS	58	OLS	54	OLS	58	OLS	54	OLS	58	OLS	58
Sample period	78 Q4 -	93 Q1	78 Q4 -	92 Q1	78 Q4 -	93 Q1	78 Q4 -	92 Q1	78 Q4 -	93 Q1	78 Q4 -	93 Q1

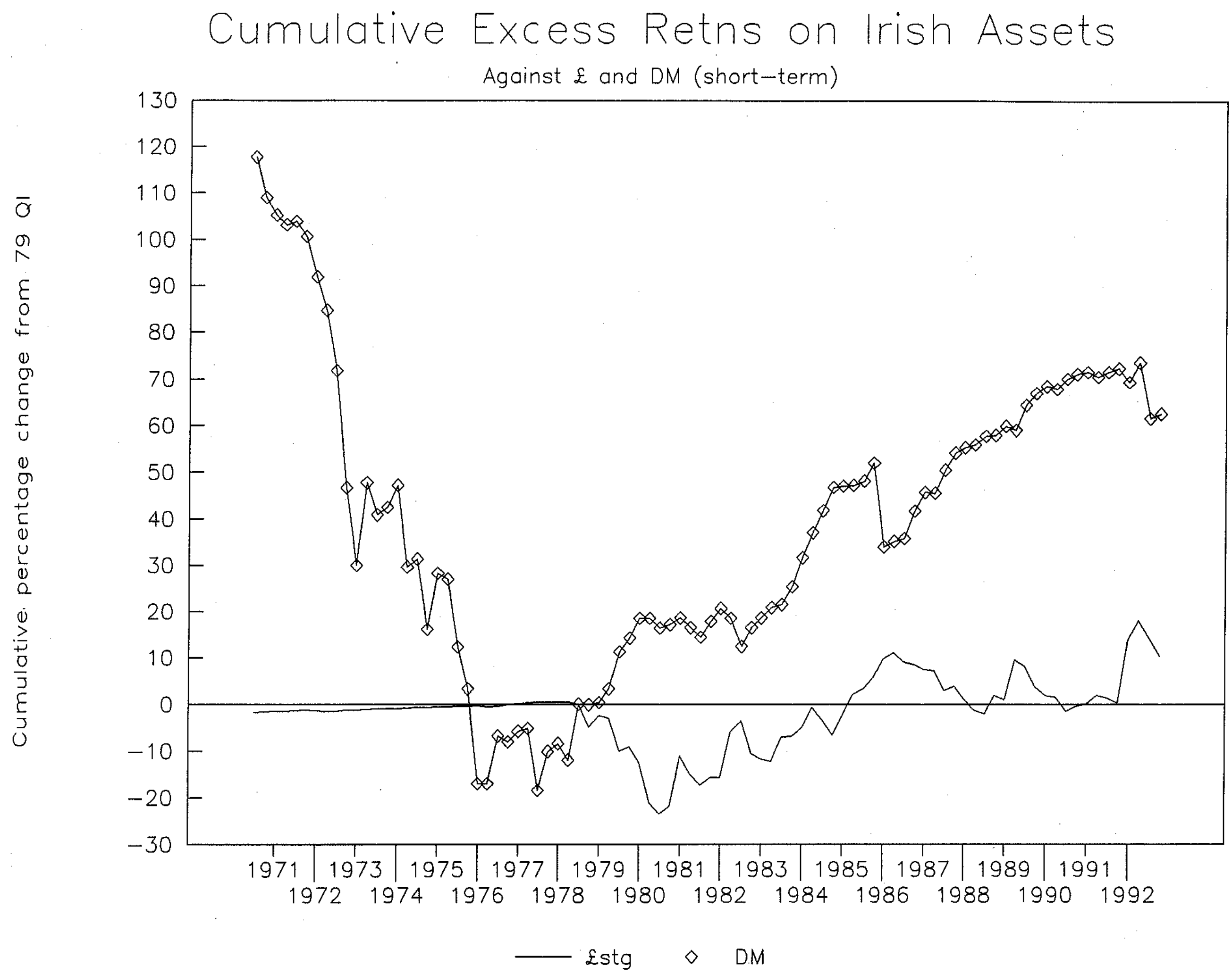
Equation no.	2.8		2.9	
	Coeff	t-stat	Coeff	t-stat
Intercept	-0.05	(1.3)	0.003	(0.1)
IR£/£stg Exchange Rate	0.05	(1.3)	-0.01	(0.2)
Short-term interest diff - DM	-0.19	(2.1)	-0.14	(1.6)
RSQ / DW	0.102	1.84	0.04	1.97
F / d.f.	2.88	2,51	1.28	2,55
Method / No. of obs	OLS	54	OLS	58
Sample period	78 Q4 -	92 Q1	78 Q4 -	93 Q1

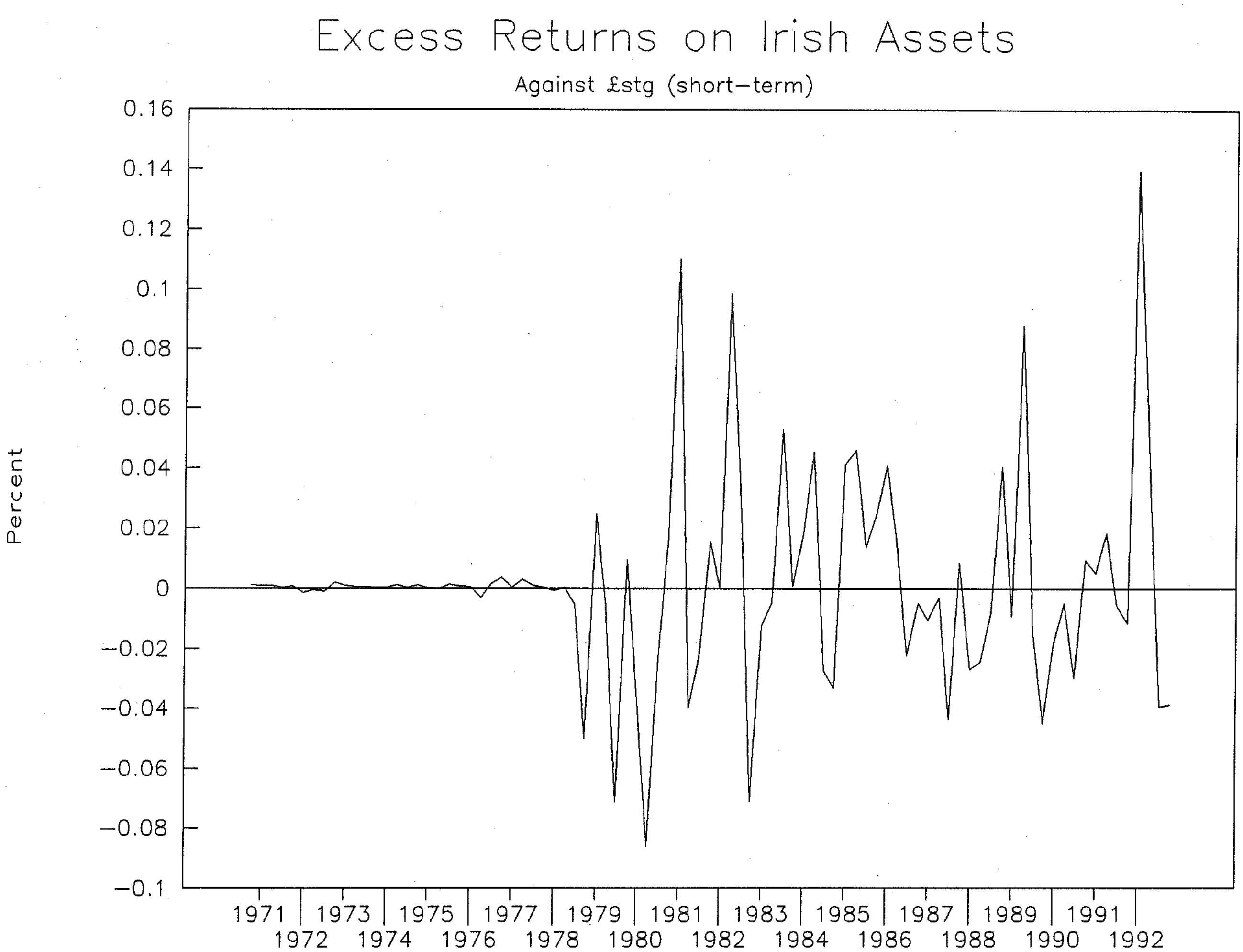
Table 4: Cointegration Tests

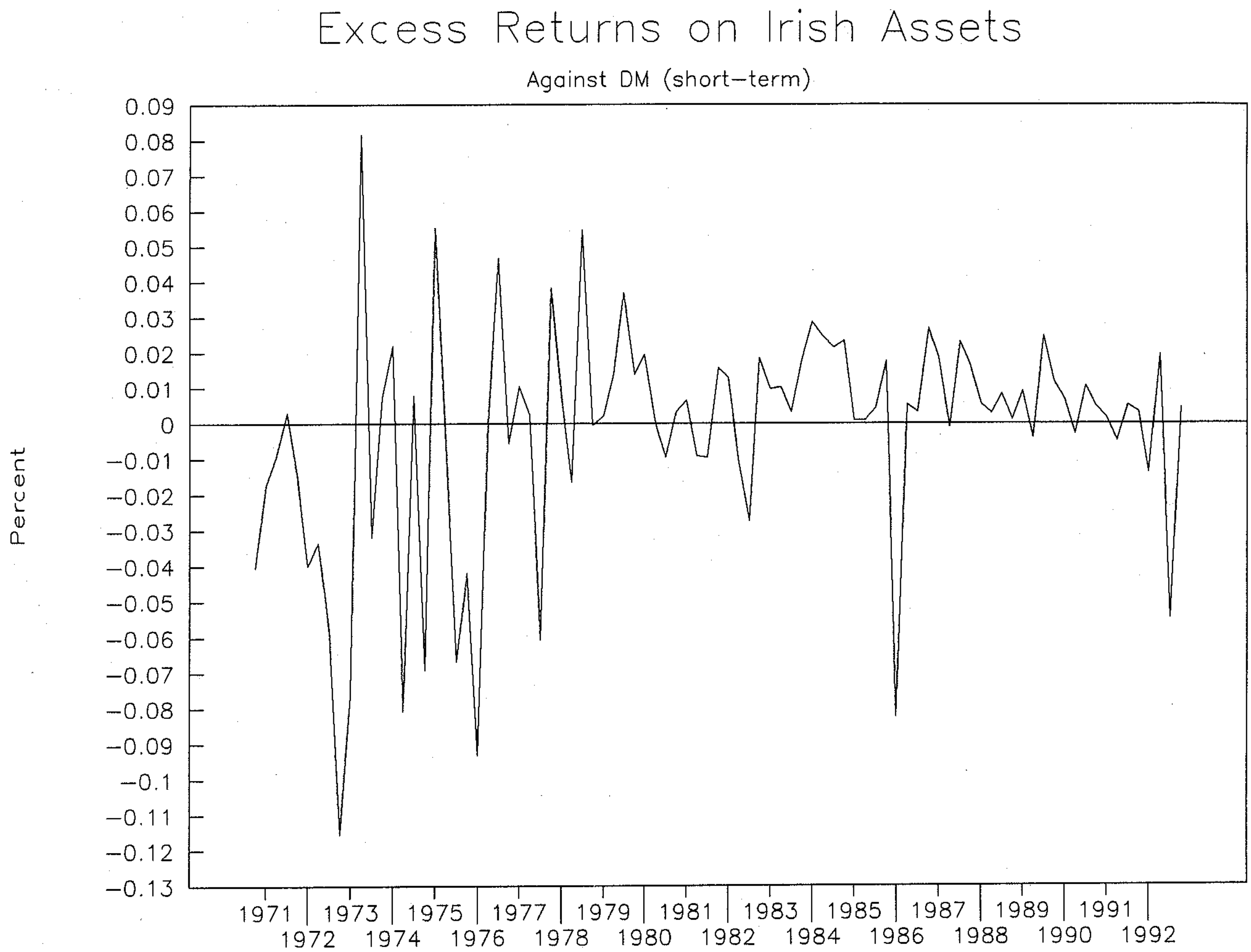
	DF	(DW)	ADF(3)	(DW)
r^l	-0.88	1.65	-0.98	1.94
with trend	-3.10	1.61	-3.39†	2.01
r^s	-2.60	1.44	-2.43	1.73
with trend	-3.58*	1.47	-3.64*	1.84
λ	-6.58**	1.92	-3.95*	2.01
with trend	-6.58**	1.93	-3.99*	2.02
μ^{DM}	-8.01**	1.79	-3.30*	1.83
with trend	-8.27**	1.80	-3.57*	1.83
$\mu^{£}$	-6.78**	1.95	-4.13**	1.98
with trend	-6.79**	1.94	-4.27**	1.98

† The 5% significance level is 3.49.


Excess Returns on Irish Assets
Against US$ (short–term)
Percent
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
–0.02
–0.04
–0.06
–0.08
–0.1
–0.12
–0.14
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992


Cumulative Excess Retns on Irish Assets
Against £ and DM (short-term)
Cumulative percentage change from 79 QI
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
£stg
DM


Excess Returns on Irish Assets
Against £stg (short-term)
Percent
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991
1972 1974 1976 1978 1980 1982 1984 1986 1988 1990 1992


Excess Returns on Irish Assets
Against DM (short–term)
Percent
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
−0.01
−0.02
−0.03
−0.04
−0.05
−0.06
−0.07
−0.08
−0.09
−0.1
−0.11
−0.12
−0.13
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992