THE IRISH STOCK MARKET AND EXCHANGE RISK

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Introduction and Summary

On December18th, 1978 exchange control on financial transactions between the U.K. and Ireland was introduced for the first time. Three months later Irish entry into the EMS became official and on March 30th 1979 the parity of the Irish pound with sterling was broken. From that date the investment decision was not between alternate stocks, but between a combination of stock and currency investments. This paper represents a first look at the impact on the Irish market of these two major events.

Analysis of the data shows a very strong link between the Irish and U.K. markets. Given the number of Irish investors holding shares which were quoted in London this is exactly what we would expect. The strength of this tie between the markets appears to be weakest in the period immediately prior to the introduction of exchange risk. This was probably due to defensive reactions on the part of the investors as uncertainty increased. The conclusions one draws about the link between the markets depends very much on which data base one uses. If we examine data on a quarterly basis then the movement between the two markets appears to be simultaneous. However, studying the daily movements yields different results. The Irish market appears to react to the U.K. market, but only after a delay of about one day. Unfortunately, due to the rather minor movements over such a short interval of time, it is unlikely that one could develop a profitable trading rule. In the period since the break in parity, the exchange rate movement does appear to have some impact on the market, but the effect does not appear to be fully discounted. Three sub-periods are examined – pre-exchange control, pre-, and post-, the parity break. It is difficult to distinguish any significant change over the period. The link between the markets appears strongest in the mid period; however, whether this is pure chance would require further testing.

Background

The likely entry into the EMS had a number of major effects on the

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Irish financial markets. A substantial inflow of funds, about twice the norm, occurred during the last quarter of 1978, driving up the price level of Irish investments and causing a significant movement against the UK trend.[1] Whether this had a significant lasting effect on the gilt market is being analysed elsewhere.[2] Exchange controls relating to portfolio investment in the U.K. can briefly be summarised as:— Irish residents, with some institutional exceptions, cannot acquire additional sterling securities. Sterling securities held prior to 18/12/78 can be switched into other non-Irish securities. If the funds realised on a sterling sale are not switched within a period of three months then these funds must be repatriated. Institutions may invest up to 10% of their cash flow in foreign securities. Neither the Irish nor the U.K. governments place restrictions on U.K. residents wishing to invest in Irish securities. As a consequence of these rules the opportunities available to Irish residents have decreased, while there has been no change for the U.K. resident. However, uncertainty existed for a period of time especially in relation to the U.K. and it is not clear whether a portion of the inflows was caused by U.K. residents investing "while there was still time" in what was then thought to be the stronger economy. For the purpose of this study it is assumed that the bulk of the inflows were fund repatriations, rather than short term flows of hot money.

The break with sterling parity at the end of March, 1979 and the danger of this break, once a decision had been made to enter the European Monetary System alone, was a great significance to the Irish investor. Prior to this an investment in U.K. gilts was absolutely safe in money terms, and given the U.S. evidence safer in real terms than an investment in the stock market. Now, however, the value of guaranteed sterling returns for Irish residents is dependent on the fluctuations of the exchange rate and consequently is frought with uncertainty. The same is not necessarily true for stock returns, as these returns are not fixed in advance. As a simple example picture a U.K. resident who currently owns stock in an Irish company which exports to the U.K. The decline of the punt has put a downward pressure on the value of his holding; however, the company's U.K. exports benefit, asserting a compensating upward pressure. Which force dominates will depend on the circumstances, i.e. relative importance of exports, or import content of the business, etc., but it is not a simple one way effect as in th fixed interest security.[3] In the very extreme case of absolutely perfect markets and zero transport costs, inflation and exchange rate changes would be offsetting so that in a real analysis of income, exchange rates would be irrelevant. Those Irish stocks which are traded in both the London and Dublin exchanges, must trade at the same price to avoid arbitrage between the two markets by non-residents. This pricing restriction has no implications for the behaviour of the stocks during the different phases.

Given the relative size of the UK and Irish markets, about 300:1, it is

unlikely that any observable influence would be transmitted from the Irish to the U.K. markets.[4] It will be assumed that any changes manifested as a result of either exchange control, or the break with parity, will appear as adjustments to the Irish market.

Towards a theory of stock market integration

Portfolio managers seek to maximise their returns subject to certain constraints. Since the advent of the Markovitz-Sharpe work an attempt has been made to analytically describe the fund manager's job.[5] Substantial emphasis had been placed on the diversification aspect. Intuitively, managers recognised that two investments in the textile business provided less security than one investment in each of the textile and building sectors. Making certain assumptions on how people and stocks behaved the risk on the portfolio was measured by a spread (variance) factor. Figure 1 a-c shows the effect of holding half our portfolio in stock A and the remainder in another stock. Figure 1a shows what happens when the second stock behaves exactly in the same fashion as stock A; i.e. there is no effective diversification. Figure 1b illustrates the opposite extreme, where stock B moves exactly countercyclically to A. In this case we remove all fluctuation from the return on the portfolio. Figure 1c shows the normal case where stocks A and B are influenced by many of the same factors and tend to move in similar directions, but not necessarily all the time. Indepth study of stocks has shown a very strong market effect in each country and consequently most stocks are positively correlated (as Figure 1c).[6] Market effects in the U.S. account for about 60% of the stock movement, while industry factors explain a further 30% and the 10% balance is due to individual stock effects. If over half the movement of each stock in the portfolio is caused by the market, then even a very large domestic portfolio will not substantially reduce the level of risk. In the absence of perfectly integrated economies a substantial improvement in the level of security should be achievable by international investment.

Evidence of International Pricing

Tests to-date indicate some evidence of international pricing of assets.[7] Stehle has suggested that some NYSE stocks are priced by reference to alternatives available on an international basis. [8] As an indication of the existence of an international bias note the tradeoff between return and risk (measured by standard deviation here) for the dollar returns on three month government bills. Over the period an investment in U.K. bills would have given the highest level of return on average, but also the highest degree of fluctutation. The investor forced to liquidate his portfolio, at some point over the interval considered, could have lost more by an investment in the U.K. gilt market than in any of the alternates considered here. 76% of the variation in return on these invest-

Figure 1A

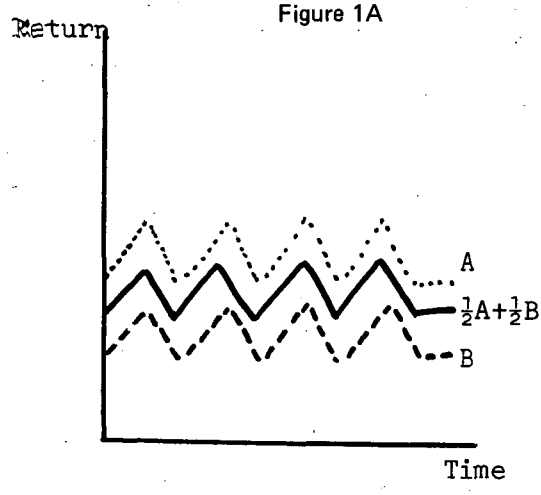


Figure 1B

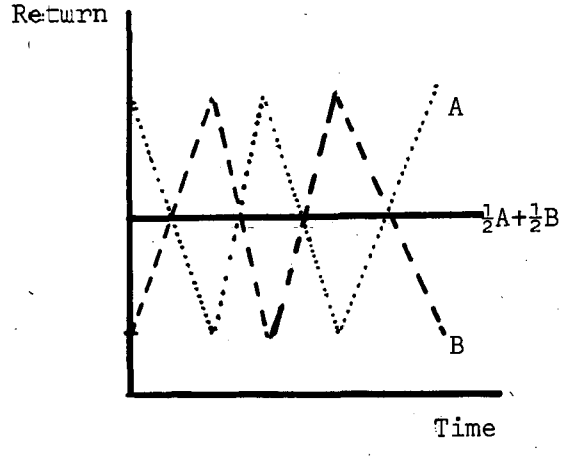
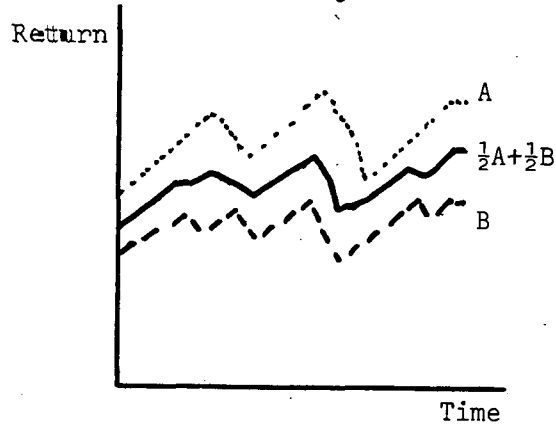


Figure 1C



ments can be explained by the different levels of inherent risk. β does not work as well – this is as expected given the inability to construct an accurate world portfolio, and given Roll.[9]

Table 1: Dollar returns on short dated government bonds
Monthly 1964-1973

	Average Return	Standard Deviation
U.S.A.	5.36	0.84
Austria	4.61	0.54
France	6.64	1.21
Germany	7.52	0.96
Canada	6.11	1.00
Japan	5.70	0.66
U.K.	8.06	1.44
Netherlands	6.76	0.98
Switzerland	4.76	0.65

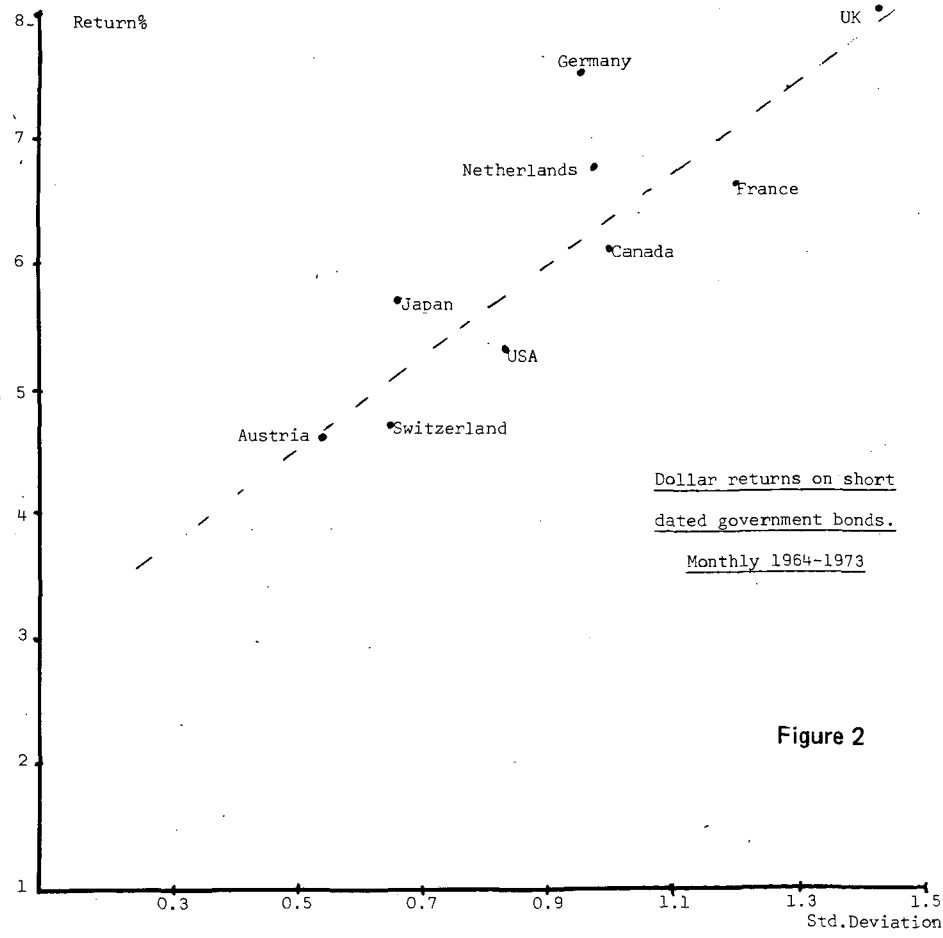


Figure 2

The existence of an international factor in determining the returns on gilts does not preclude some domestic influences and a simple comparison of individual government yields and dividend yields indicates the significance of this. There is a one to one correspondence between these factors, an event with less than a 1% probability if they were randomly distributed.

	Expected dividend yield on 1978 year end prices	Long term government bond yields end 1978
Japan	2.1	5.6
Germany	4.9	6.5
U.S.A.	5.5	8.9
France	5.7	10.0
U.K.	5.8	13.1

Theory of International Stock Pricing

The simple stock pricing model derived from Sharpe is

$$E_i = E_o + \lambda\beta_i$$

where E_i is the expected return on stock i, E_o is a risk free return, λ is a constant which reflects the degree of risk aversion in the market, and β_i is the level of risk involved in stock i. (Note precisely $\beta_i = \frac{\text{Cov}(R_i R_m)}{\text{Var}(R_m)}$ where R_m is the return on the market portfolio.) The nor-

Figure 3A

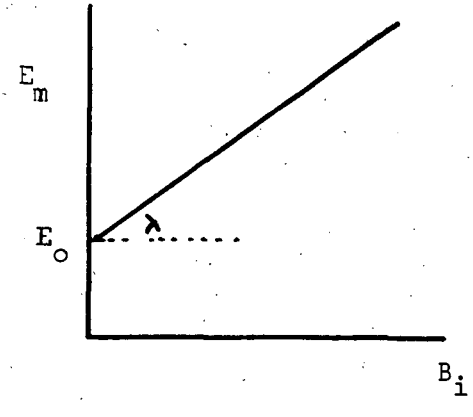
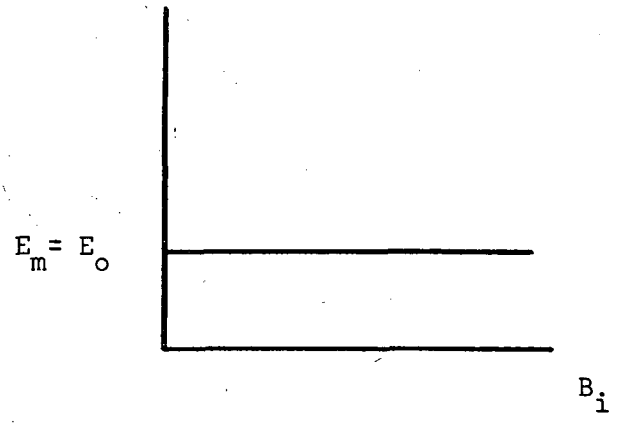


Figure 3B



mal picture is in Figure 3a, which indicates a higher level of expected return as we increase the level of risk. If society were risk neutral then investors would ignore risk and the same level of expected return would be required on each investment. In this unlikely case $\lambda = 0$ and we have Figure 3b.

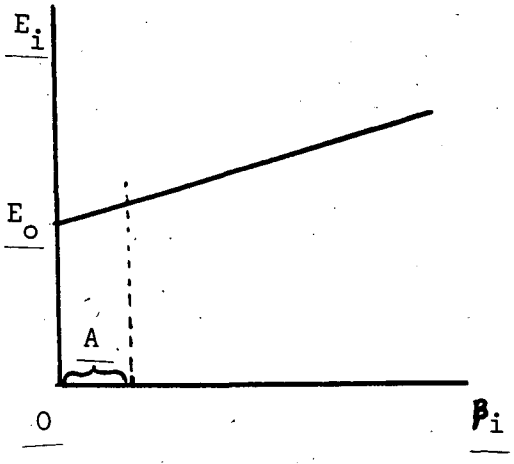
The development of this domestic pricing relationship to an international context involves a number of changes. There is now a wider set of investments to choose from, issued by both private and public sectors of many countries. All foreign investments will involve an exchange risk, but does this exchange risk have any real relevance?

When one invests in an Irish gilt, one receives a guaranteed rate of return provided the security is held until its maturity. There is substantial risk in this investment because of inflation. Contracting for a fixed rate of return in sterling terms and accepting exchange risk is not conceptually very different from contracting for a return in Irish pounds and risking a loss of purchasing power because of changing domestic inflation. In the no inflation case we can approximate the derived holdings of investors by a combination of two assets, the risk free asset, and the market portfolio where this latter is a proxy for all risky assets. In the inflationary case people would invest in a mixture of a perfectly indexed asset (if one existed) and a mixture of the other assets previously held. The international model has the same form.

Prior to considerations of breaking the link Irish investors chose a mixture of risk free and risk assets. U.K. gilts were risk free at that stage. Post the break, as in the inflation case, an uncertainty in the form of exchange risk was added on to the U.K. gilt. Consequently, the investors purchased Irish gilts as well as a mixture of their original investments. Graphically, picture and investing public choosing level of risk

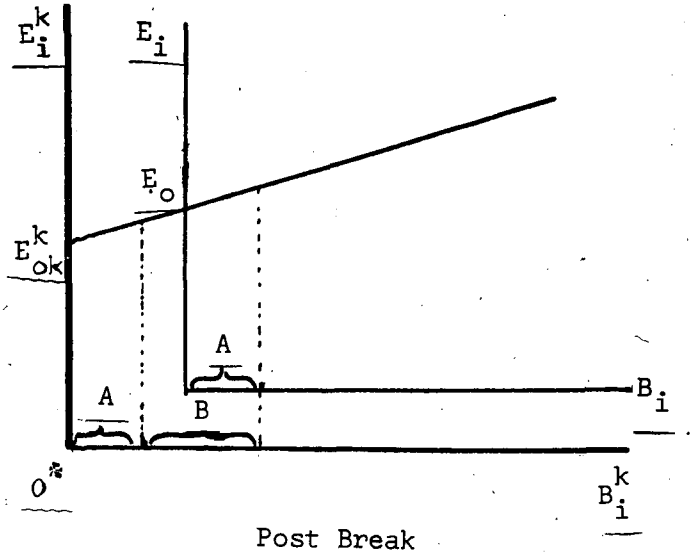
A. Then along comes exchange risk, shifting the origin of the graph from 0 to 0^*. The risk level is no longer A, but is now A + B. If the investors want to reduce risk back to the original level A they can do this by increasing their holdings of Irish gilts (E^k_{ok}).

Figure 4A



Pre-Break

Figure 4B



Post Break

If stocks are priced on an international, rather than pure domestic, basis then instead of the simple pricing model described above one gets[10]

$$E_i = E_o + \lambda \beta_i + \lambda \phi_h$$

where

E_i = Expected return on asset i;
E_0 = The riskless rate;
λ = The world market price of risk;
β_i = The beta for stock i relative to the world portfolio;
ϕ_i = The relation of i to the portfolio of exchange investments.

Given the problems involved in measuring some of the inputs to this model it is virtually impossible to test without using simplifying assumptions.

There is one exception to this and involves a simple examination of the different government bonds. Figure 5a shows the position when everyone views sterling as the relevant currency. Figure 5b is the result when we introduct a punt numeraire. Figure 5c occurs when we introduce a dollar group.

Figure 5A

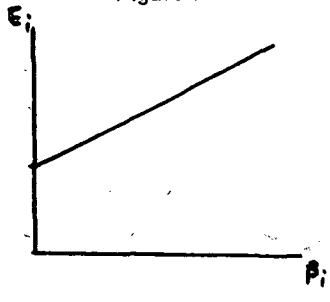


Figure 5B

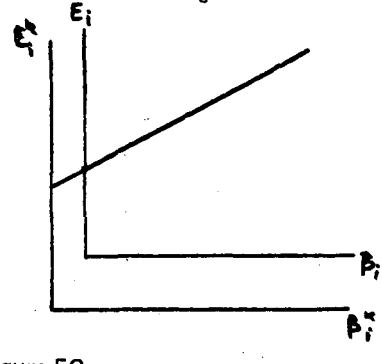
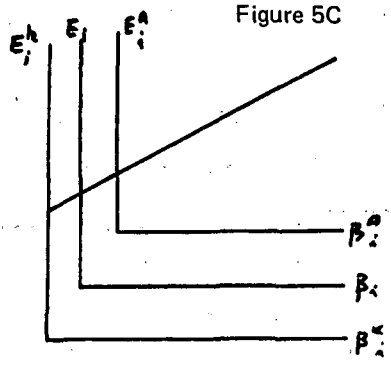
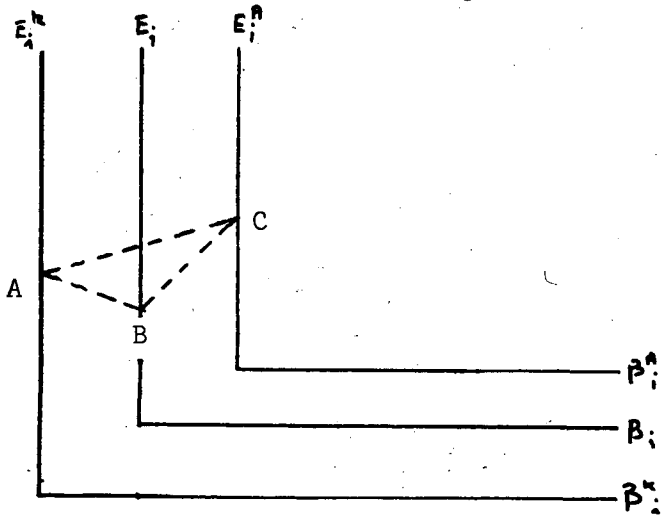


Figure 5C



To avoid arbitrage opportunities it is necessary that the risk return spread on these is linear. If it were not linear, as in Figure 6, then everyone would hold a combination of A and C and no one would hold asset B. Consequently, prices must adjust so that the return on A, B, C form a straight line. The linearity of the relationships was tested by Walsh[11] and is reproduced here as Figure 2.

Figure 6



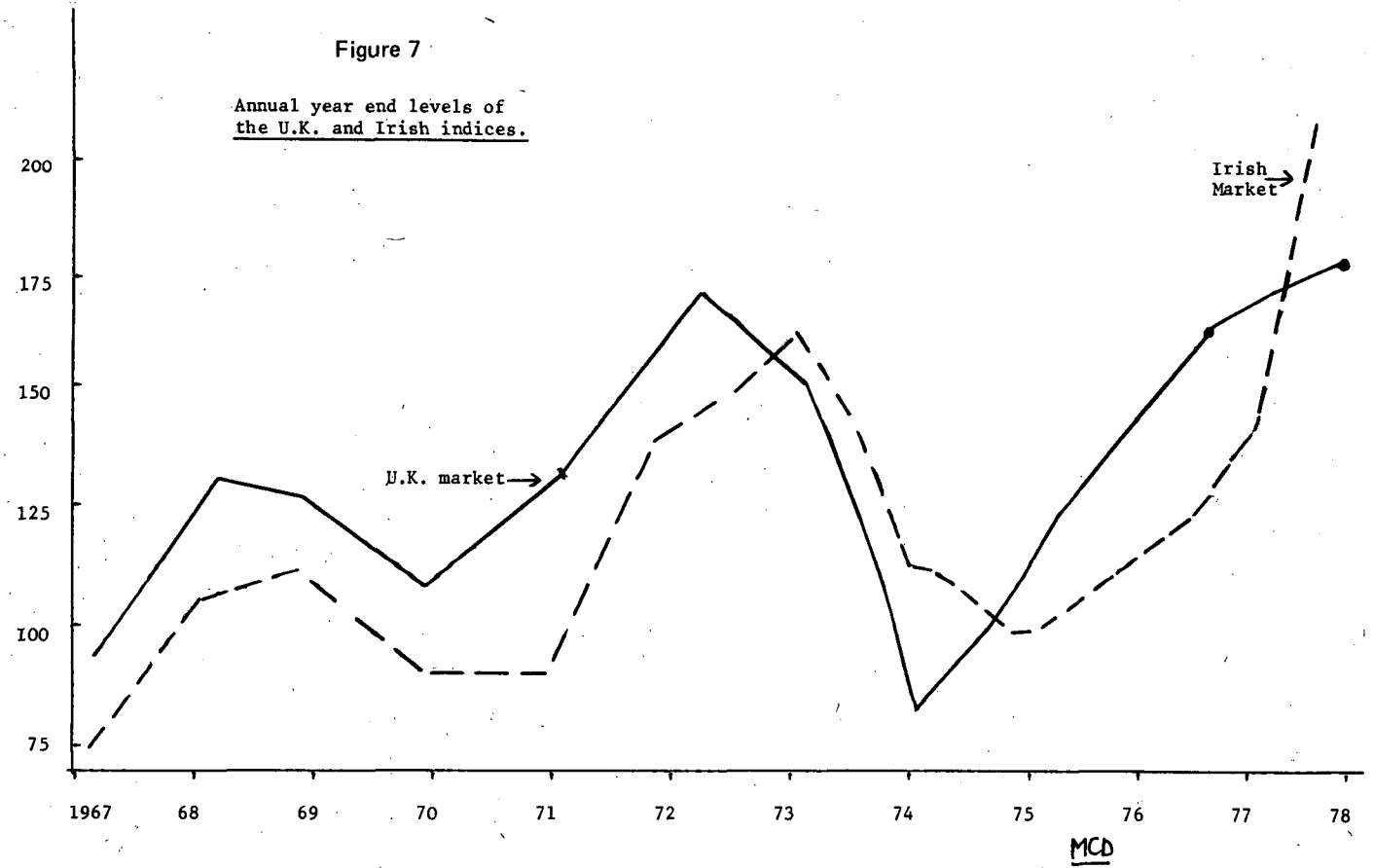
Testing the Link

The data base for this study consisted of daily values of Irish and U.K. stock indices and the level of the UK/Irish pound exchange rate. The data was gathered for the period 1/9/1978 to 31/8/1979 giving approximately 70 days pre exchange control, and a similar number between that date and the break with parity. The post parity break sample is about 50% larger. In the September-December period people were anticipating EMS, even though it was not a reality, and their activities were almost certainly influenced by its imminence. Equally, the post-break period may not be adequate to allow the markets to fully adapt to their new environment. Consequently, tests over a longer time-period might indicate different results.

As the main testing relates to a relatively short period of time it is useful to get some historical perspective. To provide background the relationship between the U.K. and Irish markets was examined, using both annual and quarterly data for the past decade. The annual data is illustrative of the relationship, but the number of periods is inadequate for useful testing.

Figure 7

Annual year end levels of the U.K. and Irish indices.



Study of the quarterly movements in index levels and returns provides some useful insight. As a test of the assumption that the U.K. market had a causal effect on the Irish one we looked at the relationship between the Irish market and the U.K. market in respect of leads, lags, and simultaneous effects. One way causality from the U.K. to Irish would imply that the Irish market during this period would have no impact on the U.K. market next period.[12] The impact of the U.K. on the Irish market and the level of flow is indicated by the results in Table 2 below. Results A examines whether the Irish market anticipates the UK, and as expected it does not. Results B and C in Table 2 are significant and we can conclude that while the strongest relationship between the markets is on a simultaneous basis there is some causalty (equation C) from the U.K. to the Irish Market. To further emphasise the simultaneous nature of the relationship the movement of the returns was in the same direction 65% of the time.

Table 2

A)	R_{I_1}	=	$1.06 - .03R_{UK_2}$	$R^2 = 0$
B)	R_{I_1}	=	$\underset{(3.75)}{.37} + \underset{(6.57)}{.64}R_{UK_1}$	$R^2 = .51$
C)	R_{I_2}	=	$\underset{(4.4)}{.53} + \underset{(4.1)}{.49}R_{UK_1}$	$R^2 = .28$

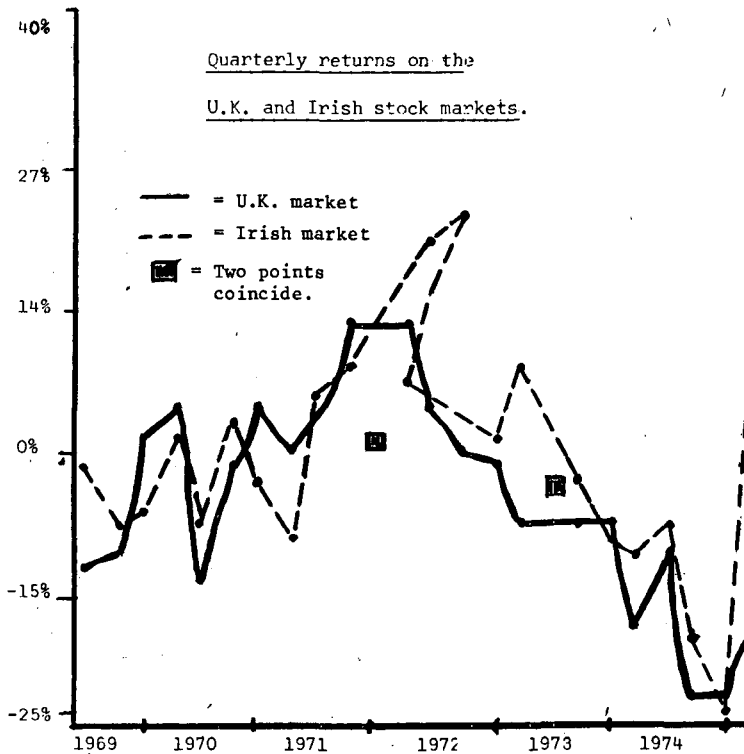
R_I = Return on the Irish Market

R_{UK} = Return on the U.K. Market

The numerical subscripts indicate the time period, and t-statistics are in brackets.

Examination of the link between daily index movements in both markets indicates a strong link in each period. This relationship can be seen from the graphs, and is specified in the regressions. The level of explanation is lower in the first period – this is due to the abnormal inflows. In the post break interval the exchange movement contributes a significant amount to the explanation of the Irish index. There is also some evidence to suggest that the Irish market follows a lagged pattern vis the U.K. market.

A brief summary of results is presented in Table 3. There was no significant improvement in the explanation for examining lagged values. All the results were significant at the 5% level. In the post break period the exchange rate is a significant variable in the determination.


Quarterly returns on the
U.K. and Irish stock markets.
= U.K. market
= Irish market
= Two points coincide.
40%
27%
14%
0%
-15%
-25%
1969
1970
1971
1972
1973
1974

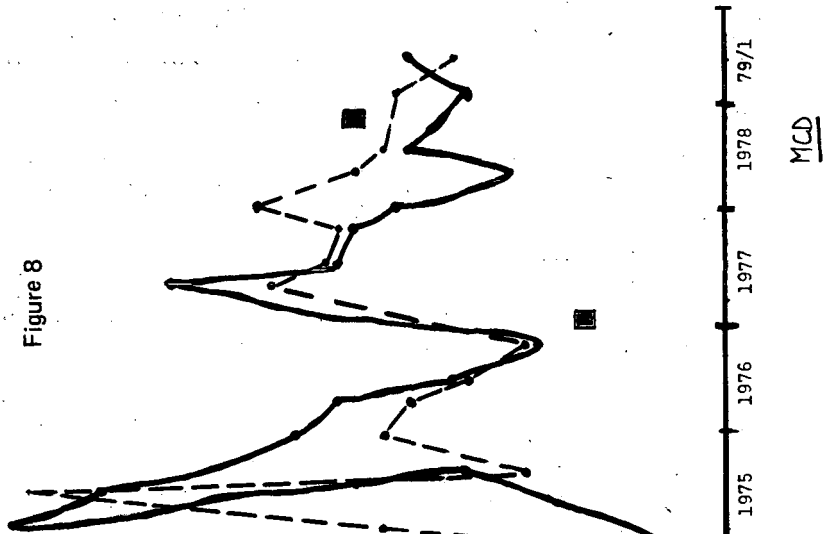


Figure 8

Figure 9

Daily levels of the Irish and UK stock market indices.

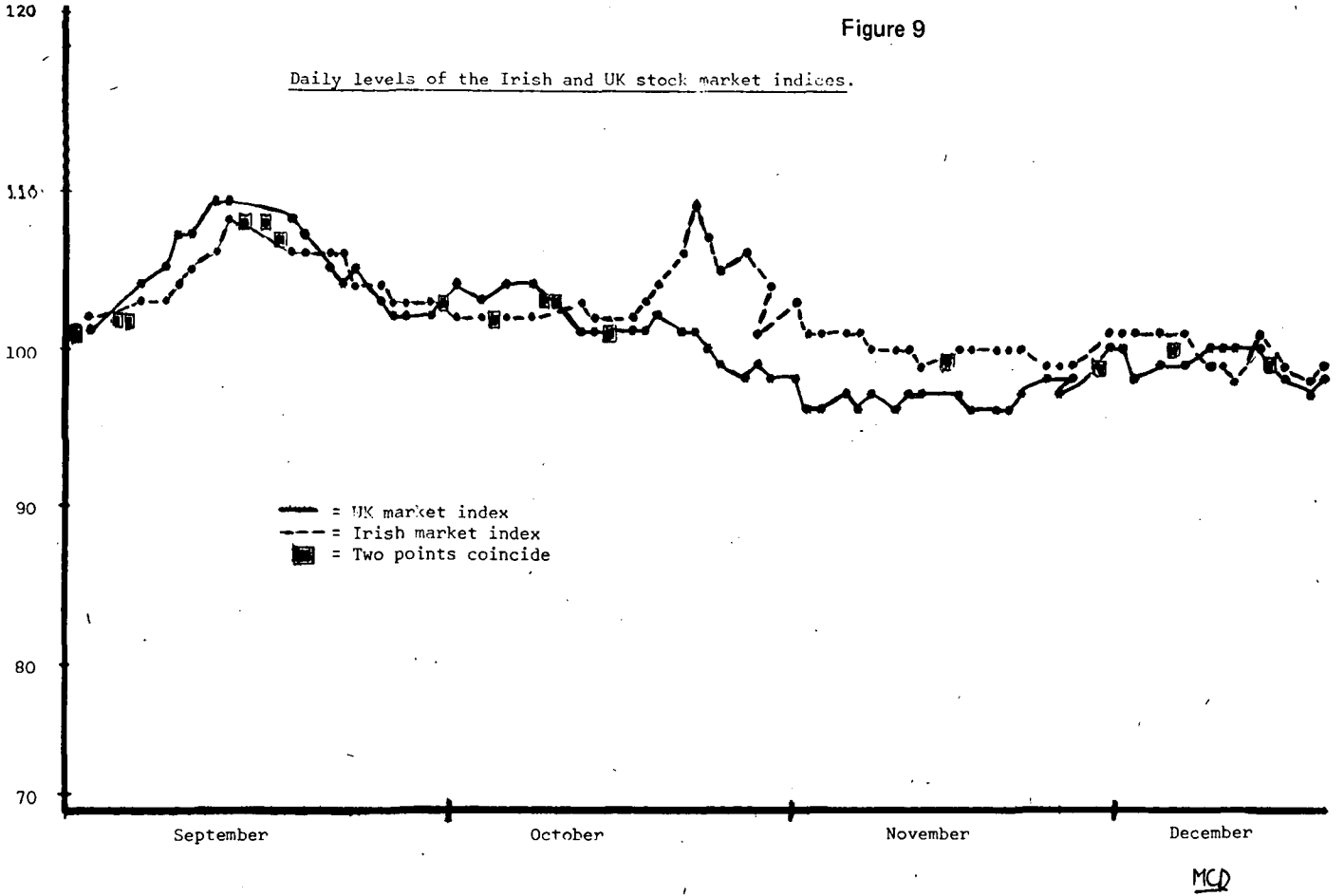
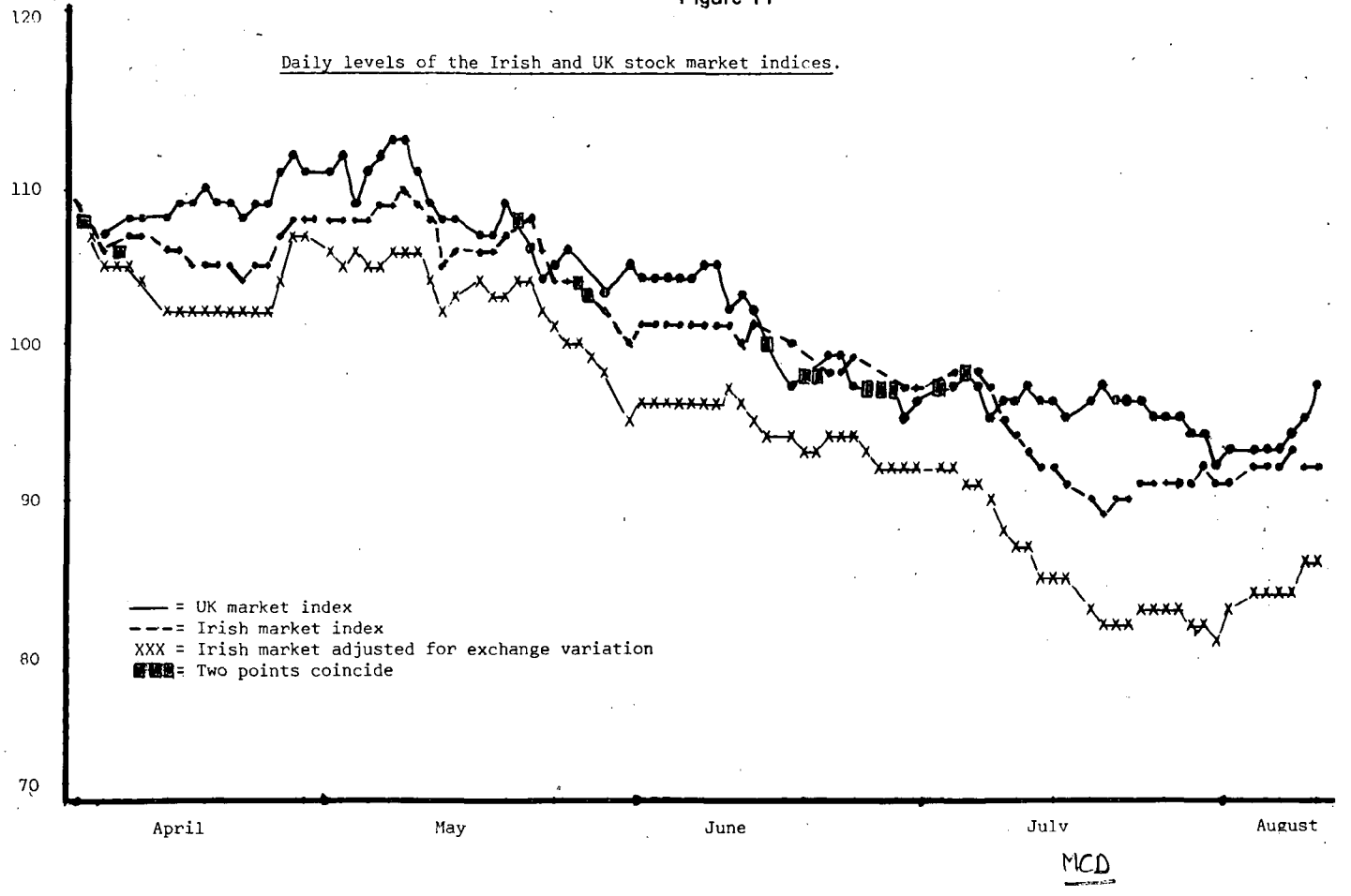


Figure 11


Daily levels of the Irish and UK stock market indices.
120
110
100
90
80
70
= UK market index
= Irish market index
XXX = Irish market adjusted for exchange variation
= Two points coincide
April
May
June
July
August
MCD

$$IR = -.48 + .59\ U.K. + .89\ Ex \qquad R^2 = .91$$

Table 3

Pre Control	IR = .47 + .54 U.K. (7.6) (8.8)	R^2 = .5
Post Control Pre Break	IR = .38 + .65 U.K. (9.5) (16.4)	R^2 = .76
Post Break	IR = −.03 + 1.21 U.K. (−6.3) (26.0)	R^2 = .89

Introducing the exchange factor also reduces the co-efficient on the U.K. index to one which is not significantly different from that in the two prior periods.

However, studying the two price series in this fashion is statistically dangerous due to the high degree of autocorrelation. To reduce this problem first differences of the prices were analysed.[13] Study of the first differences indicates a strong influence on a lagged basis by the U.K. on the Irish market. Only in the intermediate period, from December to March was the simultaneous relation significant, at the 5% level. The correlations are reproduced here and show a rapid decrease after two periods.

Table 4: Correlations of first differences of the Irish market with simultaneous and lagged values of the UK market.

Period	UK	UK(−1)	UK(−2)	UK(−3)
Sept.–Dec.	.03	.29	.25	.07
Dec.–March	.32	.48	.27	.15
April–Aug.	.13	.42	.13	−.06

Study of the returns indicates a similar type of lagged effect. Returns on the Irish market are influenced, not by what is currently happening in the U.K. market, but by what has happened on the two previous days. It is unlikely, given the degree of explanatory power, that any useful trading rules would exist, unless the December to March period reflects the norm. Much more data would be required to test this, especially given the changed investment environment. The results here are consistent with the quarterly results which found no lagged relationship. This is exactly as expected, given the negligible impact prior to a two-day lag.

Figure 10

Daily levels of the Irish and U.K. stock market indices.

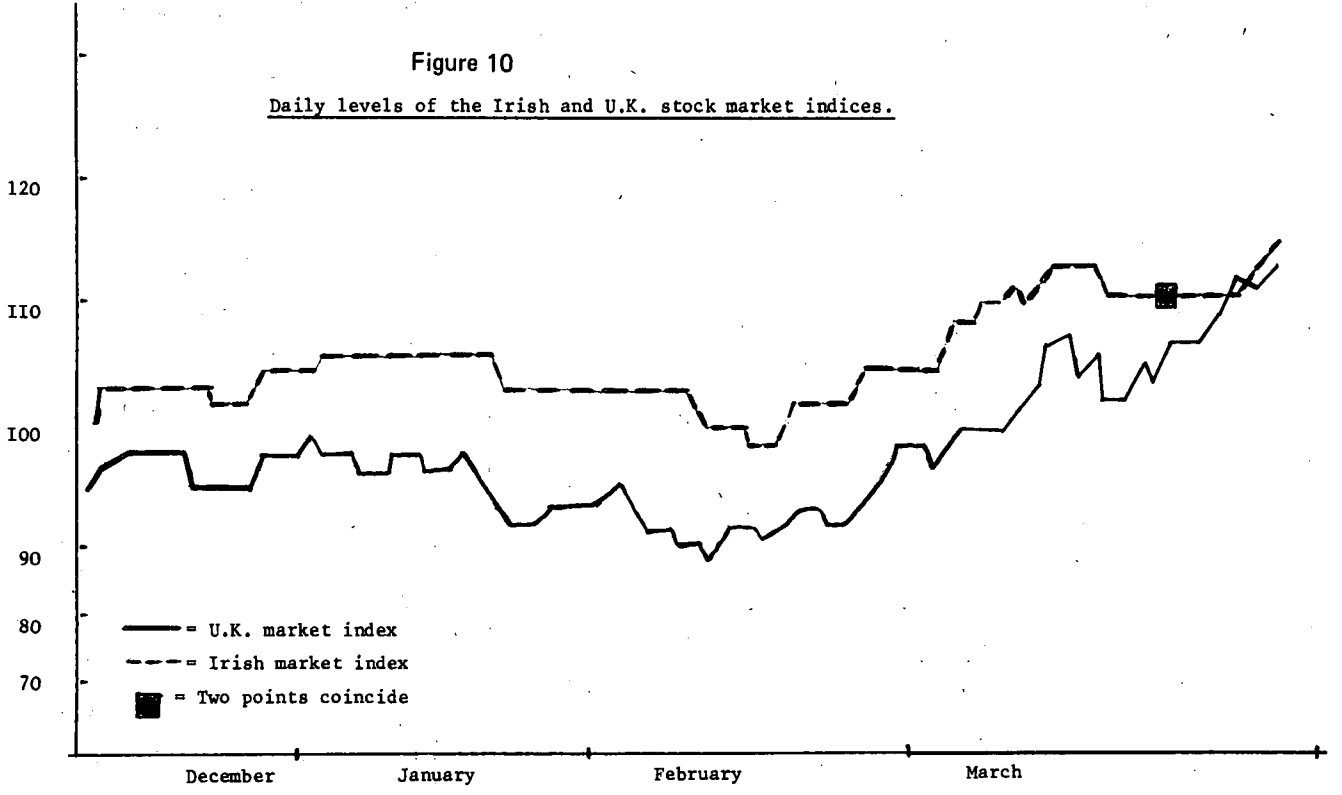


Table 5: Dairy returns on the Irish market as explained by the U.K. returns.

Period DIR =	A	DUK	DUK(−1)	DUK(−2)	DUK(−3)	R^2
Sept.–Dec.	.29 (NS)	.02 (NS)	.34 (2.8)	.28 (2.3)	.07 (NS)	.1
Dec.–March	.30 (3.1)	.19 (3.8)	.30 (6.1)	.16 (3.2)	.05 (NS)	.4
April-Aug.	.50 (3.2)	.08 (NS)	.29 (4.0)	.10 (NS)	.03 (NS)	.1

DIR = Return on the Irish market
DUK = Return on the U.K. market
( ) = t-statistic

A rather surprising feature was the apparent failure of the returns on the Irish market to reflect the exchange losses it was suffering. This may be simply the result of a realignment of the Irish market, but if this was the case one would expect a more noticeable change in the above regressions.

Conclusion

This first look at the Irish market in the light of EMS suggests that inadequate account has been taken of the movement in the exchange rate. Consequently the Irish market is overvalued relative to the U.K. market. This statement is made against a background of assumption that the earlier period tested are representative of the norm. A substantial amount of further analysis should be undertaken using more sophisticated statistical techniques and a larger body of data. Further analysis should consider the probable two-tier nature of the Irish market, as it is likely that the more traded stocks will be the first to indicate adjustment.

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13. Ideally one should use spectral analysis and further work using this approach is in progress. The following reference is a useful example of this approach: F. Browne and T. O'Connell. "A Quantitative Analysis of the Degree of Integration between Irish and UK Financial Markets." *Economic and Social Review.* Vol. 9. No. 4.