IRISH PROPERTY FUNDS: EMPIRICAL EVIDENCE ON MARKET TIMING & SELECTIVITY

Simon A.W. Stevenson, Raymond P. Kinsella, Ruairi S. O'Healai*

Introduction

The evaluation of fund performance has received a large amount of attention in finance literature over the last thirty years, however very little work has expanded this analysis to the property sector. This paper aims to redress some of this imbalance by examining the performance of Irish based property funds, concentrating specifically on the timing and selection ability of the funds. In the context of this analysis timing ability (or macroforecasting) refers to the ability of portfolio managers to correctly assess market movements and to respond accordingly in terms of the assets held. Selectivity (or microforecasting) refers to the ability of fund managers to choose individual assets. This paper will examine eleven Irish property funds over the period 1985 to 1996 using the parametric models developed by Henriksson and Merton (1981) and Chen & Stockum (1986). In addition, the non-parametric model proposed by Henriksson & Merton (1981) will also be analysed. Due to the requirement for this latter analysis of fund allocation details, these tests can only take place over the period 1992 to 1996. In the context of this analysis Twenty Six funds will be examined.

In addition to the problems concerned with the selection of funds used, there are also a number of issues that are specifically related to the property market. The general characteristics of the property market can lead to a number of problems in the application of financial theory. Some of these issues bear directly on the tests carried out in this paper. Due to the inherent illiquidity, indivisibility and lack of marketability in the property sector, it can perhaps be expected that the results achieved will be technically less efficient compared with those which, in principle, could be generated by managers of fixed income and equity funds. Fund managers will not be as able to deploy assets as effectively as in the capital markets, due to the nature of the asset. This is particularly so in the case of a property market within a small and open economy, such as Ireland.

The proxy used to measure the performance of the market as a whole is an additional issue which needs to be addressed. Lee (1993) notes that problems concerning the proxy are particularly important when the asset under examination is property due to the lack of an index that reflects the true nature of the market. Morrell (1993), states that property's heterogeneous nature leads to difficulties, as individual

* Simon A.W. Stevenson, Department of Banking & Finance, Raymond P Kinsella, and Ruairi S O'Healai, Centre for Insurance Studies all from Graduate School of Business, University College, Dublin.

IBAR - Irish Business and Administrative Research, Volume 18, 1997, pp 164-177

property returns will be diverse. Whilst this is also true for equities the important difference is that property investors cannot 'hold the index' as equity investors can. Morrell argues that not only is each property unique, but, equally, so too is each portfolio or index. Therefore he argues, "property portfolio selection can be seen as sampling from the total population without replacement".

Indivisibility, when combined with heterogeneity, causes a number of problems, in particular, specific risk is far more important in property portfolios. Brown (1988) examined the reduction of risk in property portfolios, and found that in order to explain in excess of 95% of the variation, a sample of two hundred properties was required. The corresponding figure in the case of equities is forty five stocks. This means that very few investors can construct a highly diversified property component that does not, at the same time, result in too high an allocation of property in the overall portfolio. The consequences of these factors are quite severe. The common assumptions in relation to risk - reduction which are taken for granted in the financial markets, do not apply in equal measure in property. The importance of specific risk attributable to particular properties means that few investors will be able to hold fully diversified property portfolios. This brings into focus the extent to which market wide indices are robust benchmarks.

A further problem is the common issue of autocorrelation being present in property returns. Due to the combined effect of valuation smoothing and temporal aggregation, or non-synchronous data, high degrees of autocorrelation can be found in property returns. In order to examine this issue, the timing and selectivity tests are run twice, once using the original series' and secondly using an adjusted series. The paper is laid out as follows. Section Two defines the methodological framework that this study will pursue, whilst Section Three details the data required, with particular attention paid to specific problems caused by the nature of the property market. Section Four outlines the empirical results generated, whilst Section Five presents the conclusions and implications of this study.

Methodological Framework

This section will briefly discuss the framework in which this study takes place and describe the three models used. The two parametric models will be discussed firstly, with the non-parametric model of Henriksson & Merton (1981) then described. Both of the parametric models are derived from the original work of Jensen (1968) using the mean variance framework of the CAPM (Capital Asset Pricing Model), which can be expressed as follows:

$$R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + \varepsilon_{it} \qquad (1).$$

Where R_{it} equals the one period return of the asset, R_{ft} is the risk free rate, R_{mt} is the return on the market portfolio and β represents the systematic risk of the asset in relation to the market portfolio. As the expected value of the error term is equal to zero, the portfolio

manager's success at selectivity can be measured through the intercept term. If selection policies are successful then the intercept will be positive, whilst if unsuccessful then it will be negative. The CAPM framework will however produce biased results, as noted by Fama (1972), Jensen (1972) and Grant (1977), as the intercept term, will be downwardly biased due to market timing effects, meaning that the effects of timing and selectivity cannot be examined separately. The parametric model developed by Henriksson & Merton (1981) allows for the use of observable returns and complies with the assumptions of the CAPM and multi-factor models, such as those of Merton (1973) and Ross (1976). Merton (1981) provided theoretical support for this model, with the concept that investment managers will either forecast that the market will outperform the riskless asset, or that the riskless asset will outperform the market. This can be encompassed by the Henriksson & Merton (1981) model, by assuming that assets are priced in accordance with the assumptions of the CAPM. The parametric model proposed by Henriksson & Merton (1981) can be expressed as follows:

$$R_{it} - R_{ft} = \alpha_i + \beta_{1i} (R_{mt} - R_{ft}) + \beta_{2i} [D_t (R_{mt} - R_{ft})] + \varepsilon_{it} \qquad (2).$$

The dummy variable contained in the model takes the value of zero when the market return is greater than that of the risk free asset, and a value of -1 when the risk free assets return exceeds that of the market. Therefore, when D=0 the model reduces to Equation (1), whilst when D=-1 the model reduces to the following.

$$R_{it} - R_{ft} = \alpha_i + (\beta_{1i} - \beta_{2i}) (R_{mt} - R_{ft})] + \varepsilon_{it} \qquad (3).$$

This shows that when the risk free assets return exceeds that of the market, indicating a bear market, then Equation (3) is the same as Equation (1), with the exception that the slope coefficient equals $(\beta_{1i} - \beta_{2i})$ instead of β_{1i}. The difference between Equations (3) and (1) means that β_{2i} can be used to measure the investment managers market timing, whilst the intercept term is used, as in Equation (1), as the measure for selectivity. There are, however, a number of problems with this model. Henriksson & Merton (1981), in their original paper, point out that the standard deviation of the error term is an increasing function of $(R_{mt} - R_{ft})$, meaning that it is necessary to correct for heteroscedasticity. However, both Henriksson (1984) and Chang & Lewelln (1984) find that empirical results differ little if weighted least squares is used in preference to ordinary least squares. Henriksson (1984) also notes the problems concerned with the specified return generating process. The author cites empirical studies of the CAPM by Black, Jensen & Scholes (1972), Blume & Friend (1973) and Fama & MacBeth (1973) all of whom found that the security market line (SML) does not hold for individual securities. These three studies found that the return on high beta securities was generally lower than that predicted by the SML, whilst for low beta securities the return was generally higher. Henriksson notes that if this is due

to a second factor which is uncorrelated with the market return, it will bias the results of the intercept, but not the beta coefficient. Henriksson feels that the existence of a zero beta factor should not affect the results obtained.

Henriksson also refers to Roll (1977) and his critique of the CAPM, and specifically the proxy chosen as the market portfolio. The use of a proxy means that the tests of the CAPM mentioned above can be questioned. Henriksson (op cit.) finds that there is a negative correlation between α and β_{2i} implying that those funds that earn superior returns from selectivity have negative market timing ability (similar results were also found by Kon, 1983). Possible sources of this problem noted by Henriksson are the use of a proxy for the market portfolio and the possible omission of factors that may be of importance to the return generating process. As these factors are not known, it is not possible to form a multi-factor version of the parametric model, instead, Henriksson (1984), adds a second factor to the model. This is based on the excess returns of an equally weighted portfolio of the funds used, taking account of the market, with the altered model expressed as follows:

$$R_{it} - R_{ft} = \alpha_i + \beta_{1i}(R_{mt} - R_{ft}) + \beta_{2i}[D_{1t}(R_{mt} - R_{ft})] + \beta_{3i}(R_{EWt} - R_{ft} - \beta_{EW}(R_{mt} - R_{ft})) + \beta_{4i}[D_{2i}(R_{EWt} - R_{ft} - \beta_{EW}(R_{mt} - R_{ft})]\varepsilon_{it} \quad (4).$$

The fourth expression in the model takes on the value of Max [0, w(t)], where w(t) equals the third expression. The dummy variable takes on the value of 0 when the return of the equally weighted portfolio exceeds that of the risk free asset, and -1 if the reverse occurs.

The second parametric model utilised in this study is that proposed by Chen & Stockum (1986) who extend the pure random coefficient model developed by Hildreth & Houck (1968) and Singh, Nagar, Chroudbry & Raj's (1976) variable mean response regression model. The authors propose that β_i can be specified using equation (5) if fund betas are adjusted following forecasts and that current market performance is an unbiased estimate of future performance.

$$\beta_i = \overline{\beta}_i + \lambda_i(R_{mt} - R_{ft}) + \mu_{it} \quad (5).$$

This equation decomposes the systematic risk into the target beta ($\overline{\beta}_i$), indicating the beta in the absence of market timing, the effect of market timing ($\lambda_i(R_{mt} - R_{ft})$) and the error term. The authors argue that the portfolio beta may change in the absence of market timing due to the different reposes of high and low beta stocks. The random error term allows the funds beta to alter due to non-systematic factors. If the funds beta is not nonstationary then $\beta_i = \overline{\beta}_i$, with Equation (5) reverting to Equation (1). If the fund manager does engage in market timing then the variability of the error term should not be statistically different from zero and λ_i should be statistically significant, with it's sign

indicating whether the manager has been successful in his/her timing decisions. If λ_i is not significant and the variability of the error term is not equal to zero, then the model descends to that of Francis & Fabbozi's (1980) pure random coefficient market model. If this is so, then changes in the beta of the fund can be stated to be caused by non-market related factors. However, if both the coefficient and the error term are statistically significant then a varying parameter model should be utilised as the nonstationary of the funds beta is caused by both market timing and random behaviour. The authors substitute Equation (5) into (1) to provide:

$$R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + \lambda_i (R_{mt} - R_{ft})^2 + \omega_{it} \qquad (6).$$

Where $\omega_{it} = (\varepsilon_{it} + \mu_{it}(R_{it} - R_{ft}))$. As with the Henriksson & Merton (1981) model, this term will be heteroscedastic, therefore both models will be modelled using OLS (Ordinary Least Squares) and then adjusted using the methods of Hansen (1982) and White (1980).

The non-parametric model developed by Henriksson & Merton (1981) allows the investigation of selectivity and market timing without the need to assume a CAPM framework. The model allows for the fact that while the conditional probabilities of a correct forecast can measure forecasting ability; they are not reliant on the return distributions. The null hypothesis of no market timing ability and can be formulated as follows.

$$\rho_1(t) + \rho_2(t) = 1 \qquad (7).$$

Under the null hypothesis n_1, the number of correct forecasts that $R_m(t) \leq R_f(t)$ is distributed hypergeomtric. The non-parametric model does, however, require a proxy for the use as forecasts. Koh, Phoon & Tan (1993) approached this problem by using changes in the allocation in the fund of the risk free asset and local equities. A similar approach is used in this paper. Asset splits for the funds used in this study are available from 1992, therefore we are able to use these and the corresponding changes in the allocation between property and the risk free asset.

Research Framework

For the purpose of this study we use Irish Pension Property Funds to test for market timing and selectivity of fund managers, eleven in the whole sample period and twenty six in the period 1992 to 1996, when the non-parametric model is examined. Three main problems were encountered in the creation of the fund sample. Firstly the time periods examined obviously limited the number of funds to those that were continuously traded during them. Secondly Irish regulation does not require fund managers to hold a minimum allocation in the core asset, the regulations merely stating that the funds should meet their stated objectives. In contrast, the United Kingdom requires that funds

hold at least 80% of their assets in investments appropriate to the specific fund category. This causes complications when attempting to collate a sample of funds from a specific category. Only those funds therefore that have a reasonably high allocation in the real estate sector were selected. The third problem relates to the lack of transparency in the Irish investment market, due to many of the providers of funds having more than one fund in a single category. However, similarities in returns on these funds indicates that these funds have the same asset base. The reason for this is that the company may have different management charging structures for each of the individual funds, therefore, while the underlying assets are the same, the investment vehicle will be given another name. For the purposes of this study, where two funds share the same asset base, but have marginally different returns, associated with different management charges, we have only included one of these Funds to avoid duplication.

The market proxy used is the JLW Index, thereby limiting the analysis to semi-annual data. The parametric tests are run over the full horizon of 1985 to 1996, however as already noted the non-parametric tests require asset splits, which in this case are only available from 1992. This does mean that some comparability is lost as it would be unfeasible to run the parametric models using semi-annual data over the four year period. It is however feasible to run the non-parametric test over such a short time horizon.

In addition, the tests will also be run using the adjusted JLW series as the market proxy. The aim of these tests will be to see if managers are more responsive to the adjusted series than to the original. If this is the case then it could be argued that property fund managers realise that the full volatility of the property market is not captured by the original smoothed series. The market proxy is adjusted for autocorrelation using the model proposed by Geltner (1993). The main advantage that this model has over models such as those developed by Blundell & Ward (1987) and Firstenberg, Ross & Zisler (1988), is that no assumption of market efficiency is made. This point is particularly important due to the fact that previous empirical work points to the real estate market not conforming with weak form informational efficiency. The Geltner (1993) model assumes that whilst some of the valuation error may be purely random, some may be systematic and due to the valuation process and the methodology used in index construction. The systematic part will result in smoothing of data due to valuers having incomplete information and being influenced by past values. The model applies a reverse filter to recover the underlying true return, as shown below:

$$r_t'' = \frac{(r_t^* - (1 - \alpha)\, r_{t-1}^*)}{\alpha} \qquad (8).$$

Where r_t'' is the unobserved true return, r_t^* is the observed appraised value and α is a parameter between 0 and 1. If no smoothing is present in the returns then α's value is equal to 1. Unlike the Blundell & Ward (1987) model the figure given to the parameter

can not be estimated statistically. Rather, it is a subjective assessment, using the available information on the return series'. In terms of the analysis undertaken for this paper the return series for all the property indices were examined and figures for α that were felt to be appropriate were used. In addition to following the approach advocated by Geltner (1993) and Barkham & Geltner (1994, 1995) in analysing the returns, the estimated risk measures were then compared against the figures obtained using the Blundell & Ward (1987) and Brown & Matysiak (1996) estimations. Stevenson (1997, 1998) provides further details of the application of this correction model to the Irish property market.

Empirical Results

This final section of this paper examines the empirical results obtained from the parametric and non-parametric tests used in this study. As mentioned previously, it would be expected that the results from this analysis will not be as good as with managers of equity and fixed income funds. This is primarily due to the illiquidity in the real estate market and the limiting effect this has on managers due to take up an active management position. These results will allow comparison with the work of Lee (1993) who examined UK funds and will also allow comparisons to be made between the results obtained using three different models of timing and selectivity. In addition, the results from this section may provide valuable information concerning how property fund managers evaluate the direct market. Both the original and adjusted series' will be used in this analysis. If the results point to better forecasting ability using the adjusted series then this would provide some degree of evidence that managers are aware of the problems of performance measurement in the direct market and adjust their expectations accordingly. Initially the two parametric models will be examined, followed by the results from the non-parametric model proposed by Henriksson & Merton (1981).

Table 1: Parametric Henriksson & Merton Model

Original Tests	α	$\beta 1$	$\beta 2$	$\beta 3$	$\beta 4$
Average	-0.02372	3.5287	1.0922	2.3971	0.3120
Min	-0.0850	-14.88	-2.5129	-15.165	-2.453
Max	0.035	19.192	4.1938	18.664	1.8191
No Pos	2	9	8	8	8
No Neg	9	2	3	3	3
No Positive Significant	0	0	3	0	1
No Negative Significant	3	0	0	1	0
No Positive Significant (adjusted)	0	0	4	0	4
No Negative Significant (adjusted)	4	2	1	1	2

Table 2: Parametric Henriksson & Merton Model: Adjusted Property Series

Original Tests	α	β1	β2	β3	β4
Average	-0.0873	0.1871	0.2082	-0.1065	0.272
Min	-0.8082	-3.5413	-0.3566	-3.7446	-0.2358
Max	0.0108	4.5944	0.9977	4.2809	0.7588
No Pos	3	4	5	4	9
No Neg	8	7	6	7	2
No Positive Significant	0	0	0	0	0
No Negative Significant	2	0	0	0	0
No Positive Significant (adjusted)	0	0	0	0	2
No Negative Significant (adjusted)	2	0	0	0	0

Tables 1 to 4 show the summary results from the two parametric models used in this study. All the tables contain the average coefficients and constant figure from the relevant regression equations. In addition, they contain the minimum and maximum figures and the number of coefficients in each sample that are positive and negative. The final piece of information refers to the number of coefficients that are significant at a 10% level, firstly using the original model and secondly after adjustment for heteroscedasticity.

The Henriksson & Merton (1981) parametric model is examined first, with summary results in Tables One and Two. Table 1 shows the summary figures using the original market proxy, whilst the second table contains the results when the adjusted ILW series was used as the market proxy. To briefly re-cap the intercept can be viewed as a measure of the fund managers selection ability, the second coefficient measures timing ability, the third coefficient is the fund factor and the fourth coefficient is a measure of timing ability against the other funds. The results are generally in line with existing empirical evidence. Little selectivity ability is found with an average negative coefficient across the eleven funds. Of the eleven funds only two produced a positive coefficient though neither was significant at a 10% level. As with many of the previous studies, a significant negative correlation was found between the timing and selection ability of fund managers, with relatively good timing ability being found. Eight of the funds showed a positive coefficient, three of which were significant.

These results are not totally in line with Lee's (1993) findings, as he found very little difference in both categories between funds with positive and negative coefficients, although like this study a negative correlation was found between timing and selectivity. The results found here would perhaps be more intuitively appealing as it can be seen that property managers would find it easier to time the market overall, rather than show exceptional ability for selecting individual properties. This is primarily due to the heterogeneous nature of the asset on the selectivity side and the smoothed nature of the property market on the timing side.

In terms of the fund factor eight of the funds produced a positive coefficient, although none of them was significant. With regard to market timing ability against other funds, again eight funds had positive coefficients, with one significant. The average coefficient for both of these factors is positive. The result concerning the fund factor does indicate that there is a possibility that the model is mis-specified or that other relevant factors have been omitted from the model. Lee (1993) notes that this result can also be taken to indicate the fund pursue similar investment strategies which differ from the market proxy. When the regressions are run again after correcting for heteroscedasticity, then the number of significant coefficients does increase.

The use of the adjusted property series is designed to tests whether fund managers implicitly acknowledge that the market proxy may not be fully representative of the market. The results obtained using the Henriksson & Merton model does not support this hypothesis as the results are poorer than when the original JLW series is used as the market proxy. Whilst the average measures of timing and selectivity remain positive and negative respectively, the split between positive and negative coefficients narrows. In the case of timing ability, the number of positive coefficients falls to five, with six negative. In addition, the number of significant coefficients falls dramatically, with only two of the negative intercept terms being significant using the original data series. When the results are adjusted for heteroscedasticity, then the only increase in significance is the addition of two positive fund timing coefficients.

Tables 3 and 4 show the results for the Chen & Stockum (1986) model, again the results being conducted using the original and adjusted JLW series as the market proxy. As with the Henriksson & Merton (1981) model the intercept can be interpreted as measuring selectivity, whilst the second coefficient can be viewed as measuring fund managers timing ability. The initial tests produce similar results to those obtained with the Henriksson & Merton model, with a negative average intercept term and a positive

Table 3: Chen & Stockum Model

Original Tests	α	$\beta 1$	$\beta 2$
Average	-0.0182	0.6081	3.8819
Min	-0.0607	0.13877	1.7914
Max	-0.0027	1.006	9.2389
No Pos	0	11	11
No Neg	11	0	0
No Positive Significant	0	9	1
No Negative Significant	3	0	0
No Positive Significant (adjusted)	0	10	0
No Negative Significant (adjusted)	3	0	0

Table 4: Chen & Stockum Model: Adjusted Property Series			
Original Tests	α	$\beta 1$	$\beta 2$
Average	-0.006	0.3872	-0.6888
Min	-0.0303	0.2467	-2.1323
Max	0.0135	0.5956	0.5152
No Pos	5	11	1
No Neg	6	0	10
No Positive Significant	0	11	0
No Negative Significant	2	0	0
No Positive Significant (adjusted)	0	11	0
No Negative Significant (adjusted)	4	0	0

average timing coefficient. In addition, all of the eleven funds produce negative intercepts and positive second coefficients. The main shortcoming with these results is the lack of significant results. Only three of the intercepts and one of the timing coefficients are significant at a 10% level. In addition, when the data is adjusted for heteroscedasticity, no timing coefficients are found to be significant.

When the models are run using the adjusted market proxy, a number of changes occur, with the results at odds with the remaining results. Whilst the average intercept term remains negative only six of the individual terms are negative. In addition when the adjusted data is used, the average timing coefficient is negative. This result is reinforced by the fact that ten of the funds have negative coefficients. It is obvious from these results that according to this model, if the assumption is taken that managers are able to time the market, they do so with the original market proxy in mind.

Table 5 shows the results from the Henriksson & Merton (1981) non-parametric test for market timing. As mentioned in previously, due to data limitations this analysis

Table 5: Non-Parametric Henriksson & Metton Model		
	Original Market Proxy	*Adjusted Market Proxy*
N1	45	60
N2	75	60
N	120	120
n1	22	35
n2	27	23
n	81	81
Prob (n1 $\geq$ 22 & 35)	0.000622	0.015918

does not use the same time period as the parametric tests. Whilst the parametric models were examined over the period 1985 to 1996, the need for asset splits means that the following tests only take place from 1992. This does however mean that a broader sample size is available. Comparable parametric tests were felt to be unfeasible over such a short time horizon due to the semi-annual nature of the market proxy. The terminology used in the tests can be defined as follows. The number of actual outcomes where $R_m \leq R_f$ is denoted by N, N_1 can be defined as the number of outcomes where $R_m > R_f$, n_1 is the number of correct forecasts that $R_m \leq R_f$, n_2 is the number of correct forecasts that $R_m > R_f$ and n is the total number of forecasts that $R_m \leq R_f$. The results how the null hypothesis of no market timing ability is rejected at the 1% level using the original property series and at just over 1% when it the market proxy is adjusted. As with the parametric tests, the results are not as good when the adjusted direct market series is used. This could support the arguments suggested earlier that if the assumption is made that managers can time the market, then it is the original series' that is being assessed.

Conclusion

The purpose of this paper was to test the market timing and selectivity of property fund managers, in this case in the Irish market. The issues of timing and selectivity are problematic in examining in the case of the property sector due to a number of unique characteristics of the market, such as indivisibility, the presence of autocorrelation in the return series and illiquidity.

Previous studies have generally found inconclusive results provided little robust evidence that investment managers can generate positive market timing and selectivity. The empirical data presented in this paper are encompassed in a range of scenarios using unadjusted as well as adjusted data. The timing tests that have been undertaken provide generally consistent results, with good results for the timing ability of managers. The one note of caution that should be made is that the number of significant individual timing coefficients is small for both of the parametric models. The results for selection ability are not encouraging, though the overall picture, in that there is a negative correlation between the two measures is consistent with previous evidence. The poor selection ability though is plausible due to the nature of the asset under examination.

References

Admati, A.R. & Ross, S.A. (1985). "Measuring Investment Performance in a Rational Expectations Equilibrium Model". *Journal of Business*. 58. pp 1-26.

Admati, A.R., Bhattacharya, S., Pfleiderer, P. & Ross, S.A. (1986). "On Timing and Selectivity". *Journal of Finance*. 41 (3). pp 715-732.

Barkham, R.J. & Geltner, D. (1994). "Unsmoothing British Valuation Based Returns Without Assuming an Efficient Market". *Journal of Property Research*. 11 (2). pp 81-95.

Barkham, R.J. & Geltner, D. (1995). "Price Discovery in American and British Property Markets". *Real Estate Economics*. 23 (1). pp 21-44.

Bhattacharya, S. & Pfleiderer, P. (1983). "*A Note on Performance Evaluation*". Technical Report 714, Stanford University.

Black, F. (1972). "Capital Market Equilibrium with Restricted Borrowing". *Journal of Business*. Vol 45 No.3. July. pp 444-455.

Black, F., Jensen, M.C. & Scholes, M. (1972). "The Capital Asset Pricing Model: Some Empirical Tests". in Jensen, M.C. (ed). "*Studies in the Theory of Capital Markets*". New York: Praeger.

Blume, M.E. (1971). "On the Assessment of Risk". *Journal of Finance*. 26 (1). March. pp 1-10.

Blume, M.E. & Friend, I. (1972). "A New Look at The Capital Asset Pricing Model". *Journal of Finance*. 28. March. pp 19-34.

Blundell, G.F. & Ward, C.W.R. (1987). "Property Portfolio Allocation: A Multi-Factor Model". *Land Development Studies*. 4. pp 145-156.

Breen, W., Jagannathan, R. & Ofer, A.R. (1986). "Correcting for Hetroscedasticity in Tests for Market Timing Ability". *Journal of Business*. 59 (4). pp 585-598.

Brown, G.R. (1988). "Reducing the Dispersion of Returns In UK Real Estate Portfolio's". *Journal of Valuation*. 6(2). pp 127-147.

Brown, G.R. & Matysiak, G.A. (1996). "A Note on the Periodic Conversion of Measures of Risk". *Journal of Property Research*. 13 (1). pp 17-30.

Chang, E.C. & Lewellen, W.G. (1984). "Market Timing and Mutual Fund Investment Performance". *Journal of Business*. 57 (1). pp 57-72.

Chang, E.C. & Lewellen, W.G. (1985). "An Arbitrage Pricing Approach to Evaluating Mutual Fund Performance". *Journal of Financial Research*. 8 (1). pp 15-30.

Chen, C.R. & Stockum, S. (1986). "Selectivity, Market Timing and Random Behavior of Mutual Funds: A Generalised Model". *Journal of Financial Research*. Spring. pp 87-96.

Chen, C.R., Lee, C.F., Rahman, S. & Chan, A. (1992). "A Cross-Sectional Analysis of Mutual Funds' Market Timing and Security Selection Skill". *Journal of Business*. 19 (5). September. pp 659-675.

Fabozzi, F.J. & Francis, J.C. (1979). "Mutual Fund Systematic Risk for Bull and Bear Markets: An Empirical Investigation". *Journal of Finance*. 34 (5). pp 1243-1250.

Fama, E.F. & MacBeth, J.D. (1973). "Risk, Return and Equilibrium: Empirical Tests". *Journal of Political Economy*. pp 607-636.

Fama, E.F. (1972). "Components of Investment Performance". *Journal of Finance*. 27 (3). pp 551-567.

Firstenberg, P.M., Ross, S.A. & Zisler, R.C. (1988). "Real Estate: The Whole Story". *Journal of Portfolio Management*. Spring. p 22-32.

Fletcher, J. (1995). "An Examination of The Selectivity and Market Timing Performance of UK Unit Trusts". *Journal of Business Finance & Accounting*. 22 (1). January. pp 143-156.

Francis, J.C. & Fabozzi, F.J. (1979). "Stability of Mutual Fund Systematic Risk Statistics". *Journal of Business Research*. June. pp 263-275.

Geltner, D. (1993). "Estimating Market Values from Appraised Values Without Assuming an Efficient Market". *Journal of Real Estate Research*. 8 (3). pp 325-345.

Giliberto, S.M. (1992). "Real Estate Risk & Return 1991 Survey Results". Real Estate Research Paper, Salomon Brothers Inc., March.

Grant, D. (1977). "Portfolio Performance and the "Cost" of Timing Decisions". *Journal of Finance*. 33 (3). pp 837-846.

Hansen, L.P. (1982). "Large Sample Properties of Generalised Method of Moments Estimates". *Econometrica*. 50. pp 1029-1054.

Henriksson, R.D. (1984). "Market Timing and Mutual Fund Performance: An Empirical Investigation". *Journal of Business*. 57 (1). pp 73-96.

Henriksson, R.D. & Merton, R.C. (1981). "On Market Timing and Investment Performance. 2. Statistical Procedures for Evaluating Forecasting Skills". *Journal of Business*. 54 (4). pp 513-533.

Hildreth, C. & Houck, J. (1968). "Some Estimators for a Linear Model with Random Coefficient". *Journal of the American Statistical Association*. June. pp 584-595.

Jagannathan, R. & Korajczyk, R.A. (1986). "Assessing the Market Timing Performance of Managed Portfolios". *Journal of Business*. 59 (2). pp 217-235.

Jensen, M.C. (1968). "The Performance of Mutual Funds in the Period 1945-1965". *Journal of Finance*. May. pp 389-416.

Jensen, M.C. (1969). "Risk, The Pricing of Capital Assets and The Evaluation of Investment Portfolios". *Journal of Business*. Vol. 42 No. 2. April. pp 167-247.

Jensen, M.C. (1972). "Optimal Utilization of Market Forecasts and the Evaluation of Investment Performance". in Szego, G.P. & Shell, K. (eds.) *Mathematical Methods in Investment and Finance*. Amsterdam: Elsevier.

Kenneally, M. & Gallagher, L. (1992). "The Irish Unit Fund Industry: Structure & Performance". *The Economic & Social Review*. 23 (4). July. pp 397-422.

Koh, F., Phoon, K.F. & Tan, C.H. (1993). "Market Timing Abilities of Fund Managers: Parametric and Non-Parametric Tests". *Journal of Business Finance & Accounting*. 20 (2). January. pp 155-166.

Kon, S.J. & Jen, F.C. (1979). "The Investment Performance of Mutual Funds: An Empirical Investigation of Timing, Selectivity and Market Efficiency". *Journal of Business*. 52 (2). pp 263-289.

Kon, S.J. (1983). "The Market Timing Performance of Mutual Fund Managers". *Journal of Business*. 56 (3). pp 323-347.

Lee, S.L. (1993). "*The Timing and Selection Ability of UK Property Funds: An Empirical Investigation*". Working Papers in Land Management & Development. No. 12. University of Reading.

MacGregor, B.D. & Nanthakumaran, N. (1992). "The Allocation to Property in the Multi-Asset Portfolio: The Evidence and Theory Reconsidered". *Journal of Property Research*. 9 (1). pp 5-32.

Merton, R.C. (1973). "An Intertemporal Capital Asset Pricing Model". *Econometrica*. 41 (5). pp 867-887.

Merton, R.C. (1981). "On Market Timing and Investment Performance. 1. An Equilibrium Theory of Value for Market Forecasts". *Journal of Business*. 54 (3). pp 363-406.

Morrell, G.D. (1993). "Value-Weighting and the Variability of Real Estate Returns: Implications for Portfolio Construction and Performance Evaluation". *Journal of Property Research*. 10 (3). pp 167-183.

Mossin, J. (1966). "Equilibrium in a Capital Asset Market". *Econometrica*. 34 (4). October. pp 768-783.

Newell, G. & MacFarlane, J. (1996). "Risk Estimation and Appraisal Smoothing in UK Property Returns". *Journal of Property Research*. 13 (1). pp 1-12.

Roll, R. (1977). "A Critique of the Asset Pricing Theory's Tests. Part 1: On Past and Potential Testability of the Theory". *Journal of Financial Economics*. 4. pp 129-176.

Ross, S.A. (1976). "The Arbitrage Theory of Capital Asset Pricing". *Journal of Economic Theory*. December. pp 343-362.

Sharpe, W.F. (1964). "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk". *Journal of Finance*. Vol. 19 No. 3. September. pp 425-442.

Singh, B., Nagar, L., Choudbry, N.K. & Raj, B. (1976). "On The Estimation of Structural Change: A Generalisation of the Random Coefficient Regression Model". *International Economic Review*. pp 340-361.

Stevenson, S.A.W., (1997). "Irish Commercial Property as a Portfolio Asset: Its Contribution to Risk Reduction." *Journal of Property Valuation & Investment*. Vol. 15 No. 4. pp 337-354.

Stevenson, S.A.W., (1998). "Real Estate's Role in an International Multi-Asset Portfolio: Empirical Evidence using Irish Data." Journal of Property Research. Forthcoming.

White, H. (1980). "A Heteroscedasticity-Consistent Covariance Matrix and a Direct Test for Heteroscedasticity". *Econometrica*. 48. pp 817-838.