Market direction and moment seasonality: evidence from Irish equities
Brian M. Lucey

Online publication date: 06 October 2010

To cite this Article Lucey, Brian M.(2002) 'Market direction and moment seasonality: evidence from Irish equities', Applied Economics Letters, 9: 10, 657 — 664
To link to this Article: DOI: 10.1080/13504850110117841
URL: http://dx.doi.org/10.1080/13504850110117841

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: http://www.informaworld.com/terms-and-conditions-of-access.pdf

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.
Market direction and moment seasonality: evidence from Irish equities

BRIAN M. LUCEY
School of Business Studies, Trinity College Dublin, Dublin 2, Ireland

The first four moments of four indices of equity returns produced by the Irish Stock Exchange are examined across different market directions. Using standard F, Kruskal–Wallis and Levene tests daily seasonality is confirmed in all, although in a pattern different to that found elsewhere. In particular, there appears to be a Wednesday effect in mean returns and, counter to evidence elsewhere, daily seasonality appears stronger in rising than falling markets. In addition, this note applies a method introduced by Tang (Journal of Economics and Business, 21(1), 1997) in finding a daily seasonal in skewness and kurtosis.

I. INTRODUCTION

The knowledge that their exists daily seasonality in equity returns is not new. Maberly (1995) indicates that by the early 1930s US researchers (Fields, 1931; Kelly, 1930) were aware of the tendency of stocks to decline on Mondays. Cross (1973) and French (1980) analysed Friday close–Monday close data, leading to the effect being known as the Monday effect, the assumption being that the negative return was a product of events occurring during Monday trading. However, Rogalski (1984) and Harris (1986) indicated that the effect manifested itself in lower Monday opening, perhaps being better called a weekend effect.

Since these papers, a large amount of confirmatory data for US indices has emerged, examples being Lakonishok and Levi (1982) on CRSP indices, Lakonishok and Smitd (1988) on the Dow Jones and Kohers and Kohers (1995) on the NASDAQ. These and many other papers have reinforced the pattern of Monday having the lowest, often negative, return despite having the highest, or higher than average, risk is proxied by standard deviation.


Few studies have examined equity returns in Ireland. Donnelly (1991) finds a negative Tuesday, with Thursday providing the highest return. Lucey (1994) finds a negative Tuesday over the 1987–1991 period with evidence of a day-of-the-week effect in official stock market indices, while Lucey (2000) finds a midweek over the 1973–1998 period, using Datastream indices. A significant and positive Wednesday and Thursday effect, unusual in this literature, was found.
II. PREVIOUS RESEARCH ON MARKET DIRECTION

There is also evidence that daily seasonality varies according to market direction. Steely (1999) analyses the issue in the UK, dividing the data into positive and negative returns sets, but finding no evidence of daily seasonality over positive returns, while finding such evidence both when the market is analysed over negative returns, and in aggregate. Jaffe and Westerfield (1985) and Agrawal and Tandon (1994) analyse the Monday return in a variety of markets, partitioning the data according to the return on the previous Friday. Again, the effect is stronger in the subsample that corresponds to negative Friday returns. Liang et al. (1992) introduce a further partitioning as to whether the economy is expanding or contracting. As before the effect is stronger in negative regimes. However, these approaches assume that the relevant day of interest is Monday.

III. PREVIOUS RESEARCH ON HIGHER MOMENTS

While much of the published research on equity returns concentrates on mean-variance analysis, there is theoretical and empirical evidence that higher moments merit investigation. From a theoretical perspective, Lee and Wu (1985) show how kurtosis impacts on the stationarity of standard deviation; Conine and Tamarkin (1981) show how higher moments affect diversification in investors portfolios, and Scott and Horvath (1980) show that, under common utility functions, investors have a preference for even moments (kurtosis) and are averse to odd moments (skewness). Despite this, there exists considerably less documentation on the daily variation in these higher moments. Two papers that have addressed this issue are Aggarwal and Schatzberg (1997) and Tang (1997). Both find that there exists a significant daily variation in higher moments. Aggarwal and Schatzberg (1997) calculate aggregate skewness and kurtosis across firm size classes and weekdays, and examine these directly using ANOVA and Kruskal–Wallis measures. A difficulty with this approach is that it requires, in effect, a rolling estimate of the average skewness and kurtosis of the sample. Tang (1997) adopts a different approach, one that is followed here. It was noted that as the Kolmogorov–Smirnov test is effectively a test of the equality of two distributions, it can equally be used, in appropriate circumstances, to test the equality of higher moments as between various realizations. The finding is that, for a variety of sectoral indices, the equality of higher moments cannot be accepted.

IV. DATA

Daily percentage returns to four indices are examined in this paper: the Irish Stock Exchange Official Price Index (ISEQ), a total returns version of this (ISEQQR), and the Irish Stock Exchange Financial Sector and Industrial Sector Index (ISEFIN and ISEGGEN). The ISEQ and ISEQQR are available from 4 January 1988 and the ISEFIN/ISEGEN from 4 February 1989. The data are analysed to end December 1998. After this period the introduction of the Euro for financial transactions can be expected to have a major impact on the distribution of the indices.

V. METHODOLOGY

The regression approach pioneered by French (1980) is used to test the first moment. This is buttressed by the nonparametric Kruskal–Walls H test. The formal regression is

\[ R_t = \sum_{i=1}^{n} \alpha_i D_i + \varepsilon_t \]  

(1)

where the number of \( D \), dummy variables, corresponds to the number of trading days in the market under investigation, here 5. Testing proceeds by means of a standard F test, examining the hypothesis that the individual coefficients on the dummy variables are equal to one another. Typically the individual coefficients \( t \) statistics are reported, as in Table 2, to assist evaluation of the extent to which they differ from zero. If the realized return was the same for all days-of-the-week, then the dummy coefficients should be individually close to zero and the explanatory power of the equation as a whole as measured by the \( F \) test would be weak.

The Kruskal–Wallis test is one of the most powerful of the nonparametric tests for comparing two populations. Let \( R_{ij} \) be the average rank of returns to the index in the \( j \)th day and \( n_j \) be the number of observations in the \( j \)th group. Then with \( k \) groups and \( N \) observations in total the Kruskal–Wallis H statistic is

\[ H = \left( \frac{12}{N(N+1)} \sum_{j=1}^{k} \frac{R_{ij}^2}{n_j} \right) - 3(N+1) \]  

(2)

The \( H \) statistic is distributed as a \( \chi^2 \) distribution with \( N \) degrees of freedom. For testing the second moment the Levene test can be used. The Levene test tests the following hypotheses: \( H_0: \sigma_i = \sigma_j \); \( H_a: \sigma_i \neq \sigma_j \) at least one \( i,j \) pair. The test statistic is defined as in Equation 3:

\[ W = \frac{(N-k) \sum_{i=1}^{k} N_i (\bar{Z}_i - \bar{Z})^2}{(k-1) \sum_{i=1}^{k} \sum_{j=1}^{n_i} (Z_{ij} - \bar{Z}_i)^2} \]  

(3)

where \( Z_{ij} = |Y_{ij} - \bar{Y}_i|; \bar{Y}_i \) the median of subgroup \( i \).
Testing the two higher moments is more problematic however. In the absence of knowledge of the sample distribution of skewness or kurtosis no parametric test is possible. Tang (1997) proposes a solution, although using it, it is not possible to distinguish between seasonality in skewness and that of kurtosis. Relying on the fact that the standard scores of a variable preserve skewness and kurtosis he proposes the use of the Kolmogorov–Smirnov test to compare whether the distribution, of standard scores, as between each day of the week and each other, is equal. Testing involves partitioning each index according to the day of the week and standardizing on this day. Here, as this note is also concerned with the market direction, the data are further partitioned according to market direction. The \( K-S \) test tests the maximum vertical difference between the two observed cumulative distributions (standard scores of \( day_i \) and standard scores of \( day_j \)).

\[
K S = \max_{1 \leq i \leq N} |SCD_{n}(i) - SCD_{n}(j)|
\]

The asymptotic test statistic is \( KS \sqrt{n} \).

VI. RESULTS

Table 1 shows details of the first four moments of the indices, by day of the week and according to market direction. Two issues are immediately noticeable from this. The first is that the typical pattern found internationally of the market opening low and closing high is not evident here, especially in Panel A, the results for all days. The second is the importance of Wednesdays.

Overall, the day on which mean return is highest is Wednesday, with the lowest Monday, except in the case of the total return index, where Friday is lowest. Wednesday is also associated with high, positive, skewness and low kurtosis, while Monday is associated with low kurtosis.

Panel B shows moments by day, for positive returns. Wednesday is the highest mean return day for the ISEQ and for ISEFIN, and the second highest in ISEQR and in ISEGEN. In both of the latter Monday returns are highest of the week, while in all cases the returns on Friday are lowest of the week. Again, risk patterns are not in line with the return patterns. Wednesday is also associated with low kurtosis, although in contrast to the overall, when returns are positive Wednesday is also associated with low skewness.

Panel C shows moments by day, for negative returns. The patterns here are not as clear. Wednesday returns are highest only in ISEQR, being second highest (to Thursday) in ISEQ and ISEGEN. Tuesday returns are highest in ISEFIN. Monday returns are lowest in the ISEQ and ISEQR, but for ISEGEN and ISEFIN it is Tuesday and

<table>
<thead>
<tr>
<th>Days of the week</th>
<th>Panel A: Results for all days</th>
<th>Panel B: Results for positive returns</th>
<th>Panel C: Results for negative returns</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ISEQ</td>
<td>ISEQR</td>
<td>ISEFIN</td>
</tr>
<tr>
<td>Monday</td>
<td>510</td>
<td>510</td>
<td>462</td>
</tr>
<tr>
<td>Tuesday</td>
<td>565</td>
<td>565</td>
<td>512</td>
</tr>
<tr>
<td>Wednesday</td>
<td>568</td>
<td>568</td>
<td>514</td>
</tr>
<tr>
<td>Thursday</td>
<td>568</td>
<td>568</td>
<td>515</td>
</tr>
<tr>
<td>Friday</td>
<td>567</td>
<td>567</td>
<td>513</td>
</tr>
<tr>
<td>Total</td>
<td>2778</td>
<td>2778</td>
<td>2516</td>
</tr>
</tbody>
</table>

(Continued)
Friday respectively. Again, there is little match between the relative rankings of daily mean returns and daily high risk profiles. Wednesday continues to show low kurtosis and low (although negative) skewness.

Table 2 shows the results of tests for the presence of daily seasonality in the first two moments. When measured across all days the ISEQ, ISEQR and and ISEFIN indices exhibit a day of the week effect in mean returns. The evidence is stronger from parametric tests than non-parametric. In the case of the second moment, the Levene test indicates that we can reject the null of equality of variance at a 5% level for ISEQ and at a 10% level for ISEQR. The null of equality in the second moment cannot be rejected for the ISEFIN or
ISEGEN indices. Thus some evidence is found for daily seasonality in the first and second moment. When the data are partitioned a different pattern is observed. For negative returns the hypothesis of equality in both the first moment (mean returns) and the second (variance) for all indices can be rejected. In the case of positive returns while evidence for a daily seasonal in the first moment is found from parametric testing, nonparametric tests lead to an inability to reject the hypothesis of equality and thus lead to a conclusion of no daily seasonal. No evidence is found for a daily seasonal in the second moment.

Table 2. Testing for the presence of daily seasonality in the first two moments

<table>
<thead>
<tr>
<th></th>
<th>Panel A: Results for all days</th>
<th></th>
<th>Panel B: Days with negative returns</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Monday</td>
<td>Tuesday</td>
<td>Wednesday</td>
</tr>
<tr>
<td>ISEQ</td>
<td>0.106</td>
<td>1.848</td>
<td>3.114</td>
</tr>
<tr>
<td>ISEQR</td>
<td>1.879</td>
<td>1.956</td>
<td>3.066</td>
</tr>
<tr>
<td>ISEFIN</td>
<td>0.436</td>
<td>2.256</td>
<td>2.359</td>
</tr>
<tr>
<td>ISEGEN</td>
<td>0.226</td>
<td>0.573</td>
<td>2.103</td>
</tr>
</tbody>
</table>

(Continued)
Table 3 shows the results of applying the Kolmogorov–Smirnov test for equality of distributions to each pair of standard scores of the indices. The evidence is that for ISEQ and ISEQR the distributions across the days of the week are statistically (at a 5% level) similar when all data are considered. This is markedly different to the situation for ISEFIN and ISEGEN, where eight and six pairs of days reject the equality of distributions, at a 5% level.

As for the first two moments, partitioning the data provides different results. While ISEGEN rejects equality in nine of ten pairs, ISEFIN rejects in only five pairs, of which two are common with the index measured across all days. ISEQ rejects the data on three days, all involving Monday. These pairs are also rejected for ISEFIN. No evidence is found for ISEQR that the distributions differ across days of the week. Partitioning the data on negative days only, ISEGEN rejects equality of distribution on seven of ten pairs, ISEFIN on nine of ten. This seems to indicate that for industrial companies the daily seasonal in higher moments is more readily detected, perhaps therefore stronger, in rising than falling markets. For financial companies the reverse is the case. Finally, ISEQ rejects equality in six pairs, only one of which is common with the rejection in rising markets. This indicates that the pattern of seasonality in higher moments for the official price index is both stronger in rising markets and differs as whether the market is rising or falling.

Of the three indices that show pairs of days as being different in their distribution, one pair, Tuesday–Wednesday, is rejected across the three market directions for ISEGEN and the Wednesday–Thursday pairing for all three conditions for ISEFIN. ISEQ, when the market is rising, rejects the equality of days involving Monday–Tuesday, Monday–Wednesday and Monday–Thursday. When the market is falling however only Monday–Wednesday remains, the other rejections occurring on Monday–Friday, Tuesday–Wednesday, Tuesday–Friday, Wednesday–Thursday and Thursday–Friday.

VI. CONCLUSION

This paper has outlined daily patterns in the first four moments, mean, standard deviation, skewness and kurtosis, of the main equity indices on the Irish stock exchange. The evidence indicates that the typical pattern found internationally in terms of mean returns to equities is not detected here. There appears to be an important role for Wednesday returns. The pattern found internationally, of seasonality being more easily detected and detected in stronger statistical terms when the market is partitioned into negative returns, as opposed to positive or all returns, is evident. Testing for the equality of higher moments indicates that this situation is not evident, some indices show-
<table>
<thead>
<tr>
<th></th>
<th>All days</th>
<th>Positive days</th>
<th>Negative days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ISEQ</td>
<td>ISEQR</td>
<td>ISEF1N</td>
</tr>
<tr>
<td>Monday–Tuesday</td>
<td>K-S Z statistic</td>
<td>0.768</td>
<td>0.777</td>
</tr>
<tr>
<td>Sig.</td>
<td></td>
<td>0.597</td>
<td>0.582</td>
</tr>
<tr>
<td>Monday–Wednesday</td>
<td>K-S Z statistic</td>
<td>1.353</td>
<td>1.301</td>
</tr>
<tr>
<td>Sig.</td>
<td></td>
<td>0.051</td>
<td>0.068</td>
</tr>
<tr>
<td>Monday–Thursday</td>
<td>K-S Z statistic</td>
<td>0.890</td>
<td>1.041</td>
</tr>
<tr>
<td>Sig.</td>
<td></td>
<td>0.406</td>
<td>0.228</td>
</tr>
<tr>
<td>Monday–Friday</td>
<td>K-S Z statistic</td>
<td>1.245</td>
<td>1.225</td>
</tr>
<tr>
<td>Sig.</td>
<td></td>
<td>0.090</td>
<td>0.099</td>
</tr>
<tr>
<td>Tuesday–Wednesday</td>
<td>K-S Z statistic</td>
<td>1.136</td>
<td>1.225</td>
</tr>
<tr>
<td>Sig.</td>
<td></td>
<td>0.152</td>
<td>0.099</td>
</tr>
<tr>
<td>Tuesday–Thursday</td>
<td>K-S Z statistic</td>
<td>0.527</td>
<td>0.565</td>
</tr>
<tr>
<td>Sig.</td>
<td></td>
<td>0.944</td>
<td>0.907</td>
</tr>
<tr>
<td>Tuesday–Friday</td>
<td>K-S Z statistic</td>
<td>0.915</td>
<td>0.996</td>
</tr>
<tr>
<td>Sig.</td>
<td></td>
<td>0.372</td>
<td>0.275</td>
</tr>
<tr>
<td>Wednesday–Thursday</td>
<td>K-S Z statistic</td>
<td>1.187</td>
<td>1.187</td>
</tr>
<tr>
<td>Sig.</td>
<td></td>
<td>0.120</td>
<td>0.120</td>
</tr>
<tr>
<td>Wednesday–Friday</td>
<td>K-S Z statistic</td>
<td>1.351</td>
<td>1.440</td>
</tr>
<tr>
<td>Sig.</td>
<td></td>
<td>0.052</td>
<td>0.032</td>
</tr>
<tr>
<td>Thursday–Friday</td>
<td>K-S Z statistic</td>
<td>0.898</td>
<td>0.957</td>
</tr>
<tr>
<td>Sig.</td>
<td></td>
<td>0.396</td>
<td>0.319</td>
</tr>
</tbody>
</table>
ing greater variation in moments in rising than falling markets. In addition, there are indications that the pattern of daily seasonality in higher moments differs across market direction for the official price index.

References


Steely, J. (1999) Information seasonality and the disappearance of the weekend effect in the UK stock market, Stirling, University of Stirling, Department of Accountancy, Finance and Law, 33.
