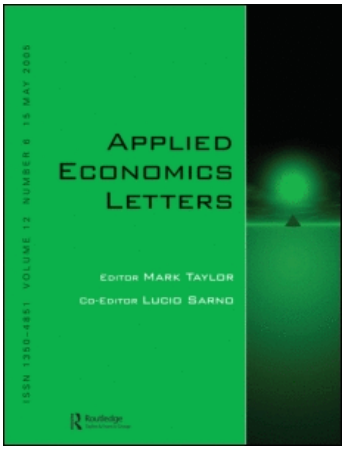

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Brian M. Lucey

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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 Smidt (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.

The evidence for the UK is similar, as shown by Theobald and Price (1984), Jaffe and Westerfield (1985), Condoyanni *et al*. (1987), Board and Sutcliffe (1988), Agrawal and Tandon (1994), Peiro (1994), Arsad and Coutts (1996), Mills and Coutts (1995), Dubois and Louvet (1996) and Coutts and Hayes (1999). Major European equity markets show a variety of daily seasonal patterns. Peiro (1994), Agrawal and Tandon (1994), Dubois and Louvet (1996) and Kramer (1996) all provide evidence for Frankfurt of a negative Monday and Tuesday return. Solnik and Bousquet (1990) and Agrawal and Tandon (1994) find evidence of a negative Tuesday for Paris, while Condoyanni *et al*. (1987) and Peiro (1994) find evidence of both negative Monday and Tuesday with Dubois and Louvet (1996) finding negative Monday and Friday returns. Barone (1990) and Agrawal and Tandon (1994) present conflicting evidence for Milan, Barone finding a negative Monday and Tuesday return while Agrawal and Tardon (1994) find a negative Monday return with a positive and significant Tuesday return. Corhay (1991) and Agrawal and Tandon (1994) find a negative Tuesday in Belgium, as do Alexakis and Xanthakis (1995) for Greece and Pena (1995) for Spain.

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. Liano *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 (ISEQR), and the Irish Stock Exchange Financial Sector and Industrial Sector Index (ISEFIN and ISEGEN). The ISEQ and ISEQR 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

$$R_t = \sum_{t=1}^{n} \alpha_t D_t + \varepsilon_t \tag{1}$$

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_j^2 be the average rank of returns to the index in the jth day and n_j be the number of observations in the jth group. Then with k groups and N observations in total the Kruskal–Wallis H statistic is

$$H = \left(\frac{12}{N(N+1)} \sum_{j=1}^{k} \frac{R_j^2}{n_j} \right) - 3(N+1) \tag{2}$$

The H statistic is distributed as a χ^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: $\sigma_i = \sigma_j \forall_{i,j}$, Ha: $\sigma_i \neq \sigma_j$ at least one i,j pair. The test statistic is defined as in Equation 3:

$$W = \frac{(N-k)\sum_{i=1}^{k} N_i (\bar{Z}_i - \bar{Z}\ldots)^2}{(k-1)\sum_{i=1}^{k}\sum_{j=1}^{N} (Z_{ij} - \bar{Z}_i)^2} \tag{3}$$

where $Z_{ij} = |Y_{ij} - \tilde{Y}_i|$, $\tilde{Y}_i$ 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).

$$KS = \underset{1 \leqslant i \leqslant N}{MAX} \; |SCD_m(i) - SCD_n(j)| \qquad (4)$$

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 1. *Moments of the indices by day of the week and market direction*

	Days of the week	*N*	Mean (%)	Std. dev.	Skewness	Kurtosis
Panel A: Results for all days						
ISEQ	Monday	510	0.18	0.45	0.04	10.44
	Tuesday	565	3.06	0.41	−0.96	11.00
	Wednesday	568	5.15	0.39	0.42	2.54
	Thursday	568	3.15	0.37	−1.01	8.49
	Friday	567	0.80	0.35	0.02	3.43
	Total	2778	2.52	0.39	−0.30	8.17
ISEQR	Monday	510	3.27	0.45	0.15	10.38
	Tuesday	565	3.24	0.41	−0.91	10.19
	Wednesday	568	5.06	0.38	0.46	2.50
	Thursday	568	3.09	0.37	−1.03	8.50
	Friday	567	0.59	0.35	0.07	3.24
	Total	2778	3.05	0.39	−0.25	8.03
ISEFIN	Monday	462	−1.11	0.57	0.77	5.87
	Tuesday	512	5.44	0.55	−0.57	7.63
	Wednesday	514	5.68	0.54	−0.09	2.86
	Thursday	515	4.39	0.57	−0.76	7.09
	Friday	513	0.85	0.49	−0.25	5.13
	Total	2516	3.13	0.55	−0.19	5.78
ISEGEN	Monday	462	0.39	0.43	−1.23	25.15
	Tuesday	512	0.94	0.40	−0.40	12.66
	Wednesday	514	3.45	0.37	0.40	2.86
	Thursday	515	1.62	0.33	−0.80	7.01
	Friday	513	1.26	0.33	0.23	2.64
	Total	2516	1.56	0.37	−0.45	13.37

(*Continued*)

Table 1. (*Continued*)

	Days of the week	*N*	Mean (%)	Std. dev.	Skewness	Kurtosis
Panel B: Days with positive returns						
ISEQ	Monday	253	29.33	0.36	3.06	13.90
	Tuesday	309	27.75	0.28	2.24	7.25
	Wednesday	315	30.18	0.29	2.01	6.57
	Thursday	325	24.47	0.24	2.11	7.02
	Friday	312	23.59	0.25	2.34	7.54
	Total	1514	26.96	0.28	2.55	10.87
ISEQR	Monday	271	30.40	0.36	3.05	13.37
	Tuesday	307	28.47	0.29	2.05	5.50
	Wednesday	311	30.06	0.28	2.01	6.70
	Thursday	322	24.83	0.24	2.09	7.06
	Friday	308	23.86	0.25	2.31	7.34
	Total	1519	27.43	0.29	2.53	10.53
ISEFIN	Monday	209	41.24	0.49	2.62	9.16
	Tuesday	278	39,46	0.39	2.25	8.58
	Wednesday	278	41.18	0.38	1.60	4.25
	Thursday	281	38.01	0.39	2.34	8.27
	Friday	282	31.93	0.34	2.33	8.17
	Total	1328	38.19	0.40	2.32	8.48
ISEGEN	Monday	233	25.96	0.29	3.41	16.62
	Tuesday	265	26.25	0.29	3.88	24.55
	Wednesday	273	28.32	0.28	2.01	5.81
	Thursday	282	22.75	0.21	1.80	5.31
	Friday	293	21.70	0.24	2.23	7.41
	Total	1346	24.90	0.27	2.98	15.48
Panel C: Days with negative returns						
ISEQ	Monday	257	−28.51	0.33	−4.06	26.95
	Tuesday	256	−26.74	0.34	−4.52	30.75
	Wednesday	253	−26.02	0.23	−1.72	3.70
	Thursday	243	−25.36	0.31	−3.73	19.03
	Friday	255	−27.08	0.25	−2.18	7.02
	Total	1264	−26.76	0.30	−3.78	24.60
ISEQR	Monday	239	−27.48	0.33	−4.17	29.47
	Tuesday	258	−26.78	0.33	−4.46	30.48
	Wednesday	257	−25.19	0.23	−1.61	3.15
	Thursday	246	−25.37	0.31	−3.77	19.42
	Friday	259	−27.09	0.24	−2.10	6.59
	Total	1259	−26.38	0.29	−3.79	25.44
ISEFIN	Monday	253	−36.09	0.36	−2.57	9.82
	Tuesday	234	−34.98	0.43	−3.72	20.39
	Wednesday	236	−36.14	0.37	−2.43	8.68
	Thursday	234	−35.98	0.48	−3.24	12.56
	Friday	231	−37.10	0.37	−2.94	12.58
	Total	1188	−36.06	0.40	−3.13	14.15
ISEGEN	Monday	229	−25.62	0.36	−6.80	69.20
	Tuesday	247	−26.21	0.32	−4.09	27.13
	Wednesday	241	−24.72	0.23	−2.02	5.81
	Thursday	233	−23.95	0.26	−3.73	23.31
	Friday	220	−25.95	0.22	−1.49	2.75
	Total	1170	−25.29	0.28	−4.82	47.24

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

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

		T-stat	Sig.	*F*-stat	Sig.	K–W	Sig.	Levene test	Sig.
Panel A: Results for all days									
ISEQ	Monday	0.106	0.106						
	Tuesday	1.848	0.065						
	Wednesday	3.114	0.002						
	Thursday	1.907	0.057						
	Friday	0.485	0.628						
	Total			3.399	0.005	9.309	0.054	2.404	0.048
ISEQR	Monday	1.879	0.060						
	Tuesday	1.956	0.051						
	Wednesday	3.066	0.002						
	Thursday	1.873	0.061						
	Friday	0.355	0.722						
	Total			4.078	0.001	4.038	0.401	2.145	0.073
ISEFIN	Monday	−0.436	0.663						
	Tuesday	2.256	0.024						
	Wednesday	2.359	0.018						
	Thursday	1.827	0.068						
	Friday	0.352	0.725						
	Total			2.861	0.014	15.488	0.004	1.083	0.363
ISEGEN	Monday	0.226	0.821						
	Tuesday	0.573	0.567						
	Wednesday	2.103	0.036						
	Thursday	0.989	0.323						
	Friday	0.769	0.442						
	Total			1.274	0.272	1.986	0.738	1.782	0.130
Panel B: Days with negative returns									
ISEQ	Monday	16.471	0.000						
	Tuesday	17.225	0.000						
	Wednesday	18.913	0.000						
	Thursday	15.576	0.000						
	Friday	14.712	0.000						
	Total			276.946	0.000	11.881	0.018	5.939	0.000
ISEQR	Monday	17.574	0.000						
	Tuesday	17.515	0.000						
	Wednesday	18.615	0.000						
	Thursday	15.649	0.000						
	Friday	14.708	0.000						
	Total			284.670	0.000	11.229	0.024	5.672	0.000
ISEFIN	Monday	15.058	0.000						
	Tuesday	16.616	0.000						
	Wednesday	17.338	0.000						
	Thursday	16.090	0.000						
	Friday	13.541	0.000						
	Total			249.139	0.000	12.713	0.013	3.893	0.00
ISEGEN	Monday	14.740	0.000						
	Tuesday	15.892	0.000						
	Wednesday	17.407	0.000						
	Thursday	14.212	0.000						
	Friday	13.816	0.000						
	Total			233.137	0.000	13.875	0.008	3.329	0.01

(*Continued*)

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. (*Continued*)

		T-stat	Sig.	*F*-stat	Sig.	K–W	Sig.	Levene test	Sig.
Panel C: Days with positive returns									
ISEQ	Monday	−15.446	0.000						
	Tuesday	−14.462	0.000						
	Wednesday	−13.989	0.000						
	Thursday	−13.363	0.000						
	Friday	−14.616	0.000						
	Total			207.125	0.000	6.238	0.182	1.111	0.35
ISEQR	Monday	−14.571	0.000						
	Tuesday	−14.754	0.000						
	Wednesday	−13.848	0.000						
	Thursday	−13.645	0.000						
	Friday	−14.954	0.000						
	Total			206.316	0.000	5.058	0.281	1.330	0.26
ISEFIN	Monday	−14.175	0.000						
	Tuesday	−13.214	0.000						
	Wednesday	−13.711	0.000						
	Thursday	−13.590	0.000						
	Friday	−13.921	0.000						
	Total			188.400	0.000	7.714	0.130	1.226	0.30
ISEGEN	Monday	−13.772	0.000						
	Tuesday	−14.628	0.000						
	Wednesday	−13.631	0.000						
	Thursday	−12.986	0.000						
	Friday	−13.673	0.000						
	Total			189.004	0.000	3.057	0.548	1.404	0.23

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 3. *Kolmogorov–Smirnov test of equal distribution, using standard scores*

		All days				Positive days				Negative days			
		ISEQ	ISEQR	ISEFIN	ISEGEN	ISEQ	ISEQR	ISEQFIN	ISEQGEN	ISEQ	ISEQR	ISEFIN	ISEGEN
Monday–Tuesday	K–S Z statistic	0.768	0.777	0.989	0.933	1.752	0.834	1.729	1.479	0.740	0.934	3.498	1.747
	Sig.	0.597	0.582	0.282	0.349	0.004	0.490	0.005	0.025	0.645	0.347	0.000	0.004
Monday–Wednesday	K–S Z statistic	1.353	1.301	1.025	1.303	1.949	1.015	2.200	5.285	1.802	1.099	1.120	2.628
	Sig.	0.051	0.068	0.245	0.067	0.001	0.254	0.000	0.000	0.003	0.179	0.163	0.000
Monday–Thursday	K–S Z statistic	0.890	1.041	1.424	1.113	1.480	0.900	1.480	2.179	0.658	1.021	3.138	2.186
	Sig.	0.406	0.228	0.035	0.167	0.025	0.393	0.025	0.000	0.780	0.248	0.000	0.000
Monday–Friday	K–S Z statistic	1.245	1.225	1.905	1.592	1.281	1.192	1.282	1.842	1.540	0.914	1.832	2.812
	Sig.	0.090	0.099	0.001	0.013	0.075	0.116	0.075	0.002	0.017	0.374	0.002	0.000
Tuesday–Wednesday	K–S Z statistic	1.136	1.225	2.067	2.245	1.003	0.819	1.187	5.087	2.326	1.249	3.997	2.053
	Sig.	0.152	0.099	0.000	0.000	0.267	0.513	0.119	0.000	0.000	0.088	0.000	0.000
Tuesday–Thursday	K–S Z statistic	0.527	0.565	2.033	1.650	0.580	0.556	0.723	1.422	0.492	0.592	5.427	1.271
	Sig.	0.944	0.907	0.001	0.009	0.889	0.917	0.673	0.035	0.969	0.875	0.000	0.079
Tuesday–Friday	K–S Z statistic	0.915	0.996	2.585	1.547	0.789	0.807	1.150	1.132	2.029	1.306	4.021	2.316
	Sig.	0.372	0.275	0.000	0.017	0.562	0.533	0.142	0.154	0.001	0.066	0.000	0.000
Wednesday–Thursday	K–S Z statistic	1.187	1.187	2.255	2.403	0.853	0.565	1.446	4.768	2.262	1.062	2.894	1.213
	Sig.	0.120	0.120	0.000	0.000	0.461	0.907	0.031	0.000	0.000	0.210	0.000	0.105
Wednesday–Friday	K–S Z statistic	1.351	1.440	2.806	2.925	1.238	1.069	1.874	5.212	0.606	0.443	1.584	0.823
	Sig.	0.052	0.032	0.000	0.000	0.093	0.203	0.002	0.000	0.856	0.989	0.013	0.507
Thursday–Friday	K–S Z statistic	0.898	0.957	2.360	2.331	0.707	0.803	0.760	1.457	1.966	1.062	2.007	1.682
	Sig.	0.396	0.319	0.000	0.000	0.700	0.539	0.610	0.029	0.001	0.210	0.001	0.007

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.

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