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New Findings Regarding Day-of-the-Week Returns over Trading and Non-Trading Periods: A Note

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ABSTRACT

This paper decomposes daily close to close returns into trading day and non-trading day returns. We discover that all of the average negative returns from Friday close to Monday close documented in the literature for stock market indexes occurs during the non-trading period from Friday close to Monday open. In addition, average trading day returns (open to close) are identical for all days of the week. January/firm size/turn-of-the-year anomalies are shown to be interrelated with day-of-the-week returns.

THE AIM OF THIS PAPER is to document new results about the day-of-the-week effect. More specifically, the day-of-the-week effect refers to the average return for Monday (from Friday close to Monday close) being negative. For convenience, we label this anomaly the Monday effect. Several papers have identified and attempted to explain the Monday effect, but to no avail.[1] This research, however, has ruled out as probable explanations the calendar time (or diffusion process) hypothesis which states that the expected return for Monday is three times the expected return for other days of the week, e.g., Oldfield and Rogalski [8] and French [2]; the delay between trading and settlements in stocks and in clearing checks, e.g., Lakonishok and Levi [7] and Gibbons and Hess [3]; various kinds of measurement errors, e.g., Gibbons and Hess [3], Keim and Stambaugh [6], and Smirlock and Starks [12]; and specialist-related biases, e.g., Keim and Stambaugh [6].

This study differs from the previous efforts by distinguishing between trading day and non-trading day returns. That is, we decompose the Friday close to Monday close return into two component parts: the Friday close to Monday open return and the Monday open to Monday close return. In Section I we show that all of the average negative Monday effect for stock market indexes documented by others is contained in the average Friday close to Monday open return. We refer to this anomaly as the non-trading weekend effect. Thus, the data suggest it is important to recognize that the return sequence when an organized market is formally open may differ from the return sequence during closed periods.

Section II of the paper relates the Monday effect and the non-trading weekend

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[1] See, for example, French [2], Gibbons and Hess [3], Lakonishok and Levi [7], Smirlock and Starks [12], and Keim and Stambaugh [6].

effect to the January effect. Segmenting day-of-the-week returns into Januarys versus the rest of the year reveals that the Monday effect and the non-trading effect are on average *positive* in January and on average negative for the rest of the year. We present evidence in Section III that links this Monday/January effect to firm size. We show that close to close returns of small firms on Monday in January are on average positive and greater than corresponding positive returns of large firms. In fact, this January/firm size finding holds for all days of the week. On Monday during the rest of the year, small and large firms have negative returns, but a relation between Monday and firm size is not evident. A large portion of this Monday/January/firm size effect occurs on average during the first Monday in January. We also include an analysis of holidays and holiday-weekends. The paper closes with a summary and conclusions.

I. The Monday Effect and the Weekend Effect

We obtained open and close values of the Dow Jones Industrial Average (DJIA) index from the *Wall Street Journal* every trading day during the period October 1, 1974 to April 30, 1984. October 1, 1974 was chosen as the starting date because on that date the exchanges extended trading time by one-half hour from 3:30 to 4:00 p.m. April 30, 1984 was the latest date available. Days for which opening of the exchange was delayed are excluded.[2] In addition, opening and closing Standard & Poor's Composite Index (SP500) values for the period December 29, 1978 to December 9, 1983 were obtained from Standard & Poor's Corporation.[3]

Daily close to close returns are computed as the natural logarithm of the ratio of succesive closing index values. Successive days means that multiple day returns such as holidays or holiday-weekends are excluded. The close to close returns are decomposed into trading and non-trading day returns. Returns over a trading day are calculated as the natural logarithm of the ratio of the closing index value to the opening index value. All non-trading period returns are based on the log of the ratio of the opening index value relative to the closing index value on the preceding day the market was open. An overnight return refers to the return between adjacent week days such as Wednesday and Thursday. Weekend returns are measured using Monday's opening value relative to Friday's closing value.

Average daily percent returns and associated t-values for all the prescribed returns are presented in Table I. SP500 and DJIA averages are tabulated in Panels A and B, respectively. The return results for close to close are strikingly similar for both indexes and are comparable to those reported for subperiods by French [2], and others. That is, Monday returns are on average negative. Most

[2] In particular, during the October 1, 1974 to April 30, 1984 sample period, two days were discarded because the opening of the NYSE was delayed 15 minutes by a fire drill, and winter storms delayed the opening on three days. The exact dates are available on request.

[3] In addition, values of the New York Stock Exchange Composite Index (NYSE) were obtained from the New York Stock Exchange as of 10:15 A.M. and 4:00 P.M. every trading day during the period October 1, 1974 to April 30, 1984. The values are computed for the Exchange by the Securities Industries Automation Corporation. Index values at 4:00 P.M. are simply closing index values. The 10:15 A.M. values do not represent opening index values because all NYSE securities may not have opened by then. Nevertheless, results with the NYSE index are similar to those reported for the SP500 index in the body of the paper.

Table I

Average Daily Percent Returns over Trading and Non-Trading Periods for the S&P Composite Index and Dow Jones Industrial Average Index

Statistic	Day of the Week: Monday	Tuesday	Wednesday	Thursday	Friday	F_5	F_4
Panel A: Standard and Poor's Composite Index (SP500) January 2, 1979–April 30, 1984							
Close to close							
Mean	−0.1167	0.0942	0.1310	0.0161	0.0746	2.67	0.78
t-value	(−1.64)	(1.59)	(2.34)	(0.30)	(1.45)	(0.0306)	(0.5082)
N	247	254	274	270	260		
Close to open (non-trading period)							
Mean	−0.1315	0.0842	0.0516	0.0906	0.0284	7.06	0.83
t-value	(−3.29)	(3.15)	(1.20)	(3.79)	(0.99)	(0.0001)	(0.4800)
Open to close (trading day)							
Mean	0.0148	0.0100	0.0794	−0.0745	0.0462	1.18	—
t-value	(0.23)	(0.19)	(1.30)	(−1.56)	(1.13)	(0.3175)	
Panel B: Dow Jones Industrial Average (DJIA) October 1, 1974–April 30, 1984							
Close to close							
Mean	−0.0312	0.0127	0.0772	0.0057	0.0640	1.06	0.76
t-value	(−0.62)	(0.28)	(1.82)	(0.15)	(1.66)	(0.3752)	(0.5197)
N	444	455	492	481	467		
Close to open (non-trading period)							
Mean	−0.0804	0.0136	−0.0154	0.0274	0.0029	4.43	0.90
t-value	(−3.46)	(0.75)	(−0.76)	(1.48)	(0.16)	(0.0016)	(0.4424)
Open to close (trading day)							
Mean	0.0492	−0.0009	0.0926	−0.0200	0.0611	1.41	—
t-value	(1.13)	(−0.02)	(2.30)	(−0.55)	(1.86)	(0.2268)	

Note: The equality of means tests are based on the regression:

$$\tilde{R}_{It} = \sum_{j=1}^{5} \alpha_{Ij} D_{jt} + \tilde{e}_{It}; \qquad t = 1, \cdots, N.$$

R_{It} is the percent returns for market index I (SP500 or DJIA) on day t; $D_{jt} = 1$ for day j and zero otherwise. The null hypothesis of equal mean returns across days of the week for index I is $\alpha_{I1} = \cdots = \alpha_{I5}$. F-values for this hypothesis are denoted F_5. A similar regression excluding Monday is computed to test whether mean returns across all days but Monday are equal. The column labeled F_4 contains the appropriate F-values.

prominent, however, is that when daily returns are decomposed into trading and non-trading periods, the Monday effect becomes a non-trading weekend effect. Specifically, the non-trading weekend returns for the SP500 and DJIA are on average 1.13 and 2.62 times larger in absolute value than the Friday close to Monday close returns. That is, the magnitude of the negative weekend return is greater than the average Monday return resulting in a positive Monday trading day return. The importance of non-trading period returns is also evident for other days of the week.

We test the null hypothesis that 50% of the non-trading weekend returns are negative. 58% of Friday close to Monday open returns are negative for the DJIA and 59% for the SP500. The null hypothesis cannot be accepted for either index at a level of significance up to 1%. Thus, more than 50% of the non-trading weekend returns are negative. Corresponding proportions for Friday close to Monday close returns are 51% (DJIA) and 49% (SP500). These proportions are consistent with the null hypothesis that half of the Monday returns are negative.

To test the equality of means across days of the week, an analysis of variance (see Scheffé [11]) was performed. The null hypothesis to be considered is equal means. An F-test can then be used. Resulting F-values with probability values in parentheses underneath are reported in the last two columns of Table I. F_5 values allow tests of equal means across all five days of the week. F_4 values exclude the average returns under the column labeled Monday to allow tests of equal means between Tuesday to Friday. As can be seen, the hypothesis of equal means for close to close returns across all days of the week is rejected for SP500 at a 3% level of significance but cannot be rejected for DJIA. When Monday is eliminated, the hypothesis of equal close to close average returns on Tuesday, Wednesday, Thursday, and Friday cannot be rejected at any reasonable significance level for SP500 or DJIA.

French [2] tested what he termed the trading time hypothesis using a similar F-test. The trading time hypothesis asserts that returns are generated only during active trading and the expected return is the same for each trading day of the week. Using Standard and Poor's Composite Index close to close returns, French concludes that the data are inconsistent with the trading time model. Our SP500 close to close returns give the same conclusion as French, but not the DJIA close to close returns. When opening data are available, calculating trading day returns from open to close is preferable to close to close. Notice in Table I that average open to close returns are consistent with the hypothesis of equal means across all trading days of the week. Therefore, when open to close returns are used, the trading time model cannot be rejected for either index. Oldfield and Rogalski [8] also accepted the trading time hypothesis using open to close returns for each trading day of the week.

Similar results are given for close to open returns. That is, we cannot reject at any reasonable significance level the hypothesis that average overnight returns between Monday-Tuesday, Tuesday-Wednesday, Wednesday-Thursday, and Thursday-Friday are equal, but including average weekend returns (Friday-Monday) increases the F-values enough to be significant at greater than the 0.0016 level.

II. Mondays, Weekends, Holidays, and Market Indexes

Table II segments the DJIA daily returns from Panel B of Table I in various ways. Panel A is only for days in January, Panel B includes all months but Janaury, and Panel C is only for holidays and holiday-weekends. Holidays and holiday-weekends are discarded in Panels A and B. It is readily apparent that in January both the Monday effect and the non-trading weekend effect are different from the rest of the year (compare Panel A with Panel B). In particular, Friday close to Monday close returns in January are on average positive, but during the rest of the year are on average negative, resulting in a negative average return on Monday over all months. A similar result is given for Friday close to Monday open returns. Most of the positive Monday return in January of 0.1782 percent is attributable to the return from Monday open to Monday close (0.1389). The average weekend return (0.0392) is positive in January but negative during the rest of the year (−0.0933).

Table II

Average Daily Percent Returns over Trading and Non-Trading Periods for the DJIA, October 1, 1974 to April 30, 1984

Statistic	Day of the Week					F_5	F_4
	Monday	Tuesday	Wednesday	Thursday	Friday		
Panel A: Only January							
Close to close							
Mean	0.1790	−0.0868	−0.1008	0.2411	0.2124	1.24	1.66
t-value	(1.01)	(−0.56)	(−0.72)	(1.54)	(1.78)	(0.2947)	(0.1762)
N	41	40	41	41	40		
Close to open (non-trading period)							
Mean	0.0441	0.0772	−0.1303	0.0972	0.1567	1.92	3.18
t-value	(0.42)	(1.62)	(−1.32)	(1.59)	(2.53)	(0.1073)	(0.0254)
Open to close (trading day)							
Mean	0.1349	−0.1639	0.0295	0.1439	0.0557	0.74	—
t-value	(0.91)	(−1.12)	(0.21)	(0.84)	(0.54)	(0.5684)	
Panel B: All Months but January							
Close to close							
Mean	−0.0526	0.0223	0.0933	0.0162	0.0501	1.59	1.17
t-value	(−1.00)	(0.46)	(2.11)	(−0.41)	(1.23)	(0.1728)	(0.3197)
N	403	415	451	440	427		
Close to open (non-trading period)							
Mean	−0.0931	0.0075	−0.0050	0.0191	−0.0115	4.74	0.50
t-value	(−4.01)	(0.39)	(−0.25)	(1.05)	(−0.60)	(0.0009)	(0.6865)
Open to close (trading day)							
Mean	0.0405	0.0148	0.0983	−0.0353	0.0616	1.57	—
t-value	(0.89)	(0.33)	(2.34)	(−0.97)	(1.78)	(0.1782)	
Panel C: Holidays and Holiday-Weekends							
Close to close							
Mean	0.0108	−0.1779	−0.4017	1.2020	0.4773	3.13	—
t-value	(0.04)	(−1.22)	(−0.77)	(2.02)	(6.11)	(0,0195)	
N	18	38	5	3	15		
Close to open (non-trading period)							
Mean	−0.0761	−0.1675	0.4359	0.3177	0.0965	1.30	—
t-value	(−0.98)	(−1.59)	(0.48)	(1.56)	(2.25)	(0.2773)	
Open to close (trading day)							
Mean	0.0870	−0.0104	−0.8376	0.8842	0.3808	2.48	—
t-value	(0.40)	(−0.06)	(−1.58)	(2.24)	(4.74)	(0.0506)	

See note to Table I.

A holiday occurs if the market was closed for a holiday during the week. Holiday close to close returns are measured from the close on the trading day before the holiday to the close on the trading day after the holiday. If a holiday occurs on Friday or Monday, we distinguish this longer period as a holiday-weekend return. The close to close returns are divided into trading and non-trading period returns.

Holiday returns for the DJIA are presented in Panel C of Table II. The day-of-the-week heading refers to the trading day *after* the holiday. That is, holiday-

weekends are given in the columns Monday and Tuesday, whereas holidays are under the headings Wednesday, Thursday, and Friday. Non-trading weekend returns are still on average negative but apparently more so if the holiday occurs on a Monday. The trading time hypothesis cannot be rejected at significance levels of 5% or higher. We also tested whether the two holiday-weekends and the three holidays were identical. We cannot reject the equality of close to close, non-trading period, and trading day returns for the two holiday-weekends.[4] However, trading day returns and close to close returns on the three holidays are significantly different.[5]

III. Mondays, Weekends, Holidays, January, and Firm Size

Gibbons and Hess [3] suggest that the Monday effect is related to firm size. Keim and Stambaugh [6] actually test the Gibbons and Hess suggestion and find that the Monday effect is similar for all size portfolios. Keim and Stambaugh, however, don't segment the size portfolios into Januarys versus the rest of the year to see if the Monday effect is related to the January effect. The Monday/January index results reported above imply that the Monday/firm size relation is different in January. To examine this Monday/January/firm size issue, we use returns for ten portfolios based on year-end market value of equity.[6] Data are obtained from the CRSP daily stock files for the 20-year period 1963–1982. The sample consists of all firms listed on the NYSE or ASE and having returns on the CRSP files.

Table III presents the average daily percent returns with t-values in parentheses below for the ten size portfolios by day of the week. Returns are computed from close to close. Multiple day returns such as holidays or holiday-weekends are discarded in Panels A to E but not in Panel F. An analysis of variance was again used to test whether the means are equal across days for each size portfolio. Resultant F-values are given in the last column of Table III.

Panels A, B, C of Table III contain average percent returns by day of the week using all months, only January, and all months but January. Panel A for 1963–1982 is similar to Table III in Keim and Stambaugh [6] for 1963–1979 with one notable exception. The smallest portfolio has a positive Monday return (0.0038) during 1963–1982 whereas it was negative (−0.0370) during 1963–1979. Also, Keim and Stambaugh mention that firm size is related to Friday returns but a close look at Panel A reveals a Wednesday, Thursday, and Friday relation.

New findings are contained in the remaining panels of Table III. It is easily seen from inspection of Panel B that in January the average Monday returns of all size portfolios are positive, while during the rest of the year (see Panel C) they are all negative. Moreover, Monday returns in January are directly related to firm size. Small firms on average have higher returns on Mondays in January

[4] The appropriate F-values with probability values in parentheses are 0.48 (0.4983), 0.32 (0.5808), and 0.12 (0.7301) for close to close, non-trading period, and trading day returns.

[5] The appropriate F-values with probability values in parentheses are 5.95 (0.0094), 0.28 (0.7619), and 9.18 (0.0016) for close to close, non-trading period, and trading day returns.

[6] These ten size portfolios are constructed in the usual fashion (see Keim [5]).

Table III

Average Daily Percent Returns from Close to Close for Size Portfolios by Day of the Week, 1963–1982

Size Portfolio	Day of the Week					
	Monday	Tuesday	Wednesday	Thursday	Friday	F_5
Panel A: All Months						
Smallest	0.0038	0.0137	0.1724	0.1939	0.3412	26.06
	(0.12)	(0.53)	(6.64)	(7.31)	(13.13)	(0.0001)
2	−0.0648	−0.0228	0.1498	0.1270	0.2881	27.67
	(−2.01)	(−0.88)	(5.73)	(4.92)	(11.94)	(0.0001)
3	−0.1285	−0.0234	0.1481	0.1255	0.2675	31.71
	(−3.98)	(−0.91)	(5.53)	(4.74)	(10.67)	(0.0001)
4	−0.1387	0.0233	0.1449	0.1240	0.2545	31.25
	(−4.28)	(−0.90)	(5.37)	(4.71)	(10.22)	(0.0001)
5	−0.1426	−0.0250	0.1544	0.0886	0.2196	26.71
	(−4.39)	(−0.96)	(5.49)	(3.33)	(8.71)	(0.0001)
6	−0.1515	−0.0116	0.1441	0.1034	0.2066	26.20
	(−4.65)	(−0.45)	(5.22)	(3.96)	(8.33)	(0.0001)
7	−0.1345	0.0117	0.1331	0.0891	0.1697	21.38
	(−4.40)	(0.48)	(5.08)	(3.65)	(7.24)	(0.0001)
8	−0.1285	0.0060	0.1321	0.0725	0.1531	19.95
	(−4.34)	(0.25)	(5.12)	(3.05)	(6.70)	(0.0001)
9	−0.1216	0.0266	0.1219	0.0678	0.1309	17.21
	(−4.22)	(1.15)	(4.91)	(3.00)	(5.82)	(0.0001)
Largest	−0.1199	0.0349	0.1052	0.0462	0.0961	12.82
	(−4.16)	(1.43)	(4.12)	(1.99)	(4.17)	(0.0001)
N	931	954	992	977	968	
Panel B: Only January						
Smallest	0.8186	0.5847	0.4709	0.7252	0.9198	2.31
	(5.78)	(5.36)	(4.44)	(6.18)	(7.98)	(0.0560)
2	0.5308	0.3619	0.3209	0.5716	0.6749	1.95
	(4.31)	(3.40)	(3.22)	(5.30)	(7.24)	(0.1006)
3	0.4068	0.2388	0.2258	0.4741	0.6309	2.82
	(3.34)	(2.51)	(2.27)	(4.94)	(6.88)	(0.0248)
4	0.3156	0.2025	0.1647	0.5124	0.5742	0.353
	(2.72)	(2.21)	(1.75)	(5.11)	(6.84)	(0.0078)
5	0.2444	0.1442	0.1180	0.4539	0.4758	2.95
	(2.13)	(1.66)	(1.23)	(4.39)	(5.25)	(0.0200)
6	0.1774	0.0799	0.0506	0.4573	0.4525	4.34
	(1.55)	(0.99)	(0.53)	(4.60)	(5.26)	(0.0020)
7	0.1544	0.0886	0.0560	0.3613	0.3584	2.91
	(1.56)	(1.18)	(0.62)	(4.13)	(4.57)	(0.0213)
8	0.0707	0.0334	0.0374	0.3089	0.3198	3.15
	(0.73)	(0.46)	(0.43)	(3.59)	(4.47)	(0.0144)
9	0.0802	−0.0064	0.0036	0.2631	0.2632	2.85
	(0.91)	(−0.09)	(0.04)	(3.24)	(3.67)	(0.0236)
Largest	0.0153	−0.0667	−0.0339	0.1959	0.1888	2.46
	(0.18)	(−0.85)	(−0.41)	(2.38)	(2.82)	(0.0441)
N	80	80	83	82	82	

Note: The equality of means tests are based on the regression:

$$\hat{R}_{pt} = \sum_{j=1}^{5} \alpha_{pj} D_{jt} + \hat{e}_{pt}; \qquad p = 1, \cdots, 10; \quad t = 1, \cdots, N.$$

R_{pt} is the percent returns for size portfolio p on day t; $D_{jt} = 1$ for day j and 0 otherwise. The null hypothesis of equal mean returns across days of the week for size portfolio p is $\alpha_{p1} = \cdots = \alpha_{p5}$. F-values for this hypothesis are denoted F_5.

Table III—*Continued*

Size Portfolio	Day of the Week					F_5
	Monday	Tuesday	Wednesday	Thursday	Friday	
			Panel C: All Months but January			
Smallest	−0.0728	−0.0385	0.1452	0.1453	0.2876	29.59
	(−2.31)	(−1.50)	(5.49)	(5.52)	(11.25)	(0.0001)
2	−0.1208	−0.0580	0.1342	0.0863	0.2523	29.78
	(−3.71)	(−2.22)	(4.98)	(3.32)	(10.27)	(0.0001)
3	−0.1788	−0.0474	0.1411	0.0936	0.2338	33.00
	(−5.44)	(−1.78)	(5.08)	(3.43)	(9.09)	(0.0001)
4	−0.1815	−0.0439	0.1431	0.0884	0.2249	31.76
	(−5.43)	(−1.64)	(5.08)	(3.28)	(8.70)	(0.0001)
5	−0.1790	−0.0405	0.1578	0.0551	0.1959	27.65
	(−5.32)	(−1.49)	(5.36)	(2.02)	(7.50)	(0.0001)
6	−0.1824	−0.0200	0.1526	0.0709	0.1839	26.38
	(−5.39)	(−0.73)	(5.29)	(2.65)	(7.13)	(0.0001)
7	−0.1616	0.0047	0.1401	0.0642	0.1522	21.90
	(−5.05)	(0.18)	(5.11)	(2.54)	(6.22)	(0.0001)
8	−0.1472	0.0035	0.1408	0.0508	0.1376	7.62
	(−4.75)	(0.14)	(5.21)	(2.07)	(5.73)	(0.0001)
9	−0.1406	0.0296	0.1328	0.0499	0.1186	17.79
	(−4.63)	(1.21)	(5.11)	(2.13)	(5.03)	(0.0001)
Largest	−0.1326	0.0442	0.1179	0.0325	0.0875	13.36
	(−4.36)	(1.73)	(4.40)	(1.34)	(3.59)	(0.0001)
N	851	874	909	895	886	
			Panel D: First Five Trading Days in January			
Smallest	1.7692	1.2514	1.0675	1.5057	1.5644	0.52
	(4.56)	(3.32)	(2.72)	(3.45)	(4.94)	(0.7274)
2	1.2531	0.9000	0.7008	1.0972	1.1185	0.37
	(3.66)	(2.18)	(1.85)	(2.92)	(4.02)	(0.8312)
3	1.0130	0.6017	0.4206	0.8331	1.0112	0.63
	(2.99)	(1.64)	(1.20)	(2.54)	(3.89)	(0.6440)
4	0.9513	0.5516	0.2502	0.8312	0.9513	0.93
	(2.99)	(1.62)	(0.78)	(2.27)	(4.15)	(0.4539)
5	0.7333	0.3261	0.1849	0.7124	0.7617	0.77
	(2.52)	(1.04)	(0.59)	(1.94)	(3.33)	(0.5497)
6	0.6037	0.2271	0.0455	0.6653	0.6870	0.99
	(2.11)	(0.76)	(0.15)	(1.90)	(3.18)	(0.4164)
7	0.4837	0.2437	−0.0217	0.5488	0.6177	1.04
	(1.99)	(0.88)	(−0.08)	(1.81)	(3.12)	(0.3912)
8	0.3492	0.1353	−0.0891	0.4672	0.4549	0.98
	(1.46)	(0.52)	(−0.37)	(1.62)	(2.67)	(0.4247)
9	0.3442	−0.0129	−0.0339	0.3679	0.3383	0.73
	(0.78)	(−0.46)	(−0.15)	(1.56)	(2.12)	(0.5768)
Largest	0.1487	−0.1356	−0.1183	0.2963	0.2685	0.94
	(0.78)	(−0.46)	(−0.56)	(1.36)	(1.88)	(0.4445)
N	17	15	17	17	17	

Table III—*Continued*

Size Portfolio	Day of the Week					F_5
	Monday	Tuesday	Wednesday	Thursday	Friday	
Panel E: Remainder of Days in January						
Smallest	0.5620	0.4308	0.3173	0.5210	0.7512	2.72
	(4.39)	(4.67)	(4.14)	(6.85)	(6.81)	(0.0293)
2	0.3358	0.2377	0.2230	0.4342	0.5589	2.49
	(2.92)	(2.88)	(3.00)	(5.03)	(6.44)	(0.0428)
3	0.2432	0.1550	0.1757	0.3803	0.5315	3.03
	(2.08)	(2.00)	(2.05)	(4.67)	(5.92)	(0.0178)
4	0.1441	0.1219	0.1427	0.4290	0.4755	3.95
	(1.31)	(1.58)	(1.67)	(5.37)	(5.72)	(0.0040)
5	0.1125	0.1023	0.1008	0.3863	0.4010	2.85
	(0.96)	(1.31)	(1.14)	(4.48)	(4.21)	(0.0238)
6	0.0624	0.0460	0.0519	0.4030	0.3911	4.19
	(0.52)	(0.65)	(0.57)	(4.79)	(4.29)	(0.0027)
7	0.0656	0.0529	0.0760	0.3122	0.2905	2.38
	(0.63)	(0.80)	(0.85)	(4.11)	(3.54)	(0.0510)
8	−0.0045	0.0099	0.0699	0.2675	0.2845	2.86
	(−0.04)	(0.15)	(0.79)	(3.45)	(3.65)	(0.0235)
9	0.0090	−0.0049	0.0132	0.2357	0.2436	2.48
	(0.10)	(−0.08)	(0.15)	(2.90)	(3.04)	(0.0434)
Largest	−0.0207	−0.0508	−0.0121	0.1696	0.1680	1.70
	(−0.21)	(−0.74)	(−0.14)	(1.97)	(2.22)	(0.1469)
N	63	65	66	65	65	
Panel F: Holidays and Holiday-Weekends						
Smallest	0.0423	0.3239	0.7462	0.6432	1.0662	3.06
	(0.28)	(2.40)	(1.67)	(2.12)	(4.07)	(0.0179)
2	−0.0672	0.1444	0.3129	0.3660	0.8720	4.64
	(−0.53)	(1.32)	(1.18)	(1.72)	(4.46)	(0.0019)
3	−0.1516	0.0915	0.1409	0.3136	0.7968	4.16
	(−1.22)	(0.89)	(0.50)	(1.57)	(5.09)	(0.0031)
4	−0.1014	0.0325	0.1345	0.2544	0.7515	5.26
	(−0.85)	(0.33)	(0.54)	(1.43)	(5.28)	(0.0006)
5	−0.1879	−0.0006	0.1620	0.2149	0.7599	6.11
	(−1.53)	(−0.01)	(0.63)	(1.26)	(5.46)	(0.0001)
6	−0.1519	−0.0032	0.1414	0.2137	0.7121	5.66
	(−1.26)	(−0.03)	(0.56)	(1.29)	(5.80)	(0.0003)
7	−0.1118	0.0352	0.0782	0.1874	0.6165	4.73
	(−1.02)	(0.38)	(0.33)	(1.32)	(6.07)	(0.0013)
8	−0.1685	−0.0010	0.0264	0.1291	0.5820	5.39
	(−1.58)	(−0.01)	(0.12)	(0.89)	(6.01)	(0.0004)
9	−0.1633	−0.0186	0.0583	0.1550	0.5487	5.08
	(−1.60)	(−0.20)	(0.26)	(1.16)	(6.19)	(0.0007)
Largest	−0.1329	−0.0381	0.0189	0.0388	0.5178	4.41
	(−1.21)	(−0.41)	(0.08)	(0.33)	(6.38)	(0.0021)
N	41	70	20	32	34	

than large firms.[7] In fact, a careful review of the average returns down any day-of-the-week column in Panel B of Table III reveals that small firms have higher returns in January than larger firms regardless of day of the week! Except for size portfolios 4 and 6, the F-values in the last column of Panel B do not allow us to reject the null hypothesis of equal mean returns across days of the week in January at a 1% level of significance.

Somewhat different results are found in Panel C using all months but January. On Mondays, Thursdays, and Fridays the average returns of small firms are greater than corresponding large firm returns, but not on Tuesdays and Wednesdays. For whatever reason, the Monday returns during February to December are on average negative regardless of firm size. The F-values in the last column do not allow us to accept the null hypothesis of equal mean returns across days of the week for any of the size portfolios at greater than the 0.001 level. It is unfortunate that the CRSP tapes don't have opening prices so that the Monday returns of size portfolios can be decomposed into trading and non-trading day returns. We can only conjecture, based on our results in Table II using DJIA, that the negative Monday effect for large size portfolios during February to December is also a non-trading weekend effect.

We did, however, look at turn-of-the-year effects by day of the week. Keim [5] and Roll [9] find that a large portion of the January size effect occurs during the first five trading days of the year. We extend their analysis by investigating whether there is a day-of-the-week effect in the first five trading days of the year. January daily returns were divided into two segments: the first five trading days of the month and the rest of the days. Average daily percent returns for each January segment by day of the week are given in Panels D and E of Table III. Corresponding t-values are in parentheses below each mean. A careful inspection of Panels D and E relative to Panel B reveals that January returns in both segments are related to firm size. That is, for all days of the week in both segments of January, smaller firms have higher average returns than larger firms. However, the absolute magnitudes of the average returns in Panel D are much larger than the averages in Panel E.

To measure how much of the average Monday returns in January are attributable to days 1 to 5, take 21% of the average Monday returns in Panel D and

[7] We formally tested whether the different Monday returns in January are statistically positive during 1963–1982 using the dummy variable regression:

$$\tilde{R}_{pt} = a_0 + a_1 DM_t + a_2 DJ_t + a_3 DM_t DJ_t + \tilde{e}_{pt}; \qquad t = 1, \cdots, N.$$

R_{pt} is the percent return for size portfolios $p = 1, \cdots, 10$ on day t; $DM_t = 1$ if t is a Monday, 0 otherwise; $DJ_t = 1$ if t is in January, 0 otherwise; and $DM_tDJ_t = 1$ for Mondays in January, 0 otherwise. The estimated a_3 coefficients for size portfolios 1 to 10 with t-values in parentheses are: 0.3518 (3.21), 0.2733 (2.52), 0.2987 (2.70), 0.2371 (2.14), 0.2719 (1.93), 0.1968 (1.77), 0.1906 (1.82), 0.1263 (1.23), 0.1726 (1.74), and 0.1472 (1.45), respectively. Notice that all ten size portfolios have positive a_3 coefficients.

A one-tailed t-test is used to test the null hypothesis that a_3 is positive. Except for portfolios 8 and 10, we cannot reject the null hypothesis at a 5% level of significance. For size portfolios 1 to 4, we cannot reject the null hypothesis at the 1% level. Furthermore, the magnitude of the estimated a_3 coefficients is related to firm size. That is, small firms have greater positive Monday returns in January than large firms.

divide this quantity by the average Monday returns for all of January in Panel B. (21% of the total number of Mondays in Janaury during 1963–1982 are in the first five trading days.) The resulting percentages are 45, 50, 52, 63, 63, 71, 66, 104, 90, and 200 for size portfolios 1 to 10, respectively. Thus, on average, a large portion of the Monday return is earned on the first Monday of the year. The first five days of January for Tuesday, Wednesday, Thursday, and Friday (see Panel D) also account for a large proportion of the January average returns in Panel B.

Also of interest are the F-values in the last column of Panels D and E. None of the F-values in Panel D are significant at any reasonable significance level. At a 1% level, only two F-values (portfolios 4 and 6) in Panel E are significant. Thus, we cannot reject the hypothesis of equal means across days of the week in the first five days of January for any of the size portfolios. During the rest of the month of January, average returns are statistically equal for all size portfolios except 4 and 6.

Last, we include an analysis of holidays for the ten size portfolios in Panel F. These were discarded in Panels A–E above and by other day-of-the-week papers in the literature. The computation of holiday returns and the format and interpretation are exactly the same as in Panel C of Table II. Average returns on holiday-weekends from Thursday close to Monday close (column headed Monday) are similar in sign and magnitude to Friday close to Monday close returns (see Panel A of Table III), and there is no obvious relation with firm size. However, average returns during holiday-weekends from Friday close to Tuesday close (column headed Tuesday) differ and are somewhat related to firm size. Holiday returns are also related to firm size (see columns headed Wednesday, Thursday, Friday). That is, if a holiday falls on a Tuesday, Wednesday, or Thursday, the average two-day calendar return from close to close is greater for small firms than large firms. A particularly interesting aspect of Panel F is the Wednesday close to Friday close returns when Thursday is a holiday. Although the magnitude of these average holiday returns is related to firm size, the magnitude of the t-ratios is related in the opposite direction.

IV. Summary and Conclusions

This paper examined trading and non-trading day returns in an attempt to better understand the Monday effect. We find that the Monday effect is actually a non-trading weekend effect. That is, for whatever reason, the average negative Monday close to previous Friday close index return documented in several papers occurs from Friday's close to Monday's open. This means that opening price data are important for understanding day-of-the-week effects. In fact, using opening data to compute trading day returns from close to previous open, we accept the trading time hypothesis previously rejected based on close to close returns. Unfortunately, the widely used CRSP tapes, Standard & Poor's Corporation data references, etc., do not contain opening prices. Nevertheless, we conjecture that if opening price data are collected the non-trading weekend effect will be found to hold over longer periods of time.

We document that the Monday and non-trading weekend effects are directly related to the January effect. We also show that Monday average returns in January are positive and related to firm size but during the rest of the year are negative. In addition, returns for *all* days of the week are related to firm size when looking at January returns separately. A large portion of the magnitude of the day-of-the-week/January/size effect occurs during the first five days of January. Thus, the January and turn-of-the-year effects appear to dominate the Monday effect. Average returns on holiday-weekends are related to firm size if the holiday occurs on a Monday but no relation is apparent if the holiday occurs on a Friday. Two-day returns over Tuesday, Wednesday, and Thursday holidays are on average related to firm size, but the mean returns over a Thursday holiday are relatively larger in magnitude.

Additional work needs to be done to discover the economic intuition underlying these anomalies. For example, one possible explanation may be that, for whatever reason, information released on weekends is primarily negative in interpretation so that specialists set Monday's opening prices lower. It is hoped that these new results over trading and non-trading periods will better focus future research aimed at uncovering the economic reason for these anomalies.

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