The Blue-Monday Hypothesis: Evidence Based on Nasdaq Stocks, 1971-2000

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As part of this special issue on the Monday effect, we examine the blue-Monday hypothesis that the inherent gloom among investors on Mondays (relative to other days), because of there being a pervasive risk factor, contributes to the famous Monday pattern in stock returns. For the period 1971-2000, we find that the Monday pattern is widespread across industries tracked by the Nasdaq sub-indices. Furthermore, the Monday seasonal in most industries is positively correlated over time. In regressions of industry returns against market (composite) returns, the r-squared values for a bulk of the industries are higher for Mondays than non-Mondays even though the composite itself exhibits a Monday seasonal. Across industries, the higher these Monday r-squared values are, the more pronounced is the Monday effect. Finally, for many of the industries, the Monday seasonal is related to proxies for pessimism among investors. We take these findings to be consistent with the blue-Monday hypothesis.

> "Monday morning found Tom Sawyer miserable. Monday morning always found him so."
>
> Mark Twain (*The Adventures of Tom Sawyer*)

Introduction

As documented in the survey article, the blue-Monday hypothesis provides a potential explanation for poor stock returns on Mondays compared to other days.

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This argument, as proposed by Rystrom and Benson (1989), Jacobs and Levi (1988), and Markese (1989), suggests that a greater proportion of investors tend to be pessimistic on Mondays than on other weekdays which makes them less willing to buy and/or more willing to sell shares on Mondays compared to other days. Rystrom and Benson (1989) draw attention to several studies indicating that individuals tend to be more pessimistic on Mondays than other days (e.g., Farber, 1953; Pecjak, 1970; Venabales and Christie, 1974; Rossi and Rossi, 1977). In an experimental study, consistent with the blue-Monday hypothesis, Pettengill (1993) finds that participants opt for less risky investments on Mondays than on Fridays. Our study provides further evidence on this investor mood-based explanation for the Monday effect.

If a sizeable proportion of investors were inherently pessimistic on Mondays, the negative influence on stock prices would be pervasive. Transactions costs and other impediments such as inability to forecast the intensity of the blues may prevent informed investors (those who are aware that the Monday blues are not driven by fundamentals) from arbitraging away this pervasive influence on stock prices. If so, consistent with the asset pricing model advanced by De Long, Shleifer, Summers, and Waldmann (1990), the Monday blues would be a source of non-diversifiable risk to informed investors, thereby reducing the equilibrium price on Mondays relative to other days.

Several testable implications can easily be formulated based on the above view. If the Monday blues are a pervasive influence on stock prices, many industries should exhibit a Monday pattern in return. Also, any fluctuations in the intensity of the blues across time would concurrently affect different industries. Therefore, the Monday seasonal (the difference between Monday and non-Monday returns) for many industries should be positively correlated over time (none should exhibit negative correlations; else the blues may cease being a source of non-diversifiable risk). If the Monday blues were a source of non-diversifiable risk to investors, then the proportion of non-diversifiable risk associated with securities would be higher on Mondays than other days. Therefore, the r-square values in regressions of industry returns against market returns, because they capture the proportion of risk that is non-diversifiable risk (see Brealey and Myers, Chapter 9, p. 224, sixth edition, 2000), would be higher on Mondays than non-Mondays.[1]

Lee, Shleifer, and Thaler (1991), and Chopra, Lee, Shleifer, and Thaler (1993) claim that concurrent pessimism among noise traders (those that use even non-fundamental factors in forming expectations about asset returns) is positively related to discounts on closed-end funds and negatively related to returns on small stocks.[2] We

[1]The slopes in such regressions (industry betas) are not expected to have a Monday pattern because the average across industries (market beta) has to be unity whether it is Monday or not.
[2]We acknowledge that, among others, Chen, Kan, and Miller (1993), Swaminathan (1996), and Elton, Gruber, and Busse (1999) report evidence that raises doubt about such a claim.

therefore examine the relationship of the Monday seasonal with proxies for noise trader pessimism. As potential proxies for pessimism among investors, we also use the consumer sentiment index and the reluctance of consumers toward buying a house.

The above formulations agree with the evidence in prior studies. If the Monday blues constitute a pervasive risk factor, it would show itself as a macro rather than a micro effect as reported by Sullivan and Liano (this issue). To compensate for an increase in the pervasive risk of securities on Mondays, even informed investors might choose less risky investments on Mondays as reported by Pettengill (1993). As individual investors are more likely to fall under the spell of the Monday blues than institutional investors, it is not surprising that selling activity of individual investors increases whereas the activity of institutional investors decreases on Mondays compared to other days (Lakonishok and Maberly, 1990; Sias and Starks 1995; Brooks and Kim, 1997). The blue-Monday hypothesis does not rule out the possibility that the intensity of the blues may fluctuate over time and hence is not inconsistent with reports of the Monday effect being weak/absent in some periods (e.g., Kamara, 1997; Mehdian and Perry, 2002).

Individual investors are more likely to exhibit the Monday blues than institutional investors and they tend to be more active in small stocks than large stocks (Kamara, 1997). Nasdaq stocks tend to have small capitalizations, and so we examine the returns on various Nasdaq indices (composite, industrial, bank, insurance, other financials, transportation, utility, and telecommunications) during the period 1971-2000 to investigate the blue-Monday hypothesis.

We find that the average Monday return is lower than the return on other days and is in fact negative for all the industries and the composite tracked by the Nasdaq indices (at least until the first half of 1990s). Furthermore, the intensity of the Monday seasonal across industries is positively correlated over time. For most industries, the r-squared values in the regressions of industry return against the market (composite) return are higher for Mondays than non-Mondays even though the composite itself exhibits a Monday pattern. Cross-sectionally, the larger the difference between the Monday and non-Monday r-squared value is, the larger is the Monday effect. Finally, findings based on proxies for investor pessimism (discounts on closed-end funds, small stock returns, consumer confidence, and pessimism about buying houses) suggest that for many industries the Monday seasonal is more pronounced in periods of pessimism among investors. None of these findings has been documented in prior research. They provide strong support for the blue-Monday hypothesis.

Data and Methodology

The primary data used in the study consist of the daily closing values for the Nasdaq composite index and nine sub-indices for a 30-year period from February 6, 1971 through December 30, 2000. The data were made available by Nasdaq, Inc. For maintaining consistent sample size with matching dates, the biotechnology and computer sub-indices were eliminated as they were started only in 1993.

We utilize four proxies to track concurrent pessimism among investors: discounts on closed-end funds, returns on small stocks, and data on consumer confidence as well as on consumer reluctance toward buying a house. The data on closed-end funds are from Swaminathan's (1996) study and cover the period 1971-1990. Following prior studies, the returns on small stocks are taken to be the value-weighted return on stocks in the lowest two deciles of the NYSE/AMEX/Nasdaq stocks sorted by market capitalization at the beginning of the year. These data are from CRSP tapes. Finally, the data on consumer confidence and their reluctance toward buying a house are from the University of Michigan, Ann Arbor, database on the consumer sentiment index.

The daily returns for each index are calculated as percentage price changes using the following formula:

$$R_{i,t} = \frac{I_{i,t} - I_{i,t-1}}{I_{i,t-1}} \tag{1}$$

where $R_{i,t}$ is the daily return on industry i on day t and $I_{i,t}$ and $I_{i,t-1}$ are closing values of index i on day t and t - 1, respectively.

To test for the presence of the Monday seasonal, we estimate the following regression equation for each sub-index:

$$R_{i,t} = \alpha + \sum_{j=1}^{4} \gamma_i \ D_j + \varepsilon_t \tag{2}$$

where D_j is a dummy variable that equals one on the respective day j and zero otherwise, j = 1 for Tuesday, 2 for Wednesday, and so on. α, and γ_j are coefficients to be estimated and ε_t is a random variable. In the above equation, the mean Monday return is measured by α and the other coefficients (γ_1 through γ_4) measure the difference between the mean return on Mondays and the other days of the week.

To test whether the differences between r-squared values estimated for Mondays and non-Mondays are statistically different, we estimate the following equation separately for Mondays and non-Mondays for each sub-index:

$$R_{i,t} = \alpha_i + \beta_i \ R_{Nasdaq} + \varepsilon_i \tag{3}$$

where R_i is the daily return of a given sub-index i, R_{Nasdaq} is the daily return on the Nasdaq composite index on Mondays (or non-Mondays), ε_i is a random variable, and α_i and β_i are parameters to be estimated. The above model is estimated for each of the 30 calendar years 1971-2000, and the differences in the r-squared values for Mondays and non-Mondays (matched by calendar years) are used to examine whether the mean difference is statically different from zero using both parametric and non-parametric tests.

In order to examine the relationship between the Monday seasonal and the noise trader sentiment, we estimate the following equation:

$$\Delta R_{i,t} = \alpha + \gamma_{i1}\Delta DCEF + \gamma_{i2}R_{s,t} + \varepsilon_i \tag{4}$$

where $\Delta R_{i,t}$ is the difference between the mean return on non-Mondays and the mean return on Mondays, $\Delta DCEF$ is the change in the value-weighted average discount on closed end funds, and $R_{s,t}$ is return on small stocks during the year t.

To further examine the relationship between investors' sentiment and Monday seasonal, we also estimate the following regression equation:

$$\Delta R_{i,t} = \alpha + \gamma_{i1}SENT + \varepsilon_i \tag{5}$$

where the variables are as defined earlier and SENT is a variable that captures consumer sentiment (measured either as percentage change in the consumer sentiment index or proportion of consumers reluctant about buying a house in year t).

Empirical Results

Table 1 contains the estimated coefficients and corresponding statistics from the estimation of equation (2) using the data for the 1971-2000 period. As can be seen from panel A of this table, the average Monday return (Friday close to Monday close) on the Nasdaq composite index and all the sub-indices is significantly negative and lower than each of the other days of the week.[3] This finding is consistent with the prior literature on the Monday effect (see the survey by Pettengill and Wingender in this issue) and adds to it because none of the extant studies examines the Monday effect on an industry level basis. An important implication of the blue-Monday hypothesis is that the Monday effect would be pervasive in nature. The findings in Table 1 clearly indicate that the Monday effect is widespread across industries and so is consistent with this implication.

Sub-period analysis, presented in panels B through E, reveals that the Monday seasonal exists in 1970s, and 1980s, and the first half of the 1990s, but is on the decline after the mid 1990s (i.e., for the sub-period 1995–2000 period). The results presented in panel E indicate that for the period 1995–2000 the mean Monday return ceases to be negative and for most industries is not different from the mean non-Monday return (bank, insurance, other financials, transportation, and utilities). This finding is consistent with the literature documenting that the Monday effect, especially for large firms, has declined in recent years (Board and Sutcliffe, 1988; Kamara, 1997; Mehdian and Perry, 2001; Steely, 2001). Even in the 1995-2000 sub-period, however, the Monday returns are lower than Friday returns for the composite, industrial, and telecommunications sub-indices. (Other financials and utility sub-

[3]In the case of the telecommunications and utility indices, the Monday return is negative, but not lower than the return on Tuesdays.

Table 1—The Monday Effect in Nasdaq Indices, 1971-2000

The close-to-close daily returns (in percent) on the Nasdaq composite and seven sub-indices are regressed against dummy variables representing the days of the week other than Monday. The data cover daily returns from the inception of the indices up to December 31, 2000. White's (1980) correction is used for dealing with heteroskedasticity. The F-statistics provides the test of whether the slope coefficients for non-Mondays are simultaneously equal to zero.

$$R_t = \alpha + \gamma_1(\text{Tue-Dummy})_t + \gamma_2(\text{Wed-Dummy})_t + \gamma_3(\text{Thu-Dummy})_t + \gamma_4(\text{Fri-Dummy})_t + \varepsilon_t$$

Dependant Variable (R_t)	α	γ_1 (Tue)	γ_2 (Wed)	γ_3 (Thu)	γ_4 (Fri)	Adj. R^2	Sample Size	F-Stat
Panel A: Full-Sample (1971-2000)								
Composite	-0.14	0.11	0.25	0.25	0.31	0.011	7561	20.9[a]
	(-4.9)[a]	(2.8)[a]	(6.5)[a]	(6.3)[a]	(7.9)[a]			
Industrial	-0.19	0.14	0.32	0.31	0.38	0.015	7559	27.8[a]
	(-6.3)[a]	(3.4)[a]	(7.7)[a]	(7.4)[a]	(9.1)[a]			
Bank	-0.09	0.09	0.17	0.19	0.19	0.009	7559	18.1[a]
	(-4.4)[a]	(3.3)[a]	(6.1)[a]	(7.0)[a]	(7.0)[a]			
Insurance	-0.08	0.07	0.18	0.19	0.19	0.007	7559	14.0[a]
	(-3.4)[a]	(2.0)[b]	(5.5)[a]	(5.7)[a]	(5.8)[a]			
Other Financial	-0.09	0.12	0.17	0.16	0.21	0.005	7553	9.2[a]
	(-3.2)[a]	(3.0)[a]	(4.5)[a]	(4.4)[a]	(5.6)[a]			
Transportation	-0.13	0.10	0.24	0.23	0.26	0.001	7553	20.0[a]
	(-5.2)[a]	(2.9)[a]	(6.8)[a]	(6.5)[a]	(7.4)[a]			
Telecommunications	-0.09	0.07	0.22	0.19	0.21	0.003	7559	6.5[a]
	(-2.2)[a]	(1.3)	(4.0)[a]	(3.6)[a]	(3.8)[a]			
Utilities	-0.09	0.04	0.27	0.20	0.21	0.003	7559	6.2[a]
	(-1.8)[b]	(0.6)	(4.1)[a]	(2.9)[a]	(3.2)[a]			
Panel B: Sub-Sample 1970 (1971-1979)								
Composite	-0.18	0.10	0.24	0.32	0.36	0.031	2252	19.1[a]
	(-5.2)[a]	(2.1)[a]	(4.9)[a]	(6.6)[a]	(7.4)[a]			
Industrial	-0.23	0.11	0.30	0.40	0.46	0.038	2252	23.3[a]
	(-5.1)[a]	(1.9)[c]	(5.1)[a]	(6.9)[a]	(7.9)[a]			
Bank	-0.12	0.089	0.13	0.19	0.20	0.016	2252	10.3[a]
	(-4.4)[a]	(2.1)[b]	(3.7)[a]	(5.1)[a]	(5.5)[a]			
Insurance	-0.18	0.13	0.24	0.30	0.35	0.016	2252	10.2[a]
	(-4.1)[a]	(2.2)[b]	(3.9)[a]	(4.9)[a]	(5.6)[a]			
Other Financial	-0.19	0.20	0.21	0.30	0.31	0.013	2252	8.4[a]
	(-4.3)[a]	(3.0)[a]	(3.1)[a]	(4.4)[a]	(4.7)[a]			
Transportation	-0.13	0.00	0.20	0.24	0.26	0.016	2252	9.9[a]
	(-2.8)[a]	(0.1)	(3.1)[a]	(3.8)[a]	(3.8)[a]			
Telecommunications	-0.08	0.03	0.11	0.16	0.19	0.013	2252	8.6[a]
	(-2.9)[a]	(0.7)	(2.8)[a]	(4.0)[a]	(4.8)[a]			
Utilities	-0.08	0.06	0.11	0.15	0.19	0.013	2252	6.9[a]
	(-2.9)[a]	(0.7)	(2.8)[a]	(3.9)[a]	(4.7)[a]			

Table 1 (cont.)—The Monday Effect in Nasdaq Indices, 1971-2000

Dependant Variable (R_t)	α	γ_1 (Tue)	γ_2 (Wed)	γ_3 (Thu)	γ_4 (Fri)	Adj. R^2	Sample Size	F-Stat
Panel C: Sub-Sample 1980s (1980 - 1989)								
Composite	-0.25 (-6.6)[a]	0.22 (4.3)[a]	0.43 (8.2)[a]	0.39 (7.3)[a]	0.44 (8.3)[a]	0.037	2529	25.0[a]
Industrial	-0.32 (-7.0)[a]	0.28 (4.5)[a]	0.51 (8.1)[a]	0.46 (7.3)[a]	0.54 (8.5)[a]	0.037	2529	25.0[a]
Bank	-0.14 (-4.7)[a]	0.15 (3.6)[a]	0.26 (6.2)[a]	0.28 (6.7)[a]	0.28 (6.6)[a]	0.024	2529	16.5[a]
Insurance	-0.14 (-3.4)[a]	0.12 (2.2)[b]	0.33 (5.9)[a]	0.23 (4.0)[a]	0.27 (4.7)[a]	0.015	2529	10.7[a]
Other Financial	-0.12 (-4.5)[a]	0.12 (3.4)[a]	0.25 (6.8)[a]	0.23 (6.2)[a]	0.26 (7.1)[a]	0.026	2529	17.9[a]
Transportation	-0.24 (-5.2)[a]	0.26 (4.1)[a]	0.40 (6.3)[a]	0.40 (6.3)[a]	0.42 (6.7)[a]	0.023	2529	15.6[a]
Telecommunications	-0.15 (-1.8)[c]	0.17 (1.5)	0.41 (3.6)[a]	0.32 (2.8)[a]	0.26 (2.2)[b]	0.004	2529	3.7[a]
Utilities	-0.15 (-1.8)[c]	0.18 (1.5)	0.42 (3.6)[a]	0.33 (2.8)[a]	0.26 (2.2)[a]	0.004	2529	3.7[a]
Panel D: Sub-Sample Early 1990s (1990-1994)								
Composite	-0.00 (0.0)	0.01 (0.1)	0.18 (2.6)[a]	0.01 (1.1)	0.04 (0.4)	0.004	1517	2.4[b]
Industrial	-0.00 (0.0)	0.04 (0.4)	0.20 (2.2)[b]	0.05 (0.6)	0.05 (0.5)	0.002	1517	1.6
Bank	-0.04 (-0.9)	0.05 (0.9)	0.18 (3.5)[a]	0.12 (2.3)[b]	0.15 (2.8)[a]	0.008	1517	4.2[a]
Insurance	0.02 (0.5)	-0.04 (-0.6)	0.10 (1.7)[c]	0.10 (1.8)[c]	0.03 (0.5)	0.004	1517	2.3[c]
Other Financial	-0.02 (-0.6)	0.10 (1.8)[c]	0.16 (3.0)[a]	0.09 (1.7)[c]	0.07 (1.3)	0.004	1517	2.7[b]
Transportation	-0.04 (-0.9)	0.02 (0.3)	0.12 (1.7)[c]	0.14 (2.0)[b]	0.12 (1.7)[c]	0.002	1517	1.6
Telecommunications	-0.04 (-0.6)	0.03 (0.4)	0.20 (2.2)[b]	0.09 (1.0)	0.04 (0.5)	0.001	1517	1.5
Utilities	-0.04 (-0.6)	0.03 (0.4)	0.20 (2.3)[b]	0.09 (0.9)	0.04 (0.5)	0.002	1517	1.5

Table 1 (cont.)—The Monday Effect in Nasdaq Indices, 1971-2000

Dependant Variable (R_t)	α	γ_1 (Tue)	γ_2 (Wed)	γ_3 (Thu)	γ_4 (Fri)	Adj. R^2	Sample Size	F-Stat
Panel E: Sub-Sample Late 1990s (1995 - 2000)								
Composite	0.02	0.01	0.03	0.07	0.26	0.001	1513	1.1
	(0.2)	(0.1)	(0.2)	(0.5)	(1.8)[c]			
Industrial	-0.06	0.03	0.10	0.16	0.29	0.001	1513	1.5
	(-0.6)	(0.2)	(0.8)	(1.2)	(2.2)[b]			
Bank	0.03	0.02	0.04	0.09	0.06	0.000	1513	0.3
	(0.5)	(0.2)	(0.4)	(0.9)	(0.5)			
Insurance	0.09	-0.05	-0.10	0.02	-0.02	0.000	1513	0.7
	(1.6)	(-0.6)	(-1.3)	(0.2)	(-0.2)			
Other Financial	0.09	0.01	-0.06	-0.10	0.08	0.000	1507	0.5
	(0.9)	(0.1)	(-0.4)	(-0.7)	(0.6)			
Transportation	-0.03	0.08	0.15	0.01	0.13	0.000	1507	1.1
	(-0.5)	(0.8)	(1.6)	(0.1)	(1.4)			
Telecommunications	-0.05	0.04	0.08	0.19	0.37	0.002	1512	1.8
	(-0.4)	(0.3)	(0.5)	(1.2)	(2.3)[a]			
Utilities	-0.05	-0.10	0.33	0.18	0.37	0.001	1513	1.4
	(-0.3)	(-0.4)	(1.4)	(0.8)	(1.5)			

a, b, and c represent significance at the 1 percent, 5 percent, and 10 percent levels, respectively

R_t = close-to-close daily return on the Index

Intercept (α) = represents the mean return for Monday (Fri-close to Mon-close)

Weekday-Dummy = 1, if it is the specified day of the week, = 0 otherwise

Slope (γ) = The difference between the mean return on Monday and the stated day of the week

indices also exhibit a noticeable Monday effect but it is not significant at conventional levels.) Thus, because Nasdaq firms tend to have small capitalizations, our findings indicate that even in recent years the Monday effect continues for small firms.

As an alternative to the approach used in Table 1, we use parametric and non-parametric tests (t-test and Wilcoxon sign rank test) to examine whether the difference in the mean Monday and non-Monday return is different from zero. The findings, displayed in Table 2, indicate that the mean Monday return is significantly negative for all the indices except the telecommunications and utility sub-indices (the mean Monday return for these two sub-indices is negative, but lacks statistical significance) and is significantly lower than the mean non-Monday return without any exception (i.e., this is true for the composite as well as all the sub-indices). What is clear from the findings in Tables 1 and 2 is that the Monday effect is widespread across the cross-section of industries. The underlying cause must therefore be something that affects all industries simultaneously and so is unlikely to be related to exogenous shocks that are industry specific. The findings in Table 2, like those in

Table 1, are consistent with the implication of the blue-Monday hypothesis that the Monday effect would be pervasive in nature.

Table 2—Differences in the Mean Monday and Non-Monday Return on Nasdaq Indices, 1971-2000

For a given Nasdaq index, the average Monday return (Friday close to Monday close) is calculated for each of the 30 calendar years 1971-2000 (usually there are 49 Mondays in a calendar year). These 30 observations are used for computing the mean Monday return. Similarly, the average daily non-Monday return is calculated for each of the 30 years 1971-2000 (usually there are 205 non-Mondays in a calendar year). These 30 observations are used for finding the mean non-Monday return. The 30 Monday and non-Monday averages are matched by the calendar years for testing the difference of means.

	Mean Return (%)		Difference of Means Tests	
INDEX	Monday (t-statistic)	Non-Monday (t-statistic)	Parametric t-test	Wilcoxon z –stat
Composite	-0.14 (-3.1)[a]	0.20 (4.2)[a]	-5.1[a]	-3.8[a]
Industrial	-0.19 (-4.5)[a]	0.09 (5.5)[a]	-7.0[a]	-4.0[a]
Bank	-0.08 (-2.5)[a]	0.07 (5.1)[a]	-5.6[a]	-3.9[a]
Insurance	-0.08 (-2.2)[a]	0.07 (6.4)[a]	-4.1[a]	-3.4[a]
Other Financial	(-0.08 (-2.1) b	0.07 (5.0)[a]	-4.8[a]	-3.5[a]
Transportation	(-0.13 (-4.4)[a]	0.08 (5.0)[a]	-5.7[a]	-4.0[a]
Telecomm	-0.08 (-1.3)	0.09 (3.8)[a]	-2.8[a]	-3.4[a]
Utilities	-0.09 (-1.5)	0.09 (3.7)[a]	-3.1[a]	-3.8[a]

a, b, and c represent significance at the 1 percent, 5 percent, and 10 percent levels, respectively

Another implication of the blue-Monday hypothesis is that the intensity of the Monday effect for many industries would be positively correlated across time. The findings in Table 3 indicate just that. The Monday seasonal (difference between the mean Monday and non-Monday returns for a given calendar year) for industries tracked by the Nasdaq indices exhibits positive correlations across the industries during the 30-year period 1971-2000. The only exceptions are the telecommunications and the utility sub-indices because even though their Monday seasonal exhibits positive correlation with that of other industries, it lacks significance.

If the Monday blues are a source of non-diversifiable risk to investors, a straightforward testable implication is that the proportion of non-diversifiable risk would be higher on Mondays than on other weekdays. We therefore examine whether the r-square values in the regressions of industry returns against the market return are higher on Mondays compared to non-Mondays. Specifically, for a given industry, we run a regression of the industry returns against the market (composite) return separately for Mondays and non-Mondays for each of the 30 years 1971-2000. We then examine whether the difference in the r-squared values for Mondays and non-Mondays (matched by calendar year) is different from zero. r-squared values in these regressions can be taken as the proportion of risk that is market wide and so is non-diversifiable in nature (Brealey and Meyers, chapter 9, page 224, sixth edition, 2000).

Table 3—Correlation Across-Time between the Monday Seasonal in Nasdaq Indices, 1971-2000

For each of the 30 years, 1971-2000, the average Monday return on an index is subtracted from the average daily non-Monday return. This Monday differential is used to find the Pearson correlations across time between the different indices. The p-value is in parentheses for the null hypothesis that the correlation is zero

	Indust	Bank	Insur	Oth Fin	Trans	Tele	Util
Composite	0.81	0.33	0.63	0.62	0.77	0.08	0.11
	(<0.01)[a]	(0.07)[b]	(<0.01)[a]	(<0.01)[a]	(<0.01)[a]	(0.67)	(0.56)
Industrial		0.59	0.80	0.76	0.85	0.34	0.35
		(<0.01)[a]	(<0.01)[a]	(<0.01)[a]	(<0.01)[a]	(0.06)[c]	(0.05)[b]
Bank			0.44	0.50	0.52	0.14	0.18
			(0.01)[a]	(<0.01)[a]	(<0.01)[a]	(0.44)	(0.33)
Insurance				0.84	0.62	0.33	0.29
				(<0.01)[a]	(<0.01)[a]	(0.07)[c]	(0.11)
Other Financial					0.59	0.32	0.27
					(<0.01)[a]	(0.08)[c]	(0.15)
Transportation						0.30	0.31
						(0.10)[c]	(0.09)[c]
Telecommunications							0.98
							(<0.01)[a]

a, b, and c represent significance at the 1 percent, 5 percent, and 10 percent levels, respectively

Table 4 provides the findings on r-squared values. The r-squared values for Mondays are significantly higher than those for non-Mondays (by 13 percent to 22 percent) for five of the seven sub-indices (bank, insurance, transportation, telecommunications, and utilities). For the remaining two sub-indices (industrials and other financials), the Monday r-squared values are higher than those for non-Mondays, but the difference is not statistically significant. These findings suggest that the proportion of non-diversifiable risk associated with stocks is higher on Mondays than other weekdays. The existence of higher non-diversifiable risk on Monday is consistent with the view that the Monday blues among investors become a source of non-diversifiable risk to other investors (knowledgeable about the blues) and so get priced in equilibrium. In other words, investors set prices on Mondays relative to other days such that they extract a premium for having to bear an additional source of risk on Mondays compared to other days.

Table 4—Differences in the Mean Monday and Non-Monday R^2 Values in the Regressions of the Return on the Nasdaq Sub-Indices Against the Return on the Composite Index

For each of the 30 years, 1971-2000, the Monday return on a given Nasdaq sub-index is regressed against the corresponding Monday return on the Nasdaq composite index (the sample size for the regressions is usually 49). Similarly, for each of the 30 years, 1971-2000, the daily non-Monday return on the sub-index is regressed against the corresponding return on the composite index (the sample size is usually 205). The 30 Monday and non-Monday r-squared values are matched by the calendar years for testing the difference of means

	Mean R^2		Difference of Means Tests	
	Monday	Non-Monday	Parametric t-test	Wilcoxon z-statistic
Industrial	0.93	0.91	0.7	0.8
Bank	0.46	0.40	2.3[a]	2.2[b]
Insurance	0.59	0.50	2.4[a]	2.0[b]
Other Financial	0.67	0.63	1.2	1.1
Transportation	0.52	0.46	2.2[b]	1.8[c]
Telecommunications	0.60	0.51	3.2[a]	2.7[a]
Utilities	0.60	0.49	4.3[a]	3.5[a]

a, b, and c represent significance at the 1 percent, 5 percent, and 10 percent levels, respectively

In the classic article entitled, R^2, Roll (1988) runs regressions of individual stock returns against the market return (he refers to this as the *CAPM approach*) or against five factors derived from factor analysis (he calls this the *APT approach*). He finds that R^2 values improve for small firms if the APT version is used instead of the CAPM version, but the improvement in R^2 values for large firms is slight. Roll states: "This may suggest that higher explanatory power of market models for large firms is due less to general diversification than to large firms being less susceptible, for some as yet unknown reason, to systematic risks that are not general market risks" (italics his). Concurrent mood among investors such as the Monday blues could be one such risk that is systematic (i.e., affects the cross section of stocks simultaneously), but is not a market risk (i.e., not fully captured by the variation in the market return). In this sense, our findings on R^2 values are consistent with the view that the Monday blues constitute a systematic (non-diversifiable) risk factor although it is not a market risk factor.

Next, we examine whether, cross-sectionally, the difference between the non-Monday and Monday returns (return differentials) is associated with the difference in the non-Monday and Monday r-squared values (r-squared differentials). For this, we estimate cross-sectional Fama-MacBeth (1973) type regressions in which return differentials are regressed against r-squared differentials for each of the 30 years (1971-2000). The results from these regressions are in Table 5. They suggest that for the entire 1971-2000 period and for the 1970s and 1980s the larger the increases in the non-diversifiable risk on Mondays, the larger is the Monday shortfall in returns relative to other weekdays. Therefore, these findings, like those presented in Table 4, support the view that investors price the securities on Mondays (relative to other days) such that they require a premium to be compensated for the increase in non-diversifiable risk on Mondays compared to other days.

Table 5—Cross-Sectional Regressions of the Differences in the Monday and Non-Monday Returns on Nasdaq Sub-Indices Against the Differences in the Monday and Non-Monday R-Squared Values

For each of the 30 calendar years, 1971-2000, the Monday return on a given Nasdaq sub-index is regressed against the corresponding return on the Nasdaq composite index (sample size is usually 49). Similarly, the daily non-Monday return on that sub-index is regressed against the corresponding non-Monday return on the composite index (sample size is usually 205). For each of the 30 calendar years, 1971-2000, the differences in the average Monday and non-Monday return on the sub-indices are regressed against the differences in Monday and non-Monday r-squared values from the regressions described earlier. This gives 30 intercepts, slope coefficients, and r-squared values. The table reports the average intercept, slope, and r-squared value from these regressions along with the t-statistics calculated as in Fama and MacBeth (1973) for different periods

	1971-1980	1981-1990	1991-2000	1971-2000
Average Intercept	-0.25	-0.25	-0.10	-0.21
	(-4.2)[a]	(-4.2)[a]	(-3.5)[a]	(-6.3)[a]
Average Slope	-0.56	-0.56	-0.13	-0.31
	(-2.1)[a]	(-2.1)[a]	(-0.6)	(-2.2)[a]
Average R^2	0.32	0.32	0.21	0.24
Sample Size for Average	10	10	10	30

a, b, and c represent significance at the 1 percent, 5 percent, and 10 percent levels, respectively

It is possible that periodic swings in the mood among investors about asset returns (such as during the dot.com years) may influence the intensity of the Monday blues over time. For examining this possibility, we regress the shortfall in Monday returns (relative to other weekdays) against two potential proxies for pessimism among noise traders (discounts on closed-end funds and the return on small-stocks).

Based on Lee, Shleifer, and Thaler (1991), we expect the Monday shortfall to have a positive relationship with the former and/or an inverse relationship with the latter. Our findings are in Table 6. We find that in the case of the telecommunications and utilities sub-indices, the higher the discounts on closed-end funds the more severe the Monday shortfall. In the case of the bank, insurance, and other financial sub-indices, the better are the small-stock returns, the less severe is the Monday shortfall.[4] For five of the seven industries considered in this analysis, the findings are

[4]As the return on the Nasdaq composite itself can be taken as a measure of small stock returns, we exclude the composite index from the analysis in Table 6. If we use the return on the Nasdaq composite index as a proxy for small stock returns, all the seven sub-indices exhibit an inverse relationship between the Monday return differential and the Nasdaq composite return for the period 1971-1990 (covered by data on closed-end funds) as well as the entire 1971-2000 period (findings not in tables).

consistent with the notion that the Monday effect is prominent in periods of pessimism among noise traders and is consistent with the blue-Monday hypothesis.

Table 6—The Relationship Between the Monday Seasonal and Proxies for Concurrent Over/Under Optimism Among Investors

For each of the 20 calendar years during the period 1971-1990, the mean return on Monday is subtracted from the mean return on non-Mondays. This difference is regressed against the change in the discounts on closed-end funds and returns on small stocks (potential proxies for concurrent over/under optimism among noise traders). The sample size for each of the regression is 20. Due to the nature of the hypothesis tested, the one-tailed approach is used in determining the significance of the t-statistics for the slope coefficients. The F-statistics provide the test of whether the slope coefficients for non-Mondays are simultaneously equal to zero

$(R_{non\text{-}Mon} - R_{Mon})_t = \alpha + \gamma_1$ Change in Discounts on Closed-end Funds$_t$ + γ_2 Return on Small-Stocks$_t$

Sector	α	γ_1	γ_2	Adj. R^2	F-Stat
Industrial	0.40	-0.25	-0.26	0.00	0.8
	(6.5)[a]	(-0.3)	(-1.2)		
Bank	0.24	0.27	-0.35	0.22	3.7[a]
	(6.0)[a]	(0.5)	(-2.5)[a]		
Insurance	0.30	-0.03	-0.38	0.18	3.0[b]
	(6.4)[a]	(-0.1)	(-2.4)[a]		
Other Financial	0.25	0.08	-0.21	0.03	1.3
	(6.0)[a]	(0.2)	(-1.6)[c]		
Transportation	0.27	-0.27	-0.06	0.00	0.1
	(4.3)[a]	(-0.3)	(-0.3)		
Telecommunications	0.14	2.34	0.03	0.08	1.7
	(1.4)	(1.8)[b]	(0.1)		
Utilities	0.16	2.11	0.01	0.04	1.4
	(1.5)	(1.7)[b]	(0.03)		

a, b, and c represent significance at the 1 percent, 5 percent, and 10 percent levels, respectively

$R_{non\text{-}Mon} - R_{Mon}$ = The difference between the mean return on non-Mondays during a given calendar year and the mean return on Mondays during that calendar year (in %)

Change in closed-end fund discounts = The change in the Value-weighted average discount on closed end funds during a given calendar year (these data are from Swaminathan, 1994)

Return on Small-Stocks = The value-weighted calendar-year return on NYSE, AMEX, OTC stocks in the two deciles of lowest market capitalization at the beginning of the calendar year

In the above analysis, at least some of the slope coefficients have signs opposite to those consistent with the inference we have drawn. (None of these coefficients is statistically significant.) Therefore, to explore this issue further, we examine the relationship between the Monday seasonal and the sentiment among consumers.[5] The University of Michigan, Ann Arbor, collects survey data for computing its Consumer Sentiment Index, an index that is widely followed in the financial press for tracking consumer confidence. In generating this index, one of the data items gathered by the University of Michigan is the proportion of consumers who feel times are bad for

[5]We thank the editors for suggesting this line of exploration.

buying a house. We use this data on consumer sentiment as another proxy for the sentiment among investors. Although economic fundamentals will surely play a role in influencing the sentiment among consumers, we assume that any over/under optimism not warranted by economic fundamentals will also be reflected in their sentiment.

Our findings pertaining to the relationship between the Monday seasonal and the sentiment among consumers are in Table 7. As can be seen from Panel A in Table 7, we find that Monday shortfall in returns (relative to other weekdays) is inversely related to the growth in consumer confidence in the case of the composite, bank, insurance, and other-financials indices. The Monday shortfall is positively related to the proportion of consumers who consider times to be bad for buying a house in the case of the composite, industrial, bank, insurance, other financials, and transportation indices (Panel B, Table 7). These findings, like those in Table 6, support the view that the Monday seasonal is severe in periods of pessimism among investors. Here too, as in Table 6, some slope coefficients (although not significant) carry signs that contradict such a story. Overall, however, the findings in Tables 6 and 7 are consistent with the view that across time the intensity of the Monday blues and hence the Monday seasonal in stock returns increases in periods of pessimism among investors.

Summary and Conclusions

On average, stock returns are negative on Mondays and lower than those on other days. The blue-Monday hypothesis explains this phenomenon by arguing that investors are inherently gloomy and hence are more willing to sell and/or less willing to buy securities on Mondays than other days. We posit that the Monday blues would affect stocks simultaneously and therefore could potentially result in a source of non-diversifiable risk that is priced in equilibrium. The study formulates and tests several implications of this proposition by using the returns on the Nasdaq composite as well as available sub-indices during the period 1971-2000.

Empirically, we find that the Monday effect in stock returns exists for all the industries tracked by the Nasdaq sub-indices at least till the mid 1990s. Furthermore, the intensity of the Monday seasonal is positively correlated over time for most industries as would be expected of a pervasive factor. Most importantly, the proportion of non-diversifiable risk of securities is higher on Mondays than on other days. Cross-sectionally, the larger this difference is, the more pronounced is the Monday effect. Finally, we find that the Monday effect is more severe in periods of pessimism among investors. Thus, the findings consistently support the view that the Monday blues give rise to a pervasive risk factor and hence are priced in equilibrium, thereby giving rise to the Monday pattern in stock returns. In a broader sense, the findings add to the growing evidence in extant research that investor mood can be a priced variable in an equilibrium asset pricing framework. (See the survey in Hirshliefer, 2001.)

Table 7—The Relationship between the Monday Seasonal and Proxies for Concurrent Over/Under Optimism Among Consumers

For each of the 30 calendar years during the period 1971-2000, the mean return on Monday is subtracted from the mean return on non-Mondays. This difference is regressed against potential proxies for pessimism among investors. The sample size for each of the regression is 30. Due to the nature of the hypothesis tested, one-tailed approach is used in determining the significance of the t-statistics for the slope coefficients. The F-statistics provides the test of whether the slope coefficients for non-Mondays are simultaneously equal to zero

Panel A: $(R_{non\text{-}Mon} - R_{Mon})_t = \alpha + \gamma_1$ Growth in Consumer Confidence$_t$

Index	α	γ_1	Adj. R^2	F-Stat
Composite	0.364	-0.908	0.04	2.1
	(5.4)[a]	(-1.4)[c]		
Industrial	0.290	-0.460	0.02	1.5
	(7.1)[a]	(-1.2)		
Bank	0.168	-0.537	0.11	4.5[b]
	(6.2)[a]	(-2.1)[b]		
Insurance	0.173	-0.772	0.12	5.0[b]
	(4.6)[a]	(-2.2)[b]		
Other Financial	0.165	-0.709	0.16	6.7[b]
	(5.7)[a]	(-2.6)[a]		
Transportation	0.215	-0.339	0.00	0.1
	(5.7)[a]	(-1.0)		
Telecommunications	0.159	0.164	0.00	0.1
	(2.6)[a]	(0.3)		
Utilities	0.174	0.246	0.00	0.2
	(2.9)[a]	(0.4)		

Panel B: $(R_{non\text{-}Mon} - R_{Mon})_t = \alpha + \gamma_1$ Pessimism About Buying a House$_t$

Index	α	γ_1	Adj. R^2	F-Stat
Composite	-0.169	0.015	0.45	24.9[a]
	(-1.5)	(5.0)[a]		
Industrial	0.007	0.007	0.23	9.8[a]
	(0.6)	(3.1)[a]		
Bank	0.067	0.003	0.05	2.6
	(1.0)	(1.6)[c]		
Insurance	-0.003	0.005	0.11	4.4[b]
	(-0.0)	(2.1)[b]		
Other Financial	0.010	0.004	0.13	5.4[b]
	(0.2)	(2.3)[a]		
Transportation	0.041	0.005	0.14	5.6[b]
	(0.5)	(2.4)[a]		
Telecommunications	0.311	-0.004	0.02	1.6
	(2.4)[a]	(-1.3)		
Utilities	0.289	-0.003	0.00	0.9
	(2.2)[b]	(-0.9)		

a, b, and c represent significance at the 1 percent, 5 percent, and 10 percent levels, respectively

$R_{non\text{-}Mon} - R_{Mon}$ = The difference between the mean return on non-Mondays during a given calendar year and the mean return on Mondays during that calendar year (in %)

Growth in consumer sentiment index = Growth, compared to four quarters ago, in the University of Michigan's Consumer Sentiment Index

Pessimism about buying a house = Proportion of consumers (surveyed by the University of Michigan in tracking the Consumer Sentiment Index) that consider times to be bad for buying a house

Kamara (1997) claims that the Monday seasonal has declined for small firms compared to large firms because costs of arbitraging away the Monday seasonal have declined in the case of large firms compared to small firms. Although we find that the Monday seasonal has declined for some of the industries tracked by the Nasdaq sub-indices in recent years (Nasdaq stocks generally tend to be small), we do not explore any explanations for the recent decline in the Monday seasonal. A potential reason behind the disappearance could be that the general pessimism among investors and hence the intensity of the Monday blues may have been low during the dot.com euphoria years. It is also likely that the emergence of online trading and unlimited switching allowed by pension plans within the fund family during this period may have provided investors better opportunities for arbitraging away the influence of the blues on security prices. Exploration of these issues is left for future research.

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