

A Survey of the Monday Effect Literature

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Introduction

An extensive and long-standing literature documents calendar patterns in asset returns. In the inaugural edition of the *Review of Economic Statistics*, Persons (1919) makes reference to a January effect in equity securities, as one of several “seasonals” in stock returns. Another seasonal, the Monday effect, the tendency for Monday stock returns to be low relative to other weekdays and on average negative, provides the focus of this survey paper and other papers in this issue. Maberly (1995) shows that financial practitioners were aware of the Monday effect as early as the late 1920s. (See Kelly, 1930.) Then, as now, the existence of negative returns on Mondays was a puzzling phenomenon. Why should investors on Friday or Saturday buy securities that, based on historical data, should be expected to exhibit negative returns the following trading day?

Academic researchers have spent considerable effort attempting to document and, with limited success, to explain the tendency for asset returns to be negative on Monday. In recent years a new dimension has arisen that presents both obstacles and opportunities for explaining the Monday effect. Monday returns for large-firm equities have become positive, and in some years these returns are significantly higher than returns for other weekdays.

This survey serves as an introduction to a series of papers that examine the Monday effect including the shift from negative Monday returns to positive Monday returns.

Documentation of the Monday Effect

An extensive literature documents that weekday returns vary with the day of the week across various assets and markets. A persistent finding of this literature is a

*I would like to thank all the authors and referees for their hard work in putting together this special edition. I am especially indebted to my co-editor, John Wingender. Thanks also to George McCabe and Margo Young of the QJBE office for their assistance.

tendency for asset returns to be negative on Mondays. This literature began with documentation of low Monday returns of U.S. equity securities by market practitioners. An extensive academic literature applies more sophisticated statistical tools to show differences in U.S. equity returns across weekdays and also identifies similar effects in other equity markets and other asset markets. This section provides a brief overview of these findings.

Early Practitioner Studies

Market practitioners identified the Monday effect at least as early as the 1920s, well in advance of the advent of studies manipulating electronic databases. Kelly (1930) cites a three-year statistical study that identified Mondays as the worse day to buy stocks. He ascribes the cause of the low Monday returns to, among other factors, weekend decision making processing by individual investors. Fields (1931) studies conventional market wisdom and searches for a low-Saturday-return effect in the DJIA. Fields finds (consistent with a Monday effect) that Saturday's average closings are higher than the average of adjacent Friday and Monday closings.¹

Practitioners continued to report evidence of a Monday effect as interest in the market revived following the depression and World War II. Merrill (1966) reports that for the period 1952 through 1965 the DJIA rose only 43.0 percent of Monday trading days, but rose over 50 percent of the trading days for every other weekday. (The DJIA increased 64.6 percent of the Friday trading days in his sample.) Hirsch (1968) in his *Stockholder's Almanac* reports average weekday returns and identifies negative average returns for Monday. Another practitioner, Cross (1973), conducts a statistical test of the weekday effect. He studies price changes for the S&P 500 for the period 1953 through 1970. Cross reports that the proportion of increases on Friday is significantly higher than the proportion of increases on Monday.

Further Tests on U.S. Equity Markets

The first application of rigorous statistical testing of the difference in weekday returns results from French (1980) studying the S&P 500 Index over the period 1953 through 1977 and from Gibbons and Hess (1981) studying the S&P 500 Index and CRSP value- and equally-weighted indexes for NYSE and AMEX securities over the period 1962 through 1978. Keim and Stambaugh (1984) extend the period over which the weekday seasonal is examined for the S&P 500 Index and examine actively traded OTC securities. Linn and Lockwood (1988) examine a larger sample of OTC securities. Using different time frames and different sets of securities, these

¹Thaler (1987) indicates that Fields (1931) conducted his study as a graduate student at Harvard. Field's presentation articulates the trading time and calendar time hypotheses suggested by French (1980).

authors all find a statistically significant difference in returns across weekdays and a significantly negative return for Monday.

Lakonishok and Smidt (1988) extend these findings by conducting a ninety-year study of weekday returns for the DJIA. They report negative Monday returns for the entire sample period of 1897 through 1986 and for each of nine subsample periods. Average Monday returns are significantly less than zero for all but two of the subsample periods. Bessembinder and Hertzel (1993) extend the examination of weekday returns for U.S. equity securities into an even earlier period studying daily autocorrelations for a period from 1885 through 1989. For the overall sample and in each of 10 subperiods they find patterns of significant daily return autocorrelations that vary with the day of the week. Siegel (1998) examines the Monday effect over the period 1885 through 1997. He determines that, if Monday returns had been equal to the average return for other weekdays over this period, the Dow Jones Industrial Average would be almost twice its level at the end of 1997. Thus, an extensive literature reporting rigorous statistical analysis in addition to reported observations of various practitioners, documents a pervasive finding of a weekday effect involving low Monday returns.

International Evidence of Weekday Effects

Searching for collaboration and explanations, researchers have documented weekday effects in other equity markets. Several studies find weekday effects in equity returns for other developed markets. Hindmarch, Jentsch, and Drew (1984) document a weekend effect in the Canadian market. Jaffe and Westerfield (1985) find weekday effects similar to those in the U.S. market for the Canadian, British, Japanese, and Australian equity markets. In all cases average returns for Mondays were negative. Condoyanni, O'Hanlon, and Ward (1987) find significantly negative Monday or Tuesday returns in a study including seven developed markets. Chang, Pinegar, and Ravichandran (1993) find significantly negative Monday returns in 13 of 23 international markets, although results are sensitive to choice of statistical testing procedures. Dubois and Louvet (1996) provide further evidence of the existence of low Monday returns for developed markets in an examination of eleven indexes from nine countries during the period 1969 through 1992. Tong (2000) finds pervasive weekday effects studying 23 European, Asian and North American markets.

The weekday effect has also been found in emerging markets. Aggarwal and Rivoli (1989) find weekday effects in four emerging Asian markets. They find a strong negative Monday effect and a strong negative Tuesday effect that they suggest may be linked to the time differential between the location of these markets and the New York market.

Weekday Effects in Other Assets

Weekday effects are present for debt securities as well as equity securities. Gibbons and Hess (1981) find a pattern in Treasury bill returns that is similar to those in equity securities. Flannery and Protopapadakis (1988) study returns on overnight repurchase agreements and seven different maturities of Treasury issues. They find that Monday returns provide the lowest return for any day of the week for all of these debt securities and that the strength of the effect for Treasury issues increase with length of maturity. Griffiths and Winters (1995), Johnston, Kracaw, and McConnell (1991), Jordan and Jordan (1991), Ma and Goebel (1990), and Singleton and Wingender (1994) find weekday effects in a wide variety of debt instruments including federal funds, agency-issued mortgage-backed securities, and corporate debt.

Weekday effects are not limited to equity and debt securities. Ball, Torous, and Tschoegl (1982) and Ma (1986) find weekday effects in the price of gold. Coats (1981), McFarland, Pettit, and Sung (1982), and Thatcher and Blenman (2001) find weekday effects in currency exchange rates. Redman, Manakyan, and Liano (1997) find weekday effects in real estate investment trusts. Weekday effects appear to occur in a wide spectrum of asset markets.

Shifts in the Monday Effect

More recent research has documented a shift in the weekday pattern of returns for large-firm securities. This shift for large-firm securities proceeded in stages: First, researchers noted that Monday returns were no longer significantly less than returns for other weekdays; subsequently researchers reported that Monday returns were no longer on average negative; and finally researchers found that Monday returns were significantly higher than returns for other weekdays. In contrast, small-firm securities continue to experience the traditional pattern of high returns on Friday and negative returns on Mondays. Thus, an important avenue for future research into the Monday effect has emerged: Why has there been this dramatic shift in Monday returns for large-firm securities and why has this shift not influenced the weekday return pattern for small-firm securities?

Connolly (1989) studies the weekday effect over the period 1963 through 1983. Using standard weekday methodology he finds a significant difference between Monday returns and other weekday returns in the period prior to 1974, but depending on the index used no significant effect after 1974 although the average Monday return remains negative.² These results are confirmed by Chang, Pinegar, and

²Connolly (1989) reports that the reduction of the weekday effect was stronger for the equally-weighted index. Consistent with later findings indicating that Monday returns become positive for large-firm securities but remain negative for small-firm securities, replication of Connolly's results indicates that the results were inadvertently reversed relative to the labeling of the equally-weighted and value-weighted index. As noted below, Connolly also argues that

Ravichandran (1993). When Kamara (1997) extends the sample period beyond that of the previous two studies, he finds that the Monday returns of large-firm securities not only become insignificantly different from other weekday returns, but also eventually become, on average, positive. Kamara documents this change in weekday returns for large-firm securities using the S&P 500 index and also documents the lack of a similar change for small-firm securities using the smallest size decile for NYSE securities. He argues that this shift results from reductions in transaction costs that allow arbitrage against the Monday effect.

Consistent with the transaction costs argument, Kamara documents that before the elimination of fixed brokerage commission on Mayday 1975, average Monday returns were negative and significantly less than average returns for other weekdays for both small-firm and large-firm securities. During the period following the Mayday 1975 and before the introduction of futures contracts on equity indexes in 1982, average Monday returns for the S&P 500 index were negative, but not significantly less than zero, and the level of significance in the difference from the average return for other weekdays became marginal. In the sample period following the introduction of the futures contract in 1982, average Monday returns became positive for large-firm securities. Monday returns remained lower than average returns for the rest of the week but the difference was no longer significant. For all three periods, Monday returns for the small-firm index were significantly less than zero and significantly less than the average for other weekdays.

Mehdian and Perry (2001) examine weekday returns over a period (1964 through 1998) that includes positive average Monday returns at the end of the period. Applying a Chow test to three large-firm indexes and two small-firm indexes, they find that the weekday effect is unstable and that different regimes appear to occur at arbitrary selected breakpoints of 1982, 1987, and 1992.

In the pre-1987 period Mehedian and Perry find that average Monday returns are negative and significantly lower than other weekday returns for all five indexes. In contrast, for the post-1987 data they find that average Monday returns are positive for the large-firm indexes. Although the differences are not significant at the .05 level, average Monday returns are higher than the average return for rest of the week. For the small-firm indexes, however, Monday returns remain negative and significantly lower than the average return for other weekdays.

In contrast, Brusa, Liu, and Schulman (2000) argue that they document a reverse weekend effect for four large-firm indexes. Using data from the period 1990 through 1994, Brusa, Liu, and Schulman find that average Monday returns are positive and significantly greater than zero. In a reversal of previous findings (e.g., French, 1980) average Friday returns are negative and significantly less than Monday returns.

the case for the weekday effect is not only temporal but also depends on the choice of statistical methodology.

Consistent with previous findings, Brusa, Liu, and Schulman find that this reversal is dependent on firm size. They examine data for NYSE and AMEX securities divided into size deciles based on market value. For these deciles they compare average Monday returns to average daily returns for the rest of the week. Within their five-year sample period, they find a nearly monotonic progression in the difference between average Monday returns and the average returns for the rest of the week across deciles. For the deciles containing the securities with the smallest market values, average Monday returns are negative and significantly lower than returns for other weekdays. For securities in the medium size deciles, Monday returns become positive but remain lower (but not at statistically significant levels) than the return for other weekdays. For the three deciles including the largest securities, average Monday returns exceed the average returns for other weekdays. For the decile with the largest securities Monday returns are significantly higher than returns for other days of the week.

The reversal of the Monday effect is not limited to securities traded in the U.S. market. Board and Sutcliffe (1988) note that the weekend effect weakens in the U.K. market toward the end of their 1962 through 1986 sample period. Steeley (2001) examines weekday returns for the FTSE100 over the period April 1991 through May 1998. Over this period Monday returns are on average positive and there is no significant difference in average returns across weekdays. Steeley finds, however, that Monday and Friday returns are significantly less than other weekday returns when only negative return days are considered.

Summary

Negative Monday returns for equity securities have existed for over 100 years of trading activity. These negative returns are found across equity markets and for other assets as well. There have been shifts in the pattern for Monday returns—most notably in recent years Monday returns for large-firm equities have been not only positive but also large relative to returns for other weekdays. Considerable research effort has been expended to explain these curious patterns. The next section reviews these explanations.

Explanations of the Monday Effect

A large literature provides an extensive if not exhaustive set of explanations for the occurrence of negative equity returns on Monday. This section provides a brief review of this research. I begin with a discussion of arguments concerning the possibility that the negative Monday effect is a spurious result of misapplication of statistical techniques. The second section describes various arguments explaining the negative Monday returns as an efficient response to various market arrangements. The third section examines the possibility that rational pricing responses to micro or macro information flows causes the negative Monday returns. A fourth section

examines whether the trading patterns of various market participants affect order flow in a manner as to create negative Monday returns.

The last two sections examine studies that enrich the understanding of the negative Monday effect. The fifth section examines the interaction of the Monday effect with other market phenomena including other seasonal patterns. A final section explores the possibility that traders might profit from the tendency for stock returns to be negative on Monday. Neither of these final two sections provides an explanation of the Monday effect *per se*, but these discussions provide additional clarification as to the nature of the Monday effect.

The Monday Effect and Statistical Errors

Some scholars suggest that an apparent Monday effect arises from employing erroneous statistical methods. Two lines of reasoning have been applied to this general argument. Some researchers have argued that the weekday effect and other seasonals arise from data mining. For instance, Sullivan, Timmermann, and White (2001) recently argue in the *Journal of Econometrics* that calendar effects result from data mining. Their application of a new bootstrap procedure fails to identify a weekend effect or other calendar effects. This conclusion, however, ignores the vast replicatory work done on the weekend effect using many different statistical methods and data samples as described above.

A separate but related issue concerns the use of statistical tests that assume normality in the underlying return distributions despite evidence that equity return distributions are not normal. Gibbons and Hess (1981) argue against this concern as they conclude that adjustment for heteroscedasticity has no important impact on the weekday effect. Chen, Lee, and Wang (2002), however, do find evidence that adjustments for heteroskedasticity reduce the weekday effect. Further, Connolly (1989), working with equity securities, and Najand and Yung (1994), working with index futures, find that applications of GARCH analysis fail to reject the hypothesis that average returns are equal across weekdays. Results from Wingender and Groff (1989), however, contest the robustness of these findings based on GARCH tests. These researchers find a weekday effect by applying stochastic dominance, a method that requires no assumption about the underlying return distribution. Thus, their findings suggest that evidence of a weekday effect does not result from inappropriate assumptions about the normality of the underlying distribution. In addition, Gardeazabul and Regulez (forthcoming) find a stronger weekday effect when the standard dummy variable model is adjusted for misspecification.

Micro Market Effects

Equity prices are not determined in a frictionless market. Market arrangements may induce rational reactions by market participants that create seasonal variations in prices. In reviewing the evidence for the efficiency of capital markets, Fama

(1991) briefly considers return seasonals including the Monday effect. He notes that the average return for Mondays differs from those of other trading days by less than the dollar value of the typical bid-ask spread and suggests that: "There is thus some hope that these seasonals can be explained in terms of market microstructure." So, this section examines studies that seek to explain the negative Monday effect as a result of market arrangements that induce minor, but statistically significant, price disturbances across weekdays.

Gibbons and Hess (1981) investigate settlement procedures that might cause a weekday effect. Because settlement occurs several days after the transaction, spot prices theoretically include a risk-free payment over the settlement period. Because this settlement period is stated in business days, the actual number of days for which the risk-free payment is held would be affected by the occurrence of a weekend. Gibbons and Hess find the weekday effect occurring even in periods when the settlement period is five days long and thus would not be responsible for a weekday effect.

Lakonishok and Levi (1982) argue that settlement float would also be affected by check clearing procedures. They suggest that stock buyers are willing to pay more for stock purchased on Fridays because they have ten calendar days to pay for the stock whereas other trading days require payment in six calendar days. The reversal of this abnormally high price on Friday could explain low returns on Monday. Lakonishok and Levi submit empirical evidence to suggest that settlement procedures explain at least a small part of the observed weekday effect. Dyl and Martin (1985), however, examine this conclusion and conduct additional empirical tests that lead them to conclude that settlement procedures do not cause equity returns to vary by day of the week.

Keim and Stambaugh (1984) raise the possibility that high Friday returns reflect measurement errors that are reversed on Friday. They find a positive autocorrelation between Friday and Monday returns, however, which is just the opposite of what would be suggested by this argument. They also address the possibility that a specialist-related bias creates the Monday effect on organized markets. They dismiss this argument because they find a Monday effect for OTC securities that trades through dealers rather than specialists. They also cast doubt on all the arguments related to settlement procedures because they find that the weekday effect is stronger in periods where interest rates are low and correspondingly float incentives would be less.

Branch and Echevarria (1991) conjecture that tax considerations that influence share price response to ex-dividend status may influence the weekend effect if ex-dividend dates are not systematic across weekdays. They find no difference, however, between samples of no dividend and ex-dividend securities. Thus, micro market explanations of the weekend effect have not received strong empirical support in U.S. equity markets.

Researchers in other equity markets have found links between micromarket conventions and the weekday effect. A number of studies links various transaction costs and Monday returns for the British market. Bell and Levin (1998) find some evidence that consideration of three institutional factors including settlement procedure effects eliminates the weekday effect for the U.K. market. Draper and Paudyal (2002) argue that consideration of a combination of various institutional factors along with announcement effects eliminates an apparent negative Monday return in a sample of British stocks. More recently, Gregoriou, Kontonikas, and Tsitsianis (forthcoming) study the returns for the FTSE 100 over the period 1986 through 1997 and argue that the Monday anomaly disappears when the bid-ask spread is used to proxy for transaction costs.

Several other markets have been studied in connection with micro market features and the Monday effect. Hindmarch, Jentsch, and Drew (1983) study the effect of settlement procedures on the weekday effect. They replicate the procedure of Lakonishok and Levi (1982) of adding two days of interest to Monday's returns and subtracting two days of interest from Friday's returns. Test of the altered returns do not reject the hypothesis of equal returns across weekdays. Condayanni, McLeay, and O'Hanlon (1987) also suggest that settlement procedures account for part of the day of the week effect in a study of the Greek equity market. Clare, Ibrahim, and Thomas (1998) also associate the disappearance of the Monday effect with institutional factors in a study of the Kuala Lumpur stock exchange. They find a Monday effect over the period January 1983 through December 1989, but fail to find a Monday effect in the period February 1990 through July 1993 consistent with a shift in settlement procedures.

Keef and McGuinness (2001) reach contrasting conclusions in a study of weekday returns of the New Zealand market for the period 1989 through 1996. Although the settlement procedures were changed six times over this period, negative Monday returns are found across all of the settlement regimes. Board and Sutcliffe (1988) present evidence that shows that settlement procedures in the U.K. market tend to moderate the negative Monday effect. Thus, studies of international markets provide mixed evidence on the influence of market microstructure factors in explaining the Monday effect.

Information Flow Effects

In an efficient market prices respond rapidly to information flows. If relevant market information flow has a discernable weekday pattern, one would expect a weekday pattern in security returns. Dyl and Maberly (1988) infer an announcement effect on the basis that large unfavorable price changes are concentrated on Mondays. They do not, however, attempt to isolate the announcements that cause these large price changes. Other researchers have examined the possibility of a weekday pattern on both a micro and macro level. On the micro level researchers

have examined patterns in dividend and earnings announcements. On the macro level researchers have examined such issues as the timing of announcements concerning monetary policy.

French (1980) suggests that the most obvious explanation of the weekday effect was a tendency for firms to delay the announcement of bad news events until the weekend to avoid market disruption. Strong evidence exists that corporations tend to delay the release of bad news, (see, for example, Kross and Schroeder (1984)) but attempts to link such releases with the weekend effect have been only partially successful. Damodaran (1989) finds that earnings and dividend announcements explain only a small proportion of the weekend effect. Fische, Gosnell, and Lasser (1993), studying the U.S. equity market, and Choy and O'Hanlon (1989), studying the U.K. equity market, reach similar conclusions. Schatzberg and Datta (1992) in a study of a large number of dividend announcements argue that these announcements actually increase Monday returns.

Peterson (1990) concludes that an earnings announcement effect does not cause the weekday effect on the basis that a comparison of returns to an index of earnings reporting firms showed no difference in weekday patterns from an index of non-reporting firms. DeFusco, McCabe, and Yook (1993), however, find that an announcement effect may be indicated if all firm-specific announcements, not just dividend and earnings announcements, are considered. They find support for this hypothesis by examining security returns around board meetings, a time when firm-specific announcements are likely. Pettengill and Buster (1994) discount this possibility in a micro examination of corporate announcements made on the *Dow Jones Business Wire Service*. They find a tendency for weekend announcements to be positive in the period they study. Further, they find that the negative Monday effect associates with a large percent of securities experiencing a small negative return rather than a few firms experiencing a large negative return as would be associated with a micro announcement effect. Thus, any announcement effect is likely associated with a macro influence.

Athanassakos and Robinson (1994) find that dividend announcements do not explain negative Monday returns on the Toronto Stock Exchange, but suggest that weekend macro announcements may cause these negative returns. Steely (2001) does find an impact of macro announcements on Monday returns in the U.K. market when data are segmented by whether market return is positive or negative. Further, Chang and Pinegar (1998) argue that for smaller stocks, reaction to macroeconomic news concentrates on Mondays. After correcting for this influence they find that the weekday effect is substantially reduced, but average returns for Monday remain negative. Thus, macroeconomic announcements seem to have a stronger influence on the weekday effect than do firm-specific announcements.

The Role of Order Flow

In the previous section I examined the tendency for information flow to generate return differentials. In this section I examine other factors that might affect order flows and consequently security returns. I first examine various arguments relative to weekday patterns in order flow and then examine empirical evidence relative to these arguments.

Several hypotheses suggest that individual investors should be net sellers on Mondays. Miller (1988) argues that small investors have time to process information over the weekend and implement trade decisions on Monday. Because investors were net sellers over Miller's research period, Monday trades were sell orders. This tendency for individuals to concentrate sales on Monday is reinforced by the tendency for brokerage recommendations to be primarily positive and to be issued later in the week. Kelly (1930) made a similar argument many years ago. He argued as follows: weekend information processing time is important for individuals to reach portfolio decisions; sell decisions are more likely to require processing time; sell trades would thus tend to concentrate on Monday. Further, Kelly suggested that assessment of liquidity needs over the weekend may result in Monday sales. Osborne (1962) in his seminal discussion of market efficiency also argues that individual investors are more active on Monday as a result of weekend financial decisions.

Rystrom and Benson (1989) attribute selling activity by individual investors to weekday patterns in psychological well-being rather than weekday patterns in decision processing time. They argue that returns are low on Monday because investors, consistent with societal wisdom, are less optimistic on Mondays than on other weekdays. Thus, on blue-Mondays investors sell and depress prices. In contrast, on Fridays optimistic investors buy and increase security prices.³ Siegel (1998) makes a similar argument relative to the U.S. equity market. Further, Jacobs and Levy (1988) apply this argument to market seasonality involving holiday and January returns as well as weekday returns.

Foster and Viswanathan (1990) provide an explanation that attributes more rational behavior to individual traders. They suggest that discretionary liquidity traders avoid buying on Mondays because they fear the potential loss from trading with informed traders who are selling based on unfavorable information received during the weekend. Sias and Starks (1995) and Brooks and Kim (1997) make similar arguments relative to institutional trading activity on Monday. These

³Kelly (1930), in his seventy-year old tract discussing market behavior, analyzes weekday variation in psychological outlook as a factor creating weekday stock variation. Kelly's argument, however, is decidedly different than the more recent argument expressed above. Kelly argues that investors would naturally start the first day of the week with "high hopes" and would tend to bid the price of stocks upward. He conjectures that the observed tendency for stocks to fall on Monday results from a depressed state of mind connected to Sunday religious services.

researchers emphasize reaction by traders on Monday relative to possible private information flows over the weekend. Wang and Walker (2000) argue that institutional investors are less active on Mondays because they treat it as a strategic planning day.⁴

Fields (1931) identifies possible trading behavior prior to non-trading period as the possible cause of negative Monday returns. Fields examines conventional market wisdom that stock prices should fall on Saturday (at the time of his investigation the market was open for a six-day week) as short-term traders closed long positions fearing that information release over the weekend could cause price declines. Recently Chen and Singal (2003) apply a similar argument to short sellers. They argue that speculative short sellers seek to closely monitor their positions to limit potential losses. Because they would be unable to close their position over the weekend, they tend to buy stocks on Fridays to close their open position and to reopen their position on Monday by borrowing and selling stocks. This trading would tend to increase returns on Friday and decrease returns on Monday.

A number of studies test for the impact of individual traders using various market proxies. Lakonishok and Maberly (1990) use odd-lot trades as a proxy for individual trading behavior. They find that odd-lot trades are primarily seller-initiated on Mondays, suggesting that negative Monday returns result from individual investors selling at the current bid. This conclusion is supported by a price decline for Mondays that is consistent with the bid-ask spread. Abraham and Ikenberry (1994) also employ odd-lot trades as a proxy for individual investor activity. They confirm that selling activity for individual investors is significantly higher on Monday relative to other days of the week. They also document that this selling activity increases on Mondays following negative Fridays, suggesting that these investors, exhibiting a herd behavior, sell in response to negative market shifts. Brooks and Kim (1997) examine the behavior of small investors using intraday trade data provided by the Institute for the Study of Security Markets. For 276 randomly selected AMEX and NYSE securities they segment all 1989 trades into buyer and seller initiated trades and into groupings by size of trade. They find that small size trades have significantly greater representation on Mondays relative to other weekdays and that small size trades are significantly more likely to be sell orders on Monday than other days of the week. Thus, Brooks and Kim conclude that the negative Monday effect results from the selling activity of individual investors. However, they also document that institutional investors withdraw liquidity on Mondays exacerbating the effect of sales by individuals. Draper and Paudyal (2002) extend these findings to the U.K. market, presenting evidence that the trade size decreases on Mondays in this market.

⁴Wang and Walker (2000) support this contention by citing a 1971 Securities and Exchange report that indicates that fewer block trades occur on Monday.

Other studies of individual trading patterns examine the psychological link to trading behavior. Pettengill (1993) provides support for the blue Monday hypothesis in an experimental study of investor trading behavior. This experiment allows investors to choose between risky and risk-free assets. When the experiment was conducted on Fridays, investors were significantly more likely to invest in risky assets than were investors when the experiment was conducted on Mondays. Coursey and Dyl (1986) also conduct an experimental study providing support for the hypothesis that individual investors create the weekend effect. In their experiment a three-day trading market finds non-trading periods to be preceded by a significant increase in stock prices. Abraham and Ikenberry (1994) also suggest a psychological link arguing that a significant positive correlation of low Monday effects with the return for the previous Friday suggests that individual investors react to low Friday returns as a proxy for market-wide unfavorable information.

A recent study by Chan, Leung, and Wang (2003) provides statistical evidence to link the disappearance of the Monday effect to the rise of institutional investors. By inference, they attribute the source of the Monday effect to the impact of individual investors. They study average Monday returns and the average difference between Monday returns and average daily returns for the rest of the week over the period 1981 through 1998 for a sample reaching over 8,000 securities. They divide securities into decile portfolios based on institutional holdings. Consistent with previously reported findings, they find that during the period 1990 through 1998 the average Monday returns are positive and not significantly different from average returns for other week days. They also show that throughout their sample period portfolios containing securities with low institutional ownership have lower average Monday returns and have average Monday returns that show a greater disparity between average daily returns for the rest of the week. They conclude that the growth of institutional ownership may eliminate the Monday effect, as these investors actively arbitrage a seasonal pattern created by individual investors.

In an earlier study Sias and Starks (1995) reach a conclusion exactly opposite of that reached by Chan, Leung, and Wang. Sias and Starks suggest that institutional investors cause the weekday pattern in the U.S. equity market. They partition their sample of securities by the level of institutional holdings. Securities with higher levels of institutional holdings display a stronger Monday effect. By inference, the weekend effect would appear to associate with selling or the lack of buying by institutional investors. Brooks and Kim (1997) argue that selling by individual investors is the root of the Monday effect despite the stronger impact on stock held by institutional investors as found by Sias and Starks. They reason that the impact on stock prices from individual investors selling will depend on the liquidity available for that particular security. If institutional investors withdraw liquidity on Monday, the selling impact of individual investors would be stronger for those securities largely held by institutional investors.

Several other studies propose the opposite—that institutional investors rather than individual investors are the sources of negative Monday returns. Wang and Walker (2000) suggest that individual investors cause the weekday pattern in the Taiwanese market, but that institutional investors cause the weekday pattern in the Japanese market and that both types of investors cause the weekday pattern in Hong Kong. Brockman and Michayluk (1998) also argue in support of Sias and Starks. They reason that evidence of a positive correlation between return indexes for Monday and the preceding Friday supports the contention that institutional investors primarily cause the Monday effect. They suggest that institutions trade portfolios and that this behavior would create a positive correlation between Monday and Friday returns if institutions react by selling securities on Monday following a down Friday. On the other hand, they argue that individual investors sell individual securities rather than portfolios. Brockman and Michayluk argue that price movement of individual stocks rather than changes in index prices should affect trades of individuals. Because they find a significant correlation between index returns but not for returns of individual securities, they conclude that institutional selling creates the Monday effect.

Fields (1931) examines the claim that long traders sell and depress prices before a non-trading period by determining the number of observations in which Saturday closed lower relative to Friday and Monday. He rejects this argument because Monday trading days rather than Saturday trading days display a tendency for prices to fall. In contrast, Chen and Singal (2003) find support for their contention that short sellers close out positions before a non-trading period. Consistent with this argument, Friday returns are high and Monday returns are low. Further, they find that this effect is stronger for securities with high short interest. They also observe that the weekend effect becomes weaker for securities after the introduction of traded put options for those securities. Because put options arguably provide a more effective bearish strategy, short selling would have less of an impact on these securities.

Conditional Nature of Monday Returns

Researchers have found that the Monday effect varies with market conditions and seasonal patterns. Further, evidence suggests that the reported close-to-close Monday return is not evenly distributed from Friday close to Monday close. Rogalski (1984), for example, shows that negative Monday returns are concentrated from Friday close to Monday open. These findings need to be reconciled with potential explanations for negative Monday returns.

Smirlock and Starks (1986) show that the distribution of the negative return across the Monday trading period is not stable. They examine Monday returns for the DJIA for the period 1963 through 1983. They find that in the early period of their sample a positive return for the period from Friday close to Monday open was

swamped by negative returns during Monday trading hours. Toward the end of the period negative Monday returns resulted from negative returns between Friday close and Monday open despite positive returns during Monday trading. Chow, Hsiao, and Solt (1997) present evidence that this change might have been temporary, as they find profitable returns to a trading strategy designed to benefit from negative returns during Monday trading hours operating in a sample later than that studied by Sias and Starks. Likewise, Draper and Paudyal (2002) find significantly negative returns during Monday's trading for a recent sample using U.K. securities.

Several researchers find evidence that Monday's returns are influenced by returns for preceding trading days. Cross (1973) was the first to identify this relationship. In a sample examining the weekday pattern of the S&P 500 Index, he finds that the average Monday return is -.001 percent if the preceding Friday had a positive return and -.48 percent if the preceding Friday had a negative return. Keim and Stambaugh (1984) examine each of the 30 securities in the DJIA. They find a positive correlation between Monday and Friday returns for all 30 securities. Further, they find that this correlation is significantly higher than for other weekday pairs. In the most extensive examination of weekday autocorrelations, Bessembinder and Hertz (1993) study autocorrelations in the U.S. equity market for the period 1885 through 1989. They find consistent positive autocorrelation between Monday returns and returns for the last trading day of the previous week⁵ in the entire period and in ten subperiods. They also find that the Monday-Friday return correlation is greater than for other weekdays. Gu (forthcoming), however, has found that the Monday-Friday return correlation is no longer stronger than the return correlation for other weekdays.

Abraham and Ikenberry (1994) show that the Monday-Friday return correlation is particularly strong when Friday returns are negative. As noted above, they suggest that this connection may result from individual trading behavior that provides an explanation for the Monday effect. Fische, Gosnell, and Lasser (1993) assert that the negative Monday effect disappears for Mondays when the return on the previous Friday is positive. Earlier Jaffe, Westerfield, and Ma (1989) reached a similar conclusion examining the return for the previous four-day trading period rather than the return for Friday only.

The correlation between negative Monday returns and the return to the previous Friday is not an exclusive property of the U.S. equity market. Bessembinder and Hertz (1993) find this relationship in the Japanese equity market and for ten futures markets traded in the U.S. In a study of the Canadian equity market, Athanassakos and Robinson (1994) find that 72 percent of the Mondays following a negative Friday have negative returns. Tong (2000) studies the Friday-Monday return

⁵Prior to June 1952 the NYSE was open for limited trading on Saturdays.

connection in twenty-three stock markets and finds that the correlation between bad Fridays and Mondays is stronger in markets outside the U.S.

The weekday seasonal is also influenced by a monthly seasonal in weekday returns. Pettengill and Jordan (1988) study weekday returns segmented by week of the month for the S&P 500 Index and an index for small-firm securities. They document that returns are significantly higher in the first half of the month, but that the weekday effect persists through all weeks in the months. The difference in returns across the month is especially strong for Mondays, but is also significant for Thursdays and Fridays. For small firms the average Monday returns are positive in the first half of the month. Liano and Lindley (1995) and Wang, Li, and Erickson (1997) also show that the Monday returns are affected by a monthly seasonal. Both studies find that the Monday effect is primarily due to low Monday returns during the last half of the month and that, depending on the index and time period studied, the difference between Friday and Monday returns may not be significant in the first half of the month.⁶ Wang, Li, and Erickson (1997) conclude that these results require that any explanation of negative Monday returns must be consistent with differing impact across the month. Liano and Lindley (1995) suggest that the monthly variation in the Monday-Friday differential may be consistent with variation in a micro announcement effect. They also present evidence, however, that the Friday-Monday differential varies over time and that the differential varies with firm size. To be a satisfactory explanation, therefore, any announcement effect would require both specifying shifts in the phenomena and relating each phenomenon to several covariates.

The Monday effect also interacts with the level of returns across time periods (e.g., whether the market is bearish or bullish). Liano and Gup (1989) find that the negative return on Monday is more pronounced during periods of economic contraction than during periods of economic expansion. Liano, Huang, and Gup (1993) examine the interaction between Monday return, the previous week's return and the business cycle. They find a negative Monday return for the S&P 500 index only if the previous week's return is negative. The return to the Nasdaq Index is

⁶Liano and Lindley (1995) divide the month in half following Ariel (1987) using a procedure that places the last trading day of the month in the first half of the following month. Wang, Li, and Erickson (1997) divide the month into weeks and include Mondays in the first week of observations only if the month begins with a Monday. Pettengill and Jordan (1988) divide trading days into the first and last half of the month simply by attributing the first five trading days to the first week, the last five trading days to week four and so on. Because the first and last day of the month historically provide a high returns and because Fridays are roughly three times as likely to be the last trading day of the month and Mondays are roughly three times as likely to be the first trading day of the month, one would expect important difference in comparisons. Pettengill and Jordan deal with this phenomenon by computing an adjusted weekday return based on the day of the month.

negative regardless of the return in the previous week. They find that these relationships are invariant relative to the business cycle.

Trading on the Monday Return

The existence of a recurring seasonal pattern suggests the possibility of trading opportunities. For instance, an investor might sell stock at Friday close and buy back the same stock at Monday close at a lower price. Yale Hirsch advised subscribers to his annual *Stockholder's Almanac* to trade on the basis of weekday variations as early as 1968. He provides more explicit direction in his book, *Don't Sell Stocks on Monday*.

A question for any market anomaly that transcends questions of spurious statistics, market micro-structure, rational pricing, and information fluctuations is the possibility of profit. Academic researchers have generally found that attempts to exploit seasonal patterns in stock returns provide poor investment strategies, given transaction costs. French (1980) and Siegel (1998) conduct back-of-the-envelope calculations showing that transaction costs would eliminate any profit from a sell-on-Friday-buy-back-on-Monday strategy. French does suggest that investors may wish to consider seasonal factors when making discretionary purchases or sales. Specifically French (p. 67) suggests that investors planning to purchase stock on Thursday or Friday should delay the purchase until Monday and that any sell planned for Monday be made the preceding Friday.

Several authors have conducted simulated trading strategies to test for the exploitability of the weekend effect. Kim (1988) applies a trading strategy to market indexes from six different countries. The trading strategy is simply to avoid trading days where the return had been historically negative. The strategy did not provide sufficient return to offset transaction costs. Ko and Lee (1993) apply a conditional trading strategy to indexes of 19 international markets. The strategy involved selling the index at Friday close and buying back at Monday close if the previous week's return had been negative and remaining in a long position on Friday if the previous week's return had been positive. Profits were insufficient to overcome modest transaction costs. Bessembinder and Hertzel (1993) examine a more aggressive strategy involving day to day sales at the beginning and end of the week conditional on the previous day's return. They also find that the return differential between this strategy and a buy-and-hold strategy is not sufficient to cover transaction costs.⁷

Chow, Hsiao, and Solt (1997) implement several trading strategies using Standard & Poor's Depository Receipts (SPDRs) as the trading vehicle over a 1970 through 1993 sample period. They implement these several strategies at various

⁷Bessembinder and Hertzel (1993) apply a similar strategy to futures markets for a number of commodities. They suggest that return differentials between the buy-and-hold and trading strategy may have been sufficient to pay for transaction costs in trading futures for various assets.

times on Friday and close the position at various times on Monday. They utilize a strategy of always leaving the market on Monday and a conditional strategy similar to Ko and Lee and find that these strategies are not sufficiently profitable to pay for transaction costs. Chow et al. find that two additional strategies provide profits great enough to offset transaction costs. They implement a strategy of shorting the SPDR if the Thursday to Friday return is negative as determined at various times during the Friday trading period. They find this strategy to be sufficiently profitable to pay transactions costs. The strategy becomes more profitable if trading is limited to Friday's where the Friday return is most negative. Chow, Hsiao, and Solt show that the profitability of their strategy is robust to consideration of ex-dividend effects, but they do not conduct out-of-sample tests of the trading strategy. Additionally, they do not consider the impact of the prohibition against short-selling without an up tick. This omission is especially important, as their most profitable trading strategies occur on days with the least likelihood of a trading up tick.

Compton and Kunkel (1999) study a trading strategy based on the reality that not all trades require the payment of transaction costs. They apply a strategy of switching from a money market account to a diversified stock account on Monday and back to the money market account on Friday. This strategy is applied to a mutual fund family that allows unlimited transfers without imposing transfer fees. They find that this strategy yields superior performance to a buy and hold strategy. In contrast, Compton and Kunkel (2000) apply a similar trading strategy to a later data sample and find no profit from the weekend effect.

Summary

Although numerous researchers have offered explanations for negative Monday returns for equity securities, none appears entirely satisfactory. Prevalence of this phenomenon argues against explanations that dismiss it as due to misapplication of statistical methodology or as a result of micro market structure. Likewise rational pricing explanations have produced mixed empirical success, at best. Although patterns in information flow seem logical, empirical results from examination of these flows likewise do not provide promising results. The most consistent findings rely on variation in order flow patterns from various traders. Empirical tests have done little to clarify, however, how these order flows are influenced by various other patterns such as monthly return patterns. Further, although changes in transaction costs might explain a reduction in the Monday-Friday return differential, it should not reverse this differential as evidenced by large-firm securities in recent years. Last, it is not clear why traders who never paid transaction costs would not have eliminated this pattern earlier.

Conclusion

For many years, investors buying equity securities in various international markets should have, based on historical information, expected to incur a loss the following trading days. Negative Monday trading returns withstood clear explanation until these returns became positive for large-firm securities but not for small-firm securities. In light of these shifts, articles in this issue provide fresh examination of various issues surrounding the Monday effect. Collectively they emphasize the continued strength of the Monday effect for small-firm securities and provide additional insight into the factors causing a Monday effect.

Miller, Prather, and Mazumder (2003) provide evidence of the exploitability of the Monday effect switching among mutual funds within a family of funds. They study weekday patterns from 1990 through mid-1995 and then trade on those patterns from mid 1995 through late 2000. In spite of the shift in Monday returns, they find that strategies that seek to profit from expected negative returns on Monday outperform buy-and-hold strategies and strategies that seek to profit from more general weekday patterns. These results are consistent with continued strength of the Monday effect for small-firm securities.

Sullivan and Liano (2003) study the changes in the average Monday returns for the value-weighted New York Stock Exchange Composite Index and the changes in the market breadth, the percent of securities declining on Mondays. They find that when the Monday seasonal in stock returns was the most pronounced, in the 1960s, 1970s, and 1980s, there was a corresponding Monday influence in the market breadth (that is, a greater percent of issues declining on Mondays). They confirm that the Monday effect extends broadly and cast doubt on the information announcement hypothesis as an important explanation of the Monday effect. They also find that in the 1990s the average Monday return for the value-weighted index was larger than the average return for the rest of the week, confirming the disappearance of the Monday effect for large-firm securities. During this period, however, the percent of issues declining, which places greater emphasis on small-firm securities, remained greater on Monday than on the rest of the week. Their finding suggests that the persistent Monday effect for small-firm securities, as documented in the literature, remains a broad based effect.

Singleton and Wingender (2003) use exploratory data to study the characteristics of Monday returns. They find that over a long period of time (1963-2001) that in both large and small stocks occasional large negative outliers contribute significantly to the Monday effect. They document that outliers in large stocks continued through 2001 but were not as strong in the latter years. These findings, in part, explain the apparent disappearance of the negative Monday effect in large stocks.

The authors identify the Mondays that are associated with the largest negative outliers to look for any systematically associated economic, behavioral, or technical factors. They use content analysis to link key words and phrases in the *Wall Street*

Journal's "Heard on the Street" column to the Mondays with large negative outliers. Singleton and Wingender's results suggest that economic factors (such as interest rates) and behavioral factors (such as investor sentiment) reported by the *Wall Street Journal* are associated with outlier Mondays for both large and small stocks. They conclude that rational responses to information flows are probably responsible for the Monday effect and that these effects are different for large and small stocks.

Tori (2003) analyzes the information processing hypothesis by comparing changes in average Monday returns for the S&P 500 index and the Nasdaq index with changes in the conditional relationship between Friday and Monday returns. She finds important shifts in the conditional relationship between Friday and Monday returns, but these shifts are not consistent with increases in average Monday returns. Further, she finds that although the Friday-Monday correlation weakens for the S&P 500 index, it remains significant. In contrast, the conditional relationship disappears altogether for the Nasdaq index despite a continuing average negative Monday return. She suggests a shift in the behavior of individual investors.

Gondhalekar and Mehdian (2003) also focus on individual investors. They argue that a tendency for investors to be pessimistic on Monday creates a source of non-diversifiable risk resulting in lower returns for Monday. Their empirical results are consistent with the existence of higher non-diversifiable risk on Mondays and a connection between levels of investor pessimism and the strength of the Monday effect. Since they study the Nasdaq equally-weighted index their data continues to reflect a Monday effect.

The findings reported above are broadly consistent with the argument posited by Kamara (1997) that the Monday effect results from recurring trading patterns of individual investors and that it was eliminated as reductions in transaction costs (from the elimination of fixed brokerage commissions and later the introduction of traded futures) allowed institutional investors to profit from the Monday anomaly. Pettengill, Wingender, and Kohli (2003) report empirical findings that question the connection between arbitrage and the disappearance of the Monday effect. In addition they show that timing of the change in the Monday effect is inconsistent with the timing of the introduction of the changes in transaction costs, especially the introduction of exchange-traded index futures. Further, they find that Monday returns in a sample where extreme observations are eliminated are much larger on a relative basis than would be suggested by arbitrage activity.

In the introduction I identified four possible explanations for the Monday effect. This review has summarized the evidence for each of these. In light of the research reported in this volume, a few words of summary and conclusion are appropriate. Of the four possible explanations, trading patterns from various traders still appears to be the most promising avenue for inquiry. While the controversy is by no means settled, logic suggests that the most likely source of the Monday effect are real economic and behavioral phenomena. For an anomaly so well publicized to have

persisted for so long, I either have to conclude the market is so inefficient it cannot learn from its own history or that the Monday effect comes from a rational response to relevant information. As our ability to measure economic and especially behavioral variables on a timely basis improves, I may indeed find the ultimate source (or sources) of the Monday effect. One challenge that lies ahead is to measure investors' behavioral responses.

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