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Working Paper

Closing the question on the continuation of turn-of-the-month effects: evidence from the S&P 500 Index futures contract

Working Paper, No. 2000-11

Provided in Cooperation with:
Federal Reserve Bank of Atlanta

Suggested Citation: Maberly, Edwin D.; Waggoner, Daniel F. (2000) : Closing the question on the continuation of turn-of-the-month effects: evidence from the S&P 500 Index futures contract, Working Paper, No. 2000-11, Federal Reserve Bank of Atlanta, Atlanta, GA

This Version is available at:
https://hdl.handle.net/10419/100728

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Closing the Question on the Continuation of Turn-of-the-Month Effects: Evidence from the S&P 500 Index Futures Contract

Edwin D. Maberly and Daniel F. Waggoner

Working Paper 2000-11
August 2000

Working Paper Series

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Abstract: Prior research documents unusually high returns on the last trading day of the month and over the next three consecutive trading days. This phenomenon is known as the turn-of-the-month (TOTM) effect. According to Siegel (1998), why these anomalies occur is not well understood, and whether they will continue to be significant in the future is an open question. In this paper, we examine the S&P 500 futures contract for evidence that turn-of-the-month effects have continued. Transaction costs are low for index futures, and the absence of short-sale restrictions makes index futures an attractive venue for testing the continuation of market anomalies because of the low cost of arbitrage. We find that TOTM effects for S&P 500 futures disappear after 1990, and this result carries over to the S&P 500 spot market. We conjecture that a change in the preference of individual investors over time from making direct to making indirect stock purchases through mutual funds is related to the disappearance of the TOTM effect for more recent return data. In this paper, we argue that turn-of-the-month return patterns for both spot and futures prices are dynamic and related to market microstructure and therefore subject to change without notice. Financial economists should be careful when making out-of-sample inferences from observed in-sample return regularities.

JEL classification: G14

Key words: disappearing turn-of-the-month effect, S&P 500 futures, market efficiency

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This paper was completed while Maberly was a visiting scholar at the Federal Reserve Bank of Atlanta. The views expressed here are the authors' and not necessarily those of the Federal Reserve Bank of Atlanta or the Federal Reserve System. Any remaining errors are the authors' responsibility.

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Closing the Question on the Continuation of Turn-of-the-Month Effects: Evidence from the S&P 500 Index Futures Contract

"Methods of this kind, which substitute mechanical plays for judgement, must fail. For the calculations on which they are based omit one fundamental fact, i.e., that the only unchangeable thing about the stock market is its tendency to change. The rigid method sooner or later will break the operator who blindly follows it."

Richard Wyckoff (1930)

I. Introduction

Financial economists have documented numerous anomalies over the past two decades. For example, there are the January effect (small firm's exhibit high returns in January), the holiday effect (stock returns are high on pre-holidays), the Monday effect (stock returns are low on Mondays), and the turn-of-the-month effect (stock returns are high around the turn of the month). According to Siegel (1998, p. 254), why these anomalies occur is not well understood, and whether they will continue to be significant in the future is an open question.

Sullivan, Timmermann and White (1998) (STW) suggest that apparent stock return anomalies do not necessarily imply a rejection of market efficiency, but instead these anomalies could be just a result of a large, collective data-snooping exercise. Shiller (2000) notes that many anomalies disappeared after they were discovered, as is the case for the January effect, and therefore, their disappearance suggests that there is a basic truth to efficient markets theory. The evidence supporting systematic abnormal stock returns has largely been considered without accounting for the intensive search preceding it. STW (1998) use a new bootstrap procedure that explicitly measures distortions in statistical inference induced by data snooping, and find that the strength of the evidence on calendar anomalies looks much weaker.

Transaction costs and short-sale constraints in the spot market could account for the apparent historical success of some mechanical trading rules formulated from observed calendar anomalies. STW (1999) note that the low transaction costs associated with S&P 500 index futures and the absence of short-sale restrictions make index futures an attractive venue for the execution and testing of mechanical trading strategies. An underlying theme of the anomaly literature (Hensel and Ziemba (1996), Haugen and Lakonishok (1988), and Clark and Ziemba (1987)) is that seasonal anomalies can be exploited more readily in the index futures market.

As noted by Siegel (1998), the persistence of turn-of-the-month effects for stock returns is an open question. Efficient markets theory predicts that this anomaly dissipates over time, and in an attempt to "close" Siegel's question, this study examines turn-of-the-month return patterns for the S&P 500 futures contract over the period 1982/05 through 1999. Prior research documents significant turn-of-the-month effects for stock returns (Ariel (1987), Lakonishok and Smidt (1988), and Ogden (1990)) over the period 1963 through 1986. In particular, unusually large returns are observed over four consecutive trading days beginning with the last trading of the month and counting forward three trading days. Henceforth, these four consecutive trading days are known as turn-of-the-month trading days (TOTM days, hereafter).[1]

The objective of this study is to examine the S&P 500 futures contract for evidence of turn-of-the-month effects, and we document significant turn-of-the-month effects for S&P 500 futures over the period 1982/05 through 1990. This finding is expected given results of prior studies that document significant turn-of-the-month effects for spot returns over a similar time period. In contrast, we find that turn-of-the-month

effects for S&P 500 futures disappear after 1990, and this result carries over to the S&P 500 spot market. TOTM days are classified into four groups (e.g., no-Friday, pre-Friday, Friday and post-Friday) depending on the incidence of Friday trading, and we provide strong evidence that the return patterns associated with the pre-Friday and post-Friday categories of TOTM days has changed significantly over the last 29 years. We conjecture that a change in the preferences of individual investors over time from making direct to making indirect stock purchases through mutual funds is related to this phenomenon. This provides us with a partial explanation of why the turn-of-the-month pattern of S&P 500 spot and futures returns has changed over time. A secondary objective of this study is to examine the pattern of S&P 500 futures returns for Monday-TOTM days, and we find that S&P 500 futures returns appear unusually large on Monday-TOTM days. The results presented in this paper are consistent with STW (1999, 1998) and advocates of efficient markets theory.

The remainder of this paper is structured in the following manner. Section II contains a literature review of empirical studies documenting turn-of-the-month effects for stock returns, and a description of our data set follows in Section III. The paper's methodology is discussed in Section IV. Section V presents the empirical findings followed by summary and conclusions in Section VI.

II. Literature Review

Empirical evidence shows that stock returns are unusually high around the turn of the month and that this pattern is persistent over time. Ariel (1987) examines daily returns for the Center for Research in Security Prices' (CRSP) value-weighted and equally weighted indexes for the 1963 through 1981 period. Daily returns are divided

into two subsets, the first half and the last half of the month. The first half of the month includes nine trading days beginning with the last trading day of the prior month and then counting forward eight trading days into the current month. The last half of the month includes nine trading days beginning with the penultimate trading day of the prior month and then counting backwards eight trading days. Ariel finds that the market's entire cumulative advance occurs during the first half of the month. Over the nineteen years studied, the cumulative return over the last half of the month is close to zero and contributes nothing to the markets overall performance. Ariel offers various explanations for this phenomenon, "but nothing sufficed to explain the observed empirical regularity" (p. 174).

As an extension of Ariel's (1987) study, Lakonishok and Smidt (1989) examine daily returns around the turn of the month for the Dow Jones Industrial Average over the ninety year period 1897 through 1986. They conclude that "Ariel's evidence of a higher average rate of return during the first half of the month appears to be partly the result of idiosyncratic characteristics of the period he studied and partly the result of including the last trading day of the previous month as part of the first half of a month" (p. 409). However, Lakonishok and Smidt find that mean daily returns are unusually high over TOTM days throughout their data set. Ogden (1990) examines stock return data for the CRSP value-weighted and equally weighted indexes for the eighteen-year period 1969 through 1986 and finds that returns are higher than normal on TOTM days, especially during periods of easy monetary policy. Ogden's results support his hypothesis that the magnitude of cash flows around the turn of the month and hence the strength of the turn-of-the-month effect appears related to monetary policy. Other studies by Martikainen,

Perttunen, and Ziemba (1994), Ziemba (1991) and Jaffe and Westerfield (1989) generalize turn-of-the-month effects to international markets and report similar results to the United States (U.S.) evidence.

III. Data Set

A. Data Description

In April 1982, a futures contract based on the S&P 500 index began trading on the Chicago Mercantile Exchange, and this contract is the most active of all index futures contracts both in terms of open interest and daily trading volume. This study examines close-close and time-decomposed (e.g., close-open and open-close) returns for the S&P 500 futures contract over the period May 1982 through December 1999. S&P 500 futures tick data for the period 1991 through 1999 was purchased from the Futures Industry Institute, and from this data, we calculate returns over 15-minute intervals. The first 15-minute interval is 9:45 to 10:00 EST with 16:00 to 16:15 EST the last 15-minute interval. [2]

Daily returns are calculated as the logarithm of the price relative for the closest to maturity contract with the price observation switched to the next most distant contact on the last trading day of February, May, August, and November. The data set is divided into two subperiods with the first period from 1982/05 through 1990 and the second period from 1991 through 1999. Besides dividing the data set into two periods of approximately equal length, there are other justifications supporting this convention. For example, based on published research on spot return patterns, turn-of-the-month effects for index futures are likely present over the period 1982/05 through 1990. Published research documenting significant turn-of-the-month return patterns for stocks predates

1991, and therefore, this information is in the public domain by January 1991. Lastly, the period 1991 through 1999 is an out of sample test for the continuation of turn-of-the-month effects.

B. Data Presentation

S&P 500 futures returns are arranged into groups using a number of criteria. In Table 1, Ariel's (1987) definition of the first and last half of the month is used to classify daily returns. Mean daily returns for each of the eighteen days is presented, as is the mean daily return over the first and last half of the month. Table 2 examines Day –1 returns in more detail. Day –1 returns are divided into two groups, and these two groups are turn-of-the-quarter (TOTQ) and not TOTQ days. TOTQ days refer to the last trading day of March, June, September and December, and not TOTQ days refers to the last trading day of the remaining eight months. [3] In Table 3, the days of the month are divided into two groups based on Ogden's (1990) definition of TOTM and regular days and mean daily returns are reported for both groups.

Previous authors treats TOTM days as a homogeneous group, but this study considers the possibility that there exist significant return differences across TOTM days other than that implied by the calendar sequence of TOTM days. For example, Ariel (1987) finds that returns are the highest on Day –1 and the lowest on Day 2. Each turn-of-the-month period contains four TOTM days, and this study divides these days into four distinct groups based on the incidence of Friday trading. The four categories of TOTM days are as follows: (1) no-Friday, (2) pre-Friday, (3) Friday, and (4) post-Friday.[4]

If Monday is the last trading day of the month, then the TOTM days are Monday, Tuesday, Wednesday and Thursday, and these days are placed in the no-Friday category. The no-Friday category also includes the sequence of TOTM days that do not include a Friday due to a Friday exchange holiday. Pre-Friday includes all TOTM days preceding a Friday that is also a TOTM day. For example, if Friday is the third trading day of the month, then the preceding Thursday, Wednesday and Tuesday are pre-Fridays. Friday includes those TOTM days that occur on a Friday. Post-Friday includes all TOTM days following a Friday that is also a TOTM day. For example, if Friday is the first trading day of the month, then the following Monday and Tuesday are post-Fridays.

IV. Methodology

Ogden (1990) argues that the payment of cash receipts is concentrated at the turn of the month, and the subsequent investment of these cash receipts is related to the observed high stock returns around the turn of the month. These receipts include dividends, interest payments, wages, and payments made to defined contribution plans. The Investment Company Institute provided annual data on net sales of stock, bond and hybrid funds for the period 1970 through 1999, and this data shows that net sales of mutual funds increased significantly after 1990. Over the period 1982 through 1990, annual mutual-fund flow averaged a positive $50 billion, but this number increased to $230.7 billion over the period 1991 through 1999. The difference in mean annual mutual-fund flow between the two periods is significant at the 0.0001 level.

In early 2000, the Vanguard S&P 500 index fund surpassed the Fidelity Magellan fund as the largest U.S. mutual fund with over $110 billion in assets. In the 1990's, the growth of S&P 500 index funds was spectacular, and this phenomenon is related to the

concurrent 4-fold increase in the S&P 500 index. Since index funds maintain very low cash balances at all times, the time lag between inflows and their reinvestment is at most one trading day. If a disproportionate amount of money flows into S&P 500 index funds around the turn of the month, then their immediate reinvestment could produce anomalous return patterns for the S&P 500 index around the turn of the month.

A reasonable assumption is that daily mutual-fund flow is a function both of calendar time and the day of the week. In such a model where inflows are the norm, a disproportionate amount of funds are available for investment on Mondays relative to the other days of the week. In this scenario, more buying pressure by mutual funds, especially near the end of the day on Monday, biases Monday's return upwards, and this phenomenon positively impacts all Mondays. However, due to a concentration of inflows around the turn of the month, the upward bias in returns is most pronounced for Monday-TOTM days

Prior research reports that, on average, Monday returns are negative and anomalous, and for this reason Monday-TOTM days are combined into a separate category. Lakonishok and Maberly (1990) argue that selling pressure on Monday by individual investors is related to the Monday effect. Ogden (1990) argues that the investment of liquid profits around the turn of the month contributes to the high returns observed on TOTM days. However, the investment of liquid profits on Monday-TOTM days potentially offsets the Monday selling pressure documented by Lakonishok and Maberly. Thus, Monday-TOTM day returns are biased upward, and the Monday effect is predicted to disappear for Monday-TOTM days.

An important fact overlooked in past studies is that the last trading day of the month occurs on Friday with frequency 3/7 excluding the impact of holiday closures. The last trading day of the month is Friday whenever Friday, Saturday, or Sunday is the last day of the month. Many U.S. workers are paid on the last trading day of the month, and therefore, fund flow into defined contribution plans is unusually high on Friday-TOTM days

Anecdotal evidence suggests that individual investors preferred direct stock purchase through brokerage firms during the 1970's versus indirect stock purchases through mutual funds. If direct equity purchases by individuals are the norm, then we conjecture that turn-of-the-month buying pressure is either coincident or leads the payment of cash receipts. An individual who anticipates receiving funds earmarked for investment say on Friday can make purchases on the preceding Tuesday, Wednesday or Thursday (the settlement date is currently three days after the purchase). In contrast, anecdotal evidence suggests that individual investors preferred indirect stock purchases through mutual funds during the 1990's, and this includes purchasing mutual funds via brokerage firms or from the mutual-fund company themselves. In many cases, investors automatically route funds on a monthly basis to mutual fund companies. If indirect equity purchases by investors are the norm, then we conjecture that turn-of-the-month buying pressure is either coincident or lags the payment of cash receipts.

If turn-of-the-month buying pressure is either coincident or leads the payment of cash receipts, then the resulting buying pressure is projected to have a greater impact on pre-Friday and Friday TOTM day returns. In contrast, if turn-of-the-month buying pressure is either coincident or lags the payment of cash receipts, then the resulting

buying pressure is projected to have a greater impact on Friday and post-Friday TOTM days. In summary, we argue that TOTM day mean returns differ across the no-Friday, pre-Friday, Friday and post-Friday classification. We find that significant differences exist in mean returns across the four categories of TOTM days and relate these differences to the investment preferences of individuals for making direct or indirect stock purchases.

V. Empirical Results

A. First half versus Last half of the Month

Ariel (1987) contends that stock returns are unusually high over the first half of the month and labels this phenomenon the monthly effect. In Table 1, we replicate Ariel's study for S&P 500 index futures, and the results are presented for each period 1982/05 through 1990 and 1991 through 1999.

1982/05 through 1990

The Crash of '87 occurs on Day –10, and if the –22.89 percent return is omitted, then Day –10 mean returns equal –0.1053 percent and mean returns over the last half of the month equal 0.0144 percent. Other than Day –10 and the large returns observed for Day 2, there is nothing unusual about daily mean returns for each of the eighteen trading days examined. Mean returns between the first and last half of the month are not statistically different at acceptable levels. For S&P 500 futures, the hypothesis that a monthly effect exits is rejected.

1991 through 1999

There is no evidence of a monthly effect over the period 1991 through 1999. S&P 500 futures returns are indistinguishable between the first and last half of the month for all three return measures examined. Numerically there is almost no difference between first (0.0400 percent) and last half (0.0338 percent) of the month mean returns. Ariel (1987) reports unusually high spot returns on the last trading of the month, and the results reported for Day –1 in Table 1 are of special interest. Day –1 mean returns are negative at –0.1720 percent, and of the eighteen days examined, returns are the lowest on Day –1.

B. Turn-of-the-Quarter Trading Days

Ariel (1987) documents large returns on the last trading day of the month, and therefore, the results for turn-of-the-quarter effects presented in Table 2 are totally unexpected. Mean returns for TOTQ trading days are negative for both periods 1982/05 through 1990 (-0.1508 percent) and 1991 through 1999 (-0.3201 percent). Over the 18-year period 1982/05 through 1999, mean TOTQ returns (-0.2366 percent) are statistically different from not TOTQ mean returns (0.0946 percent) at the 0.05 level. This phenomenon might be related to selling pressure generated by institutional investors "window dressing" their portfolio at the end of the quarter, but whatever the cause, the negative returns observed on TOTQ days occur exclusively during the trading day.

Ariel (1987) finds that Day –1 mean returns are unusually large over the period 1963 through 1981, but observe from Table 2 that both TOTQ (-0.3201 percent) and not TOTQ (-0.0980 percent) mean returns are negative over the period 1991 through 1999. This observation is both unexpected and unusual given the meteoric rise in the S&P 500 index and the large annual mutual-fund inflow over the decade of the 1990's. An

obvious question is whether these results carry over to the S&P 500 index, and the answer is, yes. An analysis of Day –1 returns for the S&P 500 index reveals a return pattern similar to that observed for S&P 500 futures.[5]

C. Turn-of-the-Month versus Regular Days

Ogden (1990) documents significant turn-of-the-month effects for spot returns over the period 1969 through 1986. TOTM day returns are unusually large and significantly different from regular day returns. In Table 3, we calculate TOTM and regular day mean returns for S&P 500 futures, and the results are presented for each period 1982/05 through 1990 and 1991 through 1999.

1982/05 through 1990

For the period 1982/05 through 1990, the mean return for TOTM days is 0.1676 percent, but negative at –0.0015 percent for regular days (the difference in means is significant at the 0.05 level). Similar results are reported for time-decomposed returns. The finding of significant turn-of-the-month effects for S&P 500 futures is not unexpected given prior research over similar time periods documenting turn-of-the-month effects for spot returns. A mechanical trading rule of being long S&P 500 futures on TOTM days is profitable, and this rule avoids the Crash of ’87.

1991 through 1999

The period 1991 through 1999 is an out of sample test for the continuation of the turn-of-the-month effect, and the results are presented in Table 3, panel B. There is no evidence of a turn-of-the-month effect for S&P 500 futures over the period 1991 through 1999, and this result hold for both close-close and time-decomposed returns. In

particular, mean TOTM and regular day returns equal 0.0790 and 0.0486 percent, respectively. The results reported in Table 3, panel B, are consistent with SWT (1998, 1999) and provide an answer to Siegel's (1998) question as to the continuation of the turn-of-the-month effect, that is, at least for index futures. For the S&P 500 futures contract, the answer to Siegel's question is, no. Turn-of-the-month effects do not continue into the future, and in fact, they disappeared shortly after financial economists published research identifying turn-of-the-month effects. An obvious question is whether our results carry over to the spot market, and the answer is, yes. After 1990, turn-of-the-month effects disappear for the S&P 500 index. [6]

D. Turn-of-the-Month Days by Type

In Table 3, we report mean S&P 500 futures returns for each of four TOTM day categories (e.g., no-Friday, pre-Friday, Friday and post-Friday) and for two periods 1982/05 through 1990 and 1991 through 1999. S&P 500 futures commenced trading in early 1982 so there is no futures data prior to 1982. Our primary focus is the return pattern for each of the four TOTM day categories over the 29-year period 1970 through 1999.

To extend the analysis over a longer time horizon, we calculate daily S&P 500 spot returns for the period 1970 through 1981. Each TOTM day return is classified as a no-Friday, pre-Friday, Friday or post-Friday day, and the same procedure is applied to daily S&P 500 futures returns over each of the two periods 1982/05 through 1990 and 1991 through 1999.[7] As indicated in Table 2, panel D, the four categories of TOTM days are combined in pairs to form four new categories; (1) no-Friday plus post-Friday, (2) pre-Friday plus Friday, (3) no-Friday plus pre-Friday and (4) Friday plus post-Friday.

Mean returns are calculated for each of the four pairs, and these results are summarized in Table 2, panel D. In general, the evidence presented in Table 2, panel D, supports our conjecture that TOTM days are not a homogeneous group, and that in particular, there exists significant differences in return patterns over the 29-year period 1970 through 1999, especially for the pre-Friday and post-Friday categories of TOTM days.

For the no-Friday and Friday category of TOTM days, mean returns are relatively stable over the entire 29 years examined. On average, no-Friday returns are close to zero and consistently the lowest of the four categories of TOTM days. In contrast, on average, Friday returns are positive and consistently the largest of the four categories of TOTM days, but we are most interested in the return pattern over the period 1970 through 1999 for the pre-Friday and post-Friday categories of TOTM days. Initially, as measured from 1970 through 1981, pre-Friday mean (spot) returns are unusually large at 0.1482 percent but post-Friday mean (spot) returns are close to zero at -0.0013 percent. However, pre-Friday returns fall, on average, and post-Friday returns increase, on average, over the 29-year period examined. For the period 1991 through 1999, there is nothing unusual about pre-Friday (futures) mean returns at 0.0414 percent but post-Friday (futures) mean returns appear larger than normal at 0.1215 percent.

Annual data on mutual-fund flow strongly suggest that individuals preferred making direct equity transactions during the 1970's. A shift to indirect equity transactions via mutual funds began in the 1980's, and the preference for indirect equity purchases became stronger during the 1990's. In Section IV, we argued that whenever individuals prefer making direct equity purchases, that turn-of-the-month buying pressure is either coincident or leads the payment of cash receipts. This argument is supported by

the observation that mean returns (spot) over the period 1970 through 1981 are unusually large for the combined pair of pre-Friday plus Friday TOTM days at 0.2047 percent, and these results are reported in Table 2, panel D. In contrast, if individuals prefer making indirect equity purchases via mutual funds, then turn-of-the-month-buying pressure is coincident or lags the payment of cash receipts. This argument is supported by the observation that mean returns (futures) over the period 1991 through 1999 are large for the combined pair of Friday plus post-Friday TOTM days at 0.1218 percent.

E. Monday-TOTM Days

In Section IV, we argue that the investment of liquid profits on Monday-TOTM days potentially offsets selling pressure observed for regular Mondays and therefore, the weekend effect is predicted to disappear for Monday-TOTM days. In Table 3, mean Monday S&P 500 futures returns are presented for two categories of Mondays, Monday-TOTM days and regular Mondays. Results are presented for each period 1982/05 through 1990 and 1991 through 1999.

1982/05 through 1990

For large firms as represented by the S&P 500 index, prior studies find that the Monday effect became a weekend effect circa 1974 (Smirlock and Starks (1987)). The existence of a weekend effect implies that mean returns are negative from the close on Friday to the open on Monday. A statistically significant weekend effect is observed for S&P 500 futures for regular Mondays (Monday's close-open mean return equals –0.0935 percent), and Monday's mean close-close return is negative, although not significant, at –0.0663 percent.

This conjecture is confirmed by the observation that close-open mean S&P 500 futures returns are positive at 0.0419 percent for Monday-TOTM days. Of special interest is the observation that close-close mean futures returns are unusually large at 0.3057 percent for Monday-TOTM days, and mean futures returns on Monday-TOTM days are the largest over all five categories of TOTM days examined. These results are consistent with our conjecture that daily mutual-fund flow is a function of calendar time, and increased mutual-fund flow around the turn-of-the-month has a disproportionate positive impact on Monday-TOTM day returns.

1991 through 1999

A significant weekend effect for index futures was observed over the period 1982/05 through 1990, but this anomaly is confined to Monday-regular days. The empirical results presented in Table 3, panel B, show that this anomaly disappears for more recent S&P 500 futures return data. Of particular interest is the observation that for regular Monday trading days Monday's mean close-close futures return is unusually large at 0.0961 percent. We label this phenomenon facetiously the new Monday effect. Furthermore, the mean futures return for Monday-TOTM days (0.1508 percent) is larger than the mean return observed for any of the other four categories of TOTM days listed in Table 3.[8] The unusually high returns observed for Monday-TOTM days is consistent with the finding by Edelen and Warner (2000) of higher beginning of the month mutual-fund flow.

F. Intraday Price Changes for S&P 500 Futures: 1991 through 1999

In a recent paper, Edelen and Warner (2000) examine the relation between S&P 500 index returns and aggregate mutual-fund flow into U.S. equity funds, using daily

flow data for the period February 1998 through June 1999. They find that mutual-fund flow is correlated with concurrent S&P 500 index returns. Although no material difference in flow is observed across the days of the week, they find evidence of higher beginning of month flows and returns. Edelen and Warner extend their analysis to intraday returns to study the question of causality between concurrent flow and returns, and argue that trading in response to day's flow is projected to be concentrated late in the afternoon. S&P 500 index returns are decomposed into early and late in the day components and virtually no association exist between concurrent flow and early market returns. All of the daily association between concurrent flow and S&P 500 returns is attributable to afternoon returns.

S&P 500 futures tick data for the period 1991 through 1999 is used to calculate 15-minute interval returns for each TOTM day, and average intraday futures returns are calculated for each of the four TOTM day categories; no-Friday, pre-Friday, Friday and post-Friday. This data is used to estimate intraday pricing patterns for each of the four TOTM day categories, and this information is depicted in Figure 1.

Edelen and Warner (2000) argue that trading in response to mutual-fund flow is projected to be concentrated late in the afternoon. Therefore, we expect to observe a steeply upward sloping (S&P 500 futures) price line late in the afternoon on days when mutual-fund inflow is larger than normal, and this is interpreted as evidence of buying pressure on these days. From the graph in Figure 1, the intraday pattern of futures prices is remarkably similar for all four categories of TOTM days until about 14:30 EST. Thereafter, we observe a steeply upward sloping price line for the post-Friday category of

TOTM days, and we interpret this as confirming evidence that mutual-fund inflow is greater for the post-Friday category of TOTM days over the period 1991 though 1999.

At around 14:30 EST, we observe a steeply downward sloping price line for the no-Friday category of TOTM days that continues until the futures market closes at 16:15 EST. The late afternoon downward sloping price line is consistent with larger than normal mutual-fund outflow on these days, and this is interpreted as evidence of selling pressure on these days. Why this occurs is unknown. From Figure 1, the intraday pricing pattern of S&P 500 futures for the four categories of TOTM days reinforces the arguments presented in this paper.

VI. Summary and Conclusions

Financial economists find that returns are unusually large beginning on the last trading day of the month and continuing forward three trading days, and this phenomenon is known as the monthly or TOTM effect. Ogden (1990) argues that the payment of cash receipts in concentrated at the turn of the month, and the investment of these cash receipts is related to the TOTM effect. Siegel (1998) notes that anomalies are not well understood and whether they will continue to exist is an open question.

This study examines the S&P 500 futures contract for evidence of TOTM effect over the period 1982/05 through 1990 and 1991 through 1999), and we document that TOTM effects disappear after 1990 for the S&P 500 futures contract. These results carry over to the spot market. TOTM days are classified into four groups depending on the incidence of Friday trading and we find that a significant change in return patterns occurs over the last 29 years. Mean returns for the pre-Friday category of TOTM days has steadily declined over time while mean returns for the post-Friday category of TOTM

days had steadily increased over time. We argue that a change in the preference of individual investors over time from making direct to making indirect stock purchases through mutual funds is related to this phenomenon.

In addition, we find that mean futures returns on Monday-TOTM days are unusual large, and relate this to buying pressure associated with large mutual-fund inflow around the turn of the month. The intraday pricing pattern is estimated for the S&P 500 futures contract over the period 1991 through 1999, and we document a steeply upward sloping price line late in the afternoon for the post-Friday category of TOTM days. This is interpreted as evidence of buying pressure on these days. The results presented in this paper support the efficient markets theory.

This paper's empirical results suggest that turn-of-the-month return patterns are dynamic and related to market microstructure. Since market microstructure itself is dynamic, turn-of-the-month patterns documented in this paper for the S&P 500 futures contract are subject to change without notice. Financial economists should be careful when making out-of-sample inferences from observed in sample return regularities. In closing this paper, we offer the following quote from Wyckoff (1930):

"Many thought that the market could be beaten by mechanical methods; that is, by some means other than human judgement. All kinds of individuals came forward with ways of beating the stock market; each was certain that his method would make a fortune. Few had any money. Always there was some reason why they had not made their fortune, even though they possessed the magic key."

Notes

1. The four consecutive trading days denoted by Day –1, Day 1, Day 2, and Day 3 represents TOTM days. In this paper, regular days represent all trading days excluding TOTM days.

2. S&P 500 futures trade for fifteen minutes beyond the 16:00 EST close of the spot market.

3. Mutual funds are required to report their equity holdings at the end of each quarter, and many fund managers engage in "window dressing" to improve their portfolio's appearance. Window dressing potentially impacts returns on the last trading day of March, June, September and December. For a discussion of window dressing see Ritter (1989).

4. As justification for these four categories, empirical evidence strongly suggests that mean returns are not equal across the four categories of TOTM days. This is discussed in more detail in Section V, subsection D.

5. For example, over the 1991 through 1999 period, TOTQ and non TOTQ mean returns for the S&P 500 index equal –0.3201 and –0.0980 percent, respectively.

6. We examine S&P 500 index returns over the period 1991 through 1999. TOTM and regular day returns average 0.0844 and 0.0600 percent, respectively, but the difference in mean returns is not significant at a meaningful level. A more detailed analysis is available from the authors upon request.

7. For the 1970 through 1981 period, S&P 500 index returns are large for TOTM days at 0.0845 percent, and this result is significant from regular days (-0.0093 percent) at the 0.05 level. Mean S&P 500 spot returns for the no-Friday and post-Friday TOTM categories equal 0.0321 and –0.0013 percent, respectively. In contrast, mean S&P 500 spot returns for the pre-Friday and Friday TOTM category equal 0.1482 and 0.2586 percent, respectively. A one-way analysis of variance test for the equality of mean returns across the four categories of TOTM days yields a F-statistic of 2.563, and this result is significant at the 0.10 level.

8. A similar pattern is observed for S&P 500 index returns over the period 1991 through 1999. Mean S&P 500 spot returns for Monday-TOTM days equal 0.1670 percent, and the mean return for Monday-TOTM days is the largest over all five categories of TOTM days examined. Regular-Monday day S&P 500 spot returns are unusually large at 0.0979 percent.

References

Ariel, Robert, A., 1987, A monthly effect in stock returns, *Journal of Financial Economics* 18, 161-174.

Brock, William, Josef Lakonishok, and Blake LeBaron, 1992, Simple technical trading rules and the stochastic properties of stock returns, *Journal of Finance* 47, 1731-1764.

Clark, Ross and William T. Ziemba, 1987, Playing the turn-of-the-year effect with index futures, *Operations Research* 35, 799-813.

Edelen, Roger and Jerold Warner, 2000, Aggregate price effects of institutional trading: a study of mutual fund flow and market returns, *Journal of Financial Economics*, forthcoming.

Haugen, Robert A. and Josef Lakonishok, 1988, *The Incredible January Effect; The Stock Market's Unsolved Mystery* (Dow-Jones Irwin, Homewood, IL).

Hensel, Chris R. and William T. Ziemba, 1996, Investments results from exploiting turn-of-the-month effects, *Journal of Portfolio Management* 22, 17-23.

Hensel, Chris R., G. A. Sick, and William T. Ziemba, 1994, The turn-of-the-month effect in the futures markets, 1982-1992, *Review of Futures Markets*, 8, 827-856.

Jaffe, J., and R. Westerfield, 1989, Is there a monthly effect in stock market returns? Evidence from foreign countries, *Journal of Banking and Finance*, 13, 237-244.

Lakonishok, Josef and Seymour Smidt, 1988, Are seasonal anomalies real? A ninety-year perspective, *Review of Financial Studies* 1, 403-425.

Lakonishok, Josef and Edwin D. Maberly, 1990, The weekend effect: trading patterns of individual and institutional investors, *Journal of Finance* 45, 231-244.

Martikainen, T., J. Perttunen, and W. T. Ziemba, 1994, The turn-of-the-month effect in the world's stock markets, January 1988-January 1990, *Financial Markets and Portfolio Management* 8, 41-49.

Odgen, Joseph, P., 1990, Turn-of-month evaluations of liquid profits and stock returns: a common explanation for the monthly and January effects, *Journal of Finance* 45, 1259-1271.

Shiller, Robert, J., 2000, *Irrational Exuberance* (Princeton University Press, Princeton, NJ).

Siegel, Jeremy, J., 1998, *Stocks for the Long Run* (McGraw-Hill, NY, NY).

Smirlock, Michael and Laura Starks, 1986, Day of the week effects in stock returns, Journal of Finance 17, 197-210.

Sullivan, Ryan, Allan Timmerman, and Halbert White, 1999, Date-snooping, technical trading rule performance, and the bootstrap, *Journal of Finance* 54, 1647-1691.

Sullivan, Ryan, Allan Timmerman, and Halbert White, 1998, Dangers of data-driven inference: the case of calendar effects in stock returns, working paper, University of California at San Diego.

Wyckoff, Richard, D, 1930, *Wall Street Ventures and Adventures Through Forty Years* (Richard D. Wyckoff).

Ziemba, William, T., 1991, Japanese security market regularities: monthly, turn-of-the-month and year, holiday and Golden Week effects, *Japan and the World Economy* 3,119-146.

Table 1

S&P 500 Index Futures Mean Returns by Day-of-the-Month
First Half versus Last Half of the Month: 1982/05 through 1999

Day -1 is the last trading day of the previous month. Day +1 is the first trading day of the current month. The p-value for the difference in means test between the last half and first half of the month is in parenthesis. The test statistic is based on the pooled variance. [a,b,c] Mean returns are significantly different from zero at the 0.01, 0.05, and 0.10 level, respectively.

	1982/05 through 1990			1991 through 1999		
Day-of-the-Month	Close/Open	Open/Close	Close/Close	Close/Open	Open/Close	Close/Close
A. Last Half of the Month						
Day -10	-0.1355% [c]	-0.1889%	-0.3244% [b]	-0.0016%	0.0893%	0.0877%
Day -9	0.1073	-0.0195	0.0878	0.0185	-0.1226	-0.1040
Day -8	0.1471 [b]	0.0808	0.2279	-0.0702 [c]	0.1601 [b]	0.0899
Day -7	-0.2748 [a]	0.2108 [c]	-0.0639	0.0105	-0.0895	-0.0790
Day -6	-0.0328	0.0226	-0.0101	0.0244	0.0138	0.0382
Day -5	-0.0509	-0.1167	-0.1677	0.0588	-0.0184	0.0404
Day -4	0.0663	0.0896	0.1560	0.0199	-0.0033	0.0165
Day -3	-0.0376	0.0756	0.0379	0.0443	0.0504	0.0948
Day -2	0.0574	-0.0917	-0.0342	0.0626	0.0570	0.1196
Mean Return	-0.0170	0.0069	-0.0100	0.0186	0.0151	0.0338
Number of observations			936			972
B. First Half of the Month						
Day -1	0.0633	0.0808	0.1453	0.0678 [c]	-0.2399 [a]	-0.1720 [c]
Day +1	0.0859	0.0755	0.1615	0.0362	0.2975 [a]	0.3337 [a]
Day +2	-0.0078	0.3010 [b]	0.2932 [b]	0.0222	0.0498	0.0721
Day +3	0.0446	0.0257	0.0704	0.0142	0.0683	0.0825
Day +4	-0.0349	0.0353	0.0003	0.0182	0.0019	0.0202
Day +5	-0.0545	-0.0373	-0.0919	-0.0282	0.0644	0.0362
Day +6	0.0086	0.0474	0.0560	-0.0410	-0.0402	-0.0813
Day +7	0.0309	-0.0240	0.0068	0.0094	0.0128	0.0222
Day +8	-0.0510	0.0400	-0.0109	-0.0106	0.0575	0.0469
Mean Return	0.0094	0.0605	0.0701	0.0098	0.0302	0.0400
p-value	(0.479)	(0.367)	(0.221)	(0.637)	(0.694)	(0.882)
Number of observations			936			972

Table 2

S&P 500 Index Futures Mean Returns on the Last Trading Day of the Month, Day -1 Turn-of-the-Quarter versus Not Turn-of-the-Quarter Days: 1982/05 through1999

Turn-of-the-Quarter (TOTQ) refers to the months of March, June, September, and December. Reported mean returns are for the last trading day of the month, Day -1. The p-value for the difference in mean returns between Not TOTQ and TOTQ days is in parenthesis. The test statistic is based on the pooled variance. The S&P 500 index futures contract began trading on the Chicago Mercantile Exchange in early 1982. [a,b,c] Mean returns are significantly differently from zero at the 0.01, 0.05, and .010 level, respectively.

	A. 1982/05 through 1990					
	Close/Open	p-value	Open/Close	p-value	Close/Close	p-value
Turn-of-the-Quarter (n= 35)	0.0313%		-0.1822%		-0.1508%	
Not Turn-of-the-Quarter (n= 69)	0.0795	(0.614)	0.2161 [c]	(0.062)	0.2956 [b]	(0.058)
	B. 1991 through 1999					
	Close/Open	p-value	Open/Close	p-value	Close/Close	p-value
Turn-of-the-Quarter (n= 36)	0.0012		-0.3213 [c]		-0.3201 [c]	
Not Turn-of-the-Quarter (n= 72)	0.1012 [b]	(0.177)	-0.1922	(0.594)	-0.0980	(0.342)
	C. 1982/05 through 1999					
	Close/Open	p-value	Open/Close	p-value	Close/Close	p-value
Turn-of-the-Quarter (n= 71)	0.0160		-0.2527 [b]		-0.2366 [c]	
Not Turn-of-the-Quarter (n= 141)	0.0906	(0.214)	0.0036	(0.103)	0.0946	(0.047)

See Table 3 for defination of terms	D. Mean TOTM Day Returns by Category					
	S&P 500 index 1970 through 1981		S&P 500 futures 1982/05 through 1990		S&P 500 futures 1991 through 1999	
	Observations	close/close	Observations	close/close	Observations	close/close
1. No-Friday + Post-Friday	336	0.0071	244	0.1146	259	0.0761
2. Pre-Friday + Friday	240	0.2047 [a]	172	0.2427 [a]	173	0.0835
Difference of means test: p-value		0.008		0.254		0.938
3. No-Friday + Pre-Friday	202	0.0993	151	0.1349	159	0.0057
4. Friday + Post-Friday	374	0.0841	262	0.1868	273	0.1218 [b]
Difference of means test: p-value		0.844		0.656		0.279

Table 3

S&P 500 Index Futures Mean Returns
Turn-of-the-Month Trading Days versus Regular Trading Days: 1982/05 through 1999

Turn-of-the-Month (TOTM) days include the last trading day of the previous month and the first three trading days of the current month. Regular days include all trading days except TOTM days. No-Friday includes all TOTM days in a TOTM period that does not contain a Friday. Post-Friday includes all TOTM days followings a Friday that is also a TOTM day. Pre-Friday includes all TOTM days preceding a Friday that is also a TOTM day. Friday includes all Fridays that are TOTM days. The p-value for the difference in means test is in parenthesis. The test statistic is based on the pooled variance. TOTM days by type are compared to regular days. Monday includes Mondays that are TOTM days. Monday is compared to regular days excluding Mondays. Regular days & Friday includes regular days that are Fridays. Regular days & Friday is compared to TOTM Fridays. Regular days & Monday includes regular days that are Mondays. Regular days & Monday is compared to regular days excluding Monday. The S&P 500 index futures contract began trading on the Chicago Mercantile Exchange in early 1982. [a,b,c] Mean returns are significantly different from zero at the 0.01, 0.05, and 0.10 level, respectively.

	A. 1982/05 through 1990							
	Close/Open	p-value		Open/Close	p-value		Close/Close	p-value
Turn-of-the-Month Days (n = 416)	0.0465%			0.1207%[c]			0.1676%[b]	
Regular Days (n = 1776)	-0.0078	(0.217)		0.0063	(0.101)		-0.0015	(0.028)
Turn-of-the-Month Days by Type (n = 416)								
1. No-Friday (n = 68)	0.0802	(0.378)		-0.0749	(0.608)		0.0052	(0.969)
2. Pre-Friday (n = 86)	0.0885	(0.281)		0.1489	(0.314)		0.2375	(0.126)
3. Friday (n = 86)	0.0824	(0.312)		0.1631	(0.266)		0.2480	(0.111)
4. Post-Friday (n = 176)	-0.0045	(0.959)		0.1615	(0.126)		0.1569	(0.157)
5. Monday (n = 78)	0.0419	(0.753)		0.2637 [c]	(0.079)		0.3057 [c]	(0.076)
Regular Days & Friday (n = 352)	0.0136	(0.480)		-0.1138 [c]	(0.071)		-0.1001	(0.041)
Regular Days & Monday (n = 340)	-0.0935 [b]	(0.030)		0.0272	(0.739)		-0.0663	(0.348)

	B. 1991 through 1999							
	Close/Open	p-value		Open/Close	p-value		Close/Close	p-value
Turn-of-the-Month Days (n = 432)	0.0351 [c]			0.0439			0.0790 [c]	
Regular Days (n = 1843)	0.0183 [c]	(0.443)		0.0303	(0.763)		0.0486 [b]	(0.544)
Turn-of-the-Month Days by Type (n = 432)								
1. No-Friday (n = 76)	0.0446	(0.584)		-0.0779	(0.274)		-0.0332	(0.455)
2. Pre-Friday (n = 83)	-0.0366	(0.232)		0.0780	(0.614)		0.0414	(0.945)
3. Friday (n = 90)	0.1278 [a]	(0.013)		-0.0054	(0.695)		0.1224	(0.466)
4. Post-Friday (n = 183)	0.0182	(0.997)		0.1033 [c]	(0.265)		0.1215 [c]	(0.316)
5. Monday (n = 82)	0.0711	(0.300)		0.0797	(0.497)		0.1508	(0.286)
Regular Days & Friday (n = 362)	0.0166	(0.021)		0.0072	(0.899)		0.0239	(0.372)
Regular Days & Monday (n = 351)	-0.0010	(0.324)		0.0972 [b]	(0.099)		0.0961 [c]	(0.291)
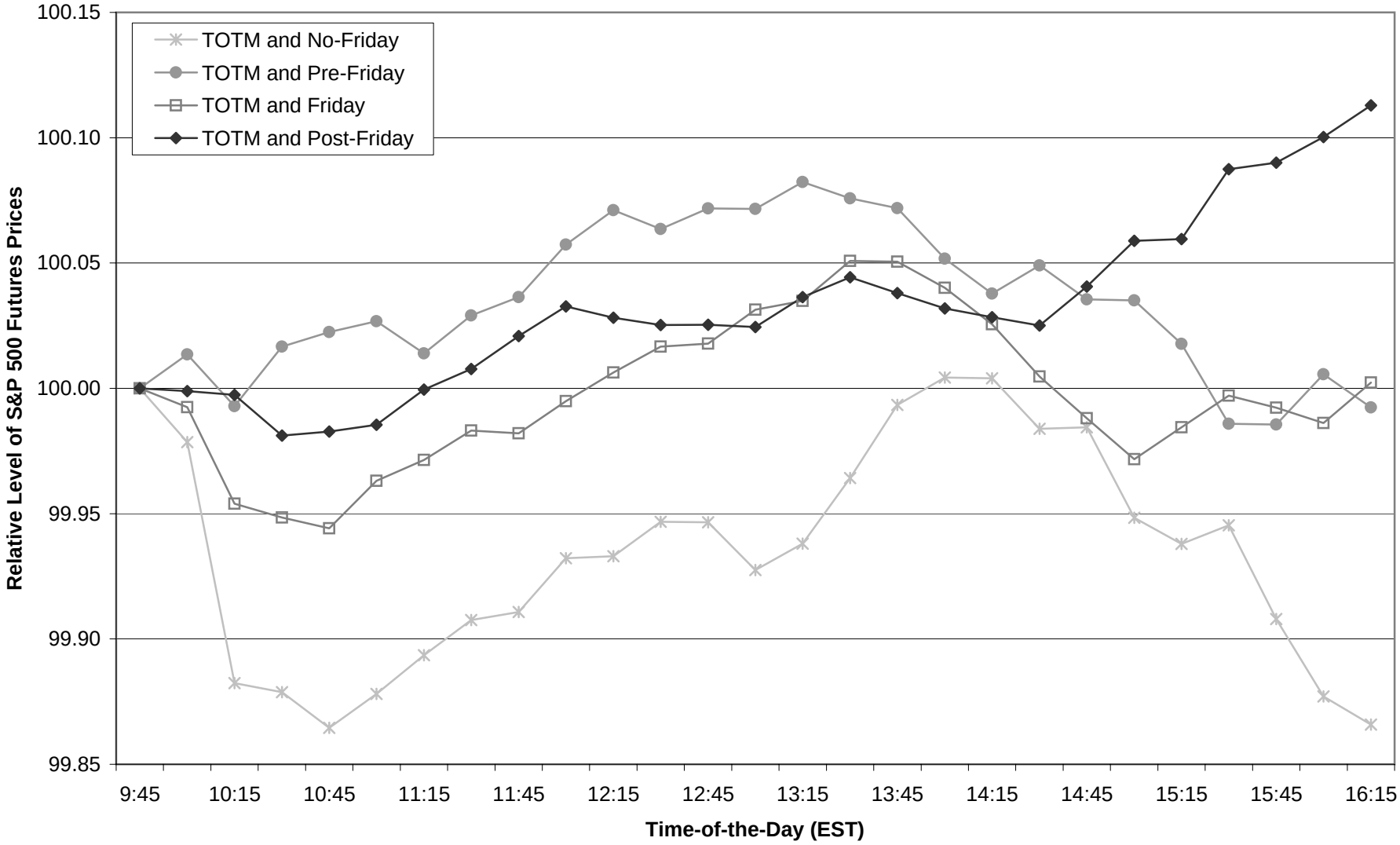
Figure 1
Intraday Pattern of S&P 500 Futures Prices
Turn-of-the-Month Day by Category: 1991-1999