A brief analysis of the "Turn of the Month" effect in the U.S.

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Abstract

The turn of the month effect is the tendency for stocks to increase in price during the last few days and the first few days of each month. In this report, I summarize previous literature regarding this effect and provide additional analysis and commentary on the turn of the month effect in the United States. I find that the turn of the month effect currently exists in the period containing the last four days and the first two days of the month using historical prices for daily returns of stock market indices SPX, SPW, W5000, RTY, and MID.

1 Introduction

The "turn of the month" effect was first documented in economic literature in 1988 by Lakonishok and Smidt, who found that from 1897 to 1986, the four days at the turn of the month–the last trading day of the previous month and the first three trading days of the current month–accounted for all of the positive return to the DJIA. Since then, there have been many papers documenting the turn of the month effect, exploring its existence, causes, and uses as a trading strategy.

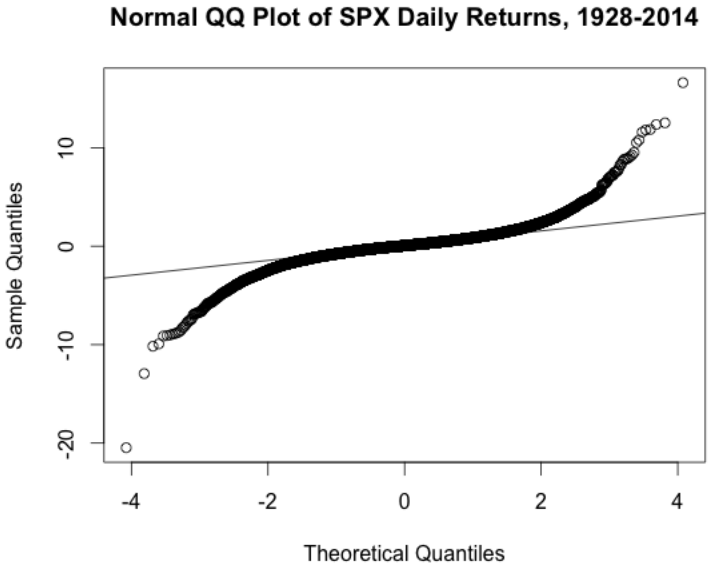
The existence of the effect has been widely researched. Jacobs and Levy (1988) reported that the effect occurred in the 1897-1986 period; Hensel, Sick, and Ziemba (1994) also found the existence of the effect in the S&P 500 large cap and Value Line small cap indices in the period 1982-1992. In contrast, Maberly and Wagner (2000) found that the effect disappeared after 1990. More recently, McConnell and Xu (2008) used data from CRSP daily returns in the extended period of 1926-2005 to conclude that the pattern continued to exist from 1987-2005 in addition to the 1926-1986 period. Dzhabarov and Ziemba (2010) found that the turn of month effect still exists with a bit of anticipation, with data from the S&P 500 and Russell 2000. This report extends previous studies by increasing the sample size of daily returns to include data measured up until 2014.

2 Data and Methodology

I use all of the available historical price data for daily gross returns (%) of several U.S. stock indices, collected from the Bloomberg terminal. The indices I investigate are: value-weighted S&P 500 (SPX; 1928-2014), equal-weighted S&P 500 (SPW; 1990-2014), Wilshire 5000 (W5000; 1987-2014), Russell 2000 (RTY; 1989-2014), and S&P 400 (MID; 1991-2014). I use all of these indices in order to examine the effect in different kind of stocks–I observe the turn effect in both equal weighted and value-weighted indices of large-cap stocks in the S&P 500, mid-cap stocks in the S&P 400, small-cap stocks in the Russell 2000, and the overall market in the Wilshire 5000.

To remain consistent with Lakonishok and Smidt (1988) and McConnell and Xu (2008), I first explore the the turn of the month as the last trading day of the month along with the first three trading days of the next month. However, graphs of daily returns reveal that in the period after 1986, the days that the effect occurs on are pushed back, possibly due to market anticipation of the turn of the month effect (see Dzhabarov and Ziemba, 2010). Therefore, for the most recent data on these U.S. indices, I investigate an updated turn of the month period containing the last four days of the month and the first two days of the month (Day -4 to Day 2).

Similar to the procedure in McConnell and Xu (2008), I also use a one-sided t-test to test if returns during the turn of the month days are significant. However, daily returns for each index is not normally distributed: according to the normal probability plot of SPX daily returns from 1928-2014 below, the distribution of percent daily returns is heavy-tailed, so the normality assumption of the t-test may be violated. To account for this, I also check the results of a nonparametric test that does not rely on the normality assumption. Because the standard deviations of the turn-of the month and non-turn of the month days are roughly equal[1] and we have a large sample size for each of the observed indices, I chose to use a two-sample Wilcoxon rank sum (Mann-Whitney) test to test the difference between turn-of-month and non turn-of-month days, and a one-sample Wilcoxon signed rank test for the other tests in addition to the one-sample and two-sample t-tests used in McConnell and Xu (2008).

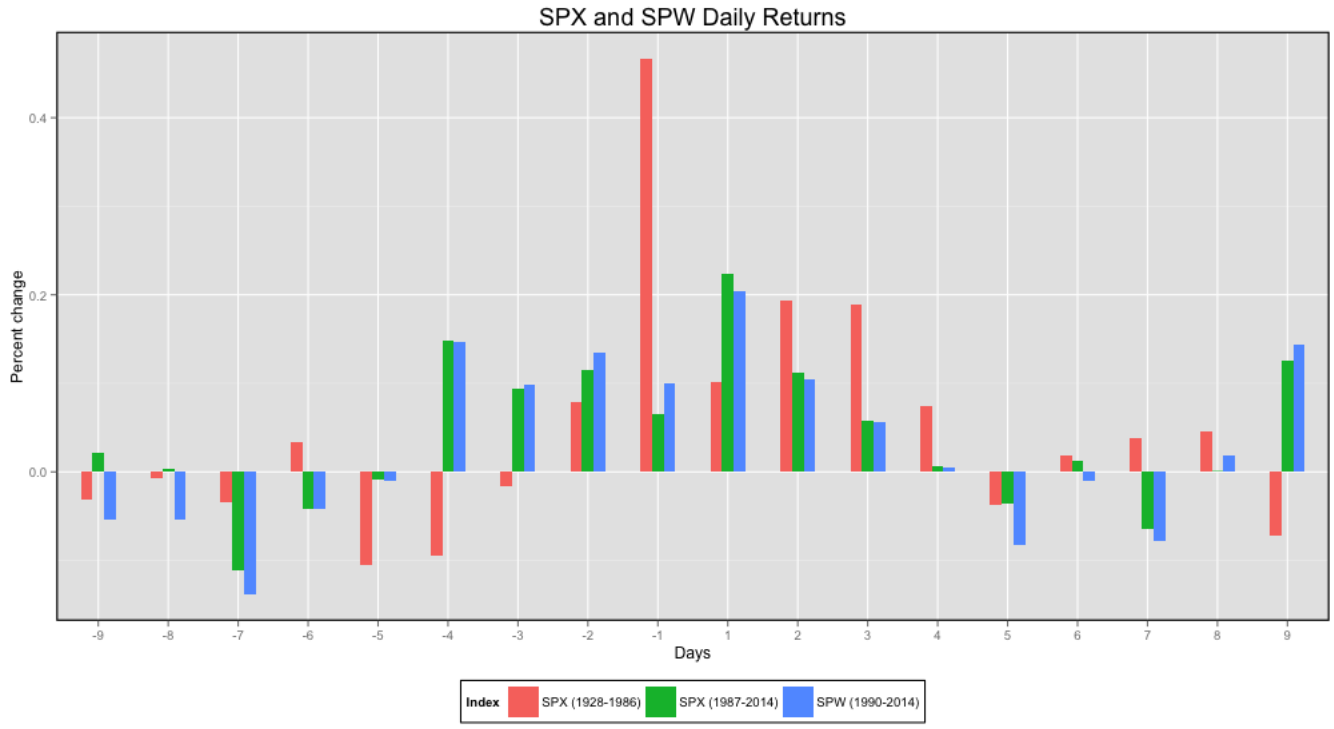


3 Analysis

Shown below are graphs of average daily returns across SPX, SPW, W5000, RTY, and MID. The graphs compare the (%) daily returns of these indices from days near the turn of the month, starting with day -9 (the ninth to last trading day of the previous month) to +9 (the ninth trading day of the month).

I split the returns of SPX in the first graph into two periods: 1928-1986 (previously examined by Lakonishok and Smidt (1988) and McConnell and Xu (2008)), and 1987-2014. We observe that in the first period, SPX displayed an increase in return from Day -1 to Day 4, which is consistent with the findings of previous studies; however, in the more current period in both SPX and SPW, we see that the effect has moved to the period between Day -4 and Day 2. The second graph with more recent data from the Wilson 5000, Russell 2000, and S&P 400 also suggests that the turn of the month effect has moved to the period between Day -4 and Day 2. The graphs show that the turn of the month effect is evident not only in the market as a whole (Wilson 5000) but also among small-cap (Russell 2000), mid-cap (S&P 400), and large-cap (S&P 500) stocks.

[1]For SPX from 1928-1987, the historical standard deviations for gross dividends per day were 1.217 (all turn of the month days), 1.171 (Day -1), 1.195 (Day +1), 1.216 (Day +2) and 1.253 (Day +3), and 1.189 (other days).


SPX and SPW Daily Returns
Percent change
0.4
0.2
0.0
-9
-8
-7
-6
-5
-4
-3
-2
-1
1
2
3
4
5
6
7
8
9
Days
Index
SPX (1928-1986)
SPX (1987-2014)
SPW (1990-2014)

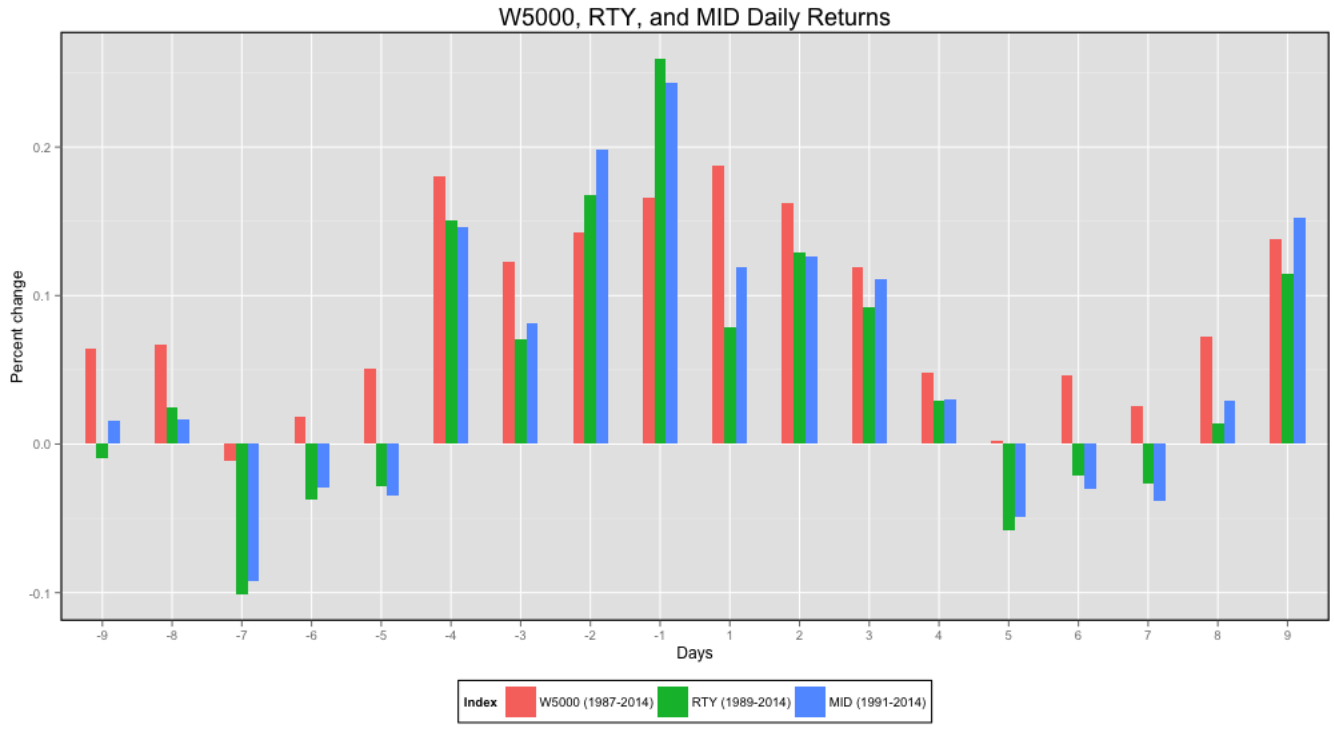

W5000, RTY, and MID Daily Returns
Percent change
0.2
0.1
0.0
-0.1
-9
-8
-7
-6
-5
-4
-3
-2
-1
1
2
3
4
5
6
7
8
9
Days
Index
W5000 (1987-2014)
RTY (1989-2014)
MID (1991-2014)

Table 1 displays an analysis of Day -1 through Day +3 of the turn of the month in the S&P 500 value-weighted index SPX[2] In the earlier period of 1928 to 1986, I find that the mean daily returns of each day as well the turn of month days as a whole are, as expected, all significantly greater than zero by both the t-test and the Wilcoxon signed rank test. In addition, the difference in returns between turn of month days and other days is also significant, and the mean daily returns of non turn of the month days is not significantly greater than zero. In each case, the percent of daily returns that were positive was also significantly greater than zero.

In the more recent period of 1987-2014, Day -1 and Day +3 are no longer significantly greater than zero, reflecting the existence of a new turn of the month period (Day -4 to Day +2) that doesn't include Day +3. The other turn of month days are still significantly greater than zero, and the turn of month days is significantly different than the non turn of month days. However, the non-turn of month days are also significantly greater than zero for this period, which points to the possibility that average daily returns may have a true mean greater than zero.

Table 1: **S&P 500: SPX(Value-Weighted) Daily Returns for Days -1 to 3**

Period	Day -1	Day +1	Day +2	Day +3	Day (-1, +3)	Other Days	Difference
SPX: Jan. 1928 - Dec. 1986							
Mean daily return (%)	.4669	.1007	.1939	.1896	.2378	-.0056	.2434
t-statistic	10.60	2.24	4.24	4.02	10.39	-.514	9.61
t-test p-value	≈ 0	.0127	$1.3e^{-}5$	$3.2e^{-}5$	≈ 0	.304	≈ 0
Wilcoxon p-value	≈ 0	.00078	$2.95e^{-}5$	$.95e^{-}7$	≈ 0	.1548	≈ 0
Positive (%)	71.4	.56.6	59.8	57.1	61.2	50.0	
t-test p-value	≈ 0	.0027	$1.2e^{-}7$	.0001	≈ 0	.4782	
SPX: Jan. 1987 - Dec. 2014							
Mean daily return (%)	.0656	.2229	.1116	.0575	.1144	.0301	.0843
t-statistic	1.11	3.24	1.87	.98	1.00	1.93	2.45
t-test p-value	.1334	.0007	.031	.1583	.0001	.0271	.0073
Wilcoxon p-value	.099	$1.6e^{-}6$	.0079	.1449	$.8e^{-}6$	$4.1e^{-}6$	.01
Positive (%)	51.8	59.5	56.5	54.8	55.7	54.3	
t-test p-value	.274.5	.0003	.01	.046	$1.9e^{-}5$	$4.5e^{-}11$	

Table 2 displays daily return data of the five U.S. indices during the updated turn of the month (TOM) period of Day -4 to Day +2.

For SPX: we find that with the exception of Day -1, all of the days in the new period of (-4, +2) are significantly greater from zero[3], while the non-TOM days are not significantly greater than zero. The TOM days are significantly greater than non-TOM days. The percent of positive returns for Day -4 and Day -1 are not significantly greater than 50%, but the other TOM days are.

For SPW: we find that arguably, all TOM days are significantly different than zero[4]. The percent of positive returns for Days -4 and -1 are not significantly above 50%, but the other days are.

For W5000: we find that returns for all TOM days are significantly above zero and greater than non-TOM days, and the percent of positive returns for TOM days are greater than 50%.

For RTY: all TOM days have returns significantly greater than zero[5] and greater than non-TOM days. TOM percent positive returns are significantly above half.

For MID: again, all TOM days have returns significantly greater than zero and greater than non-TOM days, and TOM percent positive returns are significantly above half.

[2]These are the same turn of the month days investigated by Lakonishok and Smidt (1988) and McConnell and Xu (2008).
[3]Day -4 is not significant at the .05 level by the Wilcoxon test, but the p-value is still very small
[4]Again, Day -4 is not significant at the .05 level by Wilcoxon test, but the p-value is very small
[5]The t-test does not show significance for Days -3 and +1, but the Wilcoxon test is significant

Important trends to note among the indices include:

1. Small-and mid-cap stocks tend to have a slightly greater TOM effect (larger t-statistic, smaller p-value)
2. For SPX and SPW, Day -4 had the least significant mean daily returns, and the equal weighted and value weighted stock indices behave very similarly throughout the turn of the month.
3. For all indices, TOM days are all very significantly greater than non-TOM days, even though non-TOM days are also shown to be significantly greater than zero by at least one test.

Table 2: **U.S. Indices: Daily Returns for Days -4 to +2**

Period	Day -4	Day -3	Day -2	Day -1	Day +1	Day +2	Days (-4, +2)	Others	Difference
SPX: Jan. 1987 - Dec. 2014									
Mean daily return (%)	.148	.0944	.1145	.0656	.223	.112	.126	.014	.112
t-statistic	2.30	1.72	1.76	1.11	3.2	1.87	4.98	.85	3.69
t-test p-value	.011	.043	.040	.134	.0006	.0309	$3.49e^{-}7$	.39	.0002
Wilcoxon p-value	.058	.013	.001	.090	$1.6e^{-}6$	.008	$1.35e^{-}10$	.0006	.0002
Positive (%)	53.3	57.1	59.5	51.8	59.5	56.4	56.4	53.8	
t-test p-value	.126	.005	.0003	.274	.0003	.009	$5.8e^{-}9$	$3.2e^{-}8$	
SPW: Jan. 1990 - Dec. 2014									
Mean daily return (%)	.147	.098	.135	.010	.204	.104	.132	.0066	.125
t-statistic	2.05	1.55	1.88	1.68	2.63	1.55	4.68	.376	3.78
t-test p-value	.02	.061	.031	.047	.0045	.061	$1.5e^{-}6$	.354	$8e^{-}5$
Wilcoxon p-value	.088	.017	.0004	.009	$8.5e^{-}6$	.014	$3.4e^{-}11$	.013	$1e^{-}5$
Positive (%)	52.8	58.1	60.2	54.8	62.0	54.0	57.0	52.6	
t-test p-value	.177	.003	.0002	.052	$2e^{-}5$	.09	$1.6e^{-}9$	$2.8e^{-}7$	
W5000: Jan. 1987 - Dec. 2014									
Mean daily return (%)	.180	.123	.142	1.66	.188	.162	.16	.0018	.1585
t-statistic	1.79	1.24	1.4	1.65	1.8	1.61	3.89	.114	3.58
t-test p-value	.037	.107	.081	.0498	.03	.053	$5e^{-}5$	.0018	.0002
Wilcoxon p-value	.032	.055	.0056	.002	.00067	.0052	$8.9e^{-}10$	.0026	$6.43e^{-}5$
Positive (%)	53.8	55.6	56.3	57.11	56.1	54.1	55.5	53.1	
t-test p-value	.044	.0057	.0022	.0006	.003	.03	$3.3e^{-}10$	$4e^{-}6$	
RTY: Jan. 1989 - Dec. 2014									
Mean daily return (%)	.150	.0708	.168	.260	.0789	.129	.143	-.003	.146
t-statistic	2.72	1.24	2.87	4.94	1.20	2.2	6.02	-.2	4.89
t-test p-value	.0033	.107	.002	$5.6e^{-}7$	.1155	.014	$1e^{-}9$	.508	$5e^{-}7$
Wilcoxon p-value	.003	.005	$8e^{-}8$	$5e^{-}11$	.0008	.0013	≈ 0	.005	$2e^{-}8$
Positive (%)	53.8	56.8	60.3	68.2	55.3	56.9	58.6	53.2	
t-test p-value	.062	.002	$1e^{-}5$	$3e^{-}14$	.015	.002	≈ 0	$2.5e^{-}6$	
MID: Jan. 1991 - Dec. 2014									
Mean daily return (%)	.148	.081	.197	.243	.120	.127	.152	.004	.149
t-statistic	2.88	1.56	3.64	4.84	1.97	2.37	6.95	.23	5.35
t-test p-value	.002	.059	.0001	$9e^{-}7$	.024	.009	$2e^{-}12$	.41	$5e^{-}8$
Wilcoxon p-value	.002	.003	$2e^{-}7$	$2e^{-}11$	$6e^{-}5$	.0003	≈ 0	.002	$7e^{-}10$
Positive (%)	54.8	58.3	62.6	66.5	57.4	56.5	59.4	53.4	
t-test p-value	.025	.0003	$9e^{-}8$	$4e^{-}12$	.001	.004	≈ 0	$6e^{-}7$	

4 Conclusion and Further Reading

The data I have collected is corroborated by previous studies that show the existence of the turn of the month effect. I find that according to five important U.S. indices (SPW, SPX, W5000, RTY, MID) the turn of the month effect exists currently in the period Day -4 to Day +2 and occurs in small-cap, mid-cap, and large-cap stocks. Thus, the turn of the month effect is shown to go against the findings in Schwert (2003), which found that patterns in the stock market that appear during a particular time period often disappear once they have been discovered, or turn out not to have existed to begin with.

For further exploration of the turn of month effect in both U.S. and international markets, see: Jacobs and Levy (1988); Ziemba (1989, 1991); Jordan and Jordan (1991); Hensel, Sick and Ziemba (1994); Dzhabarov and Ziemba (2010); Nikkinen, Sahlstrom and Aijo (2007). For causes of the effect, see Hensel, Sick and Ziemba (1996); Gonzalez (2006); Ogden (1987, 1990); Haugen and Lakonishok (1987); Ritter and Chopra (1989); Penman (1987). For more information about how the turn of the month effect can be used as a trading strategy, see Liu (2013); Kunkel and Compton (1998); Hensel and Ziemba (1996).

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