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A Relook at the Turn of the Month Anomaly

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A Relook at the Turn of the Month Anomaly

By

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Advisor: Dr. Craig Rennie

An Honors Thesis in partial fulfillment of the requirements for the degree Bachelor of Science in
Business Administration in Finance

Sam M. Walton College of Business

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Abstract:

This paper seeks to research the turn-of-the-month anomaly in the stock market. Prior studies have covered the anomaly's effect from 1962-2004. This study continues on the work of past research while also testing to find a shift backwards to the end of the month due to market timers anticipation of the anomaly. Empirical analysis is conducted using CRSP data of value and equal weighted market indexes along with historical returns of the S&P 500 from the Wharton Data Research Institute. Findings show that there is continued evidence of the anomaly in recent years (2005-2014), and there is subtle evidence of a shift backwards in the anomaly. Also, a passive strategy does provide different, yet not significant returns when attempting to pick a certain day of the month to make monthly contributions by leveraging this anomaly.

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Section 1: Introduction

One of the most interesting findings in the world of finance is the study of stock market anomalies. Some argue that the market is efficient and prices reflect all available information, thus making it impossible to outperform the market. Others would argue that prices do not exactly tell the whole story, and there is ample opportunity to beat the stock market with tools such as technical analysis. Those who use technical analysis often are aware of these stock market anomalies and will trade off them in an attempt to beat the market. Market anomalies include the January Effect, where stocks which may have struggled in the fourth quarter of last year rebound in the month of January, the Weekend Effect, where stocks have a tendency to perform better near the end of the week and worse at the beginning of the week, and the turn-of-the-month anomaly, where stocks prices rise on the last trading days of the month and the first three trading days of the following month.

Since the late 1980's researchers such as Robert Ariel, Jose Lakonishok & Seymour Smidt, and Joseph Odgen have all done extensive research on the turn-of-the-month anomaly. Some have attempted to prove its existence using historical daily data; others tried to explain its occurrence by following the payday patterns of investors. However, tests have yet to be run on whether or not investors have caused this anomaly to move backwards. If an investor knows which days of the month the stock market is going to move up, they are automatically going to make purchases before this bubble happens, and perhaps sell after the bubble is over.

Additionally, many average investors become discouraged in the stock market and maintain very passive strategies. They may simply contribute to their company's 401(k) plan, invest in their own IRA plan, and maybe even set money to the side to "play" around in the stock market. What if it were possible for these "average investors" to take advantage of these market anomalies by simply changing the day they contributed (or withdrew) from their retirement accounts?

This paper seeks to expand on previous studies of the turn-of-the-month anomaly by looking at the CRSP data of the Value-Weighted and Equal Weighted Market portfolios along with the historical returns from the S&P 500 for continued signs of the turn-of-the-month anomaly. Additionally, this paper will look for evidence in a shift in the turn-of-the-month anomaly from the beginning of the month to the end of the previous month. Finally, a buy-and-hold strategy will be conducted for monthly contributions to see if there are specific contribution days in the month that gross a higher return.

Section 2: Literature and Hypothesis Development

Research of the turn-of-the-month anomaly begins with Robert Ariel who examined daily CRSP data from 1962-1986 which showed that stocks generated positive average returns at the beginning and first half of the trading month (Ariel 3). Ariel noted that this anomaly was used by market technicians who encourage selling after this high return period has ended and encouraged buying before the last trading day of the month. Josef Lakonishok and Seymour Smidt later followed this research by looking at Dow Jones Industrial Average from 1897-1986 to find a persistent seasonal pattern in the rates of return (Lakonishok and Smidt 403). They also

redefined the turn-of-the-month beginning with the last trading day of the month ending with the third trading day of the following month. They found that the average rates are high for these trading days, with an average cumulative return of 0.473%, while the average monthly price increase is 0.349%. This indicates that the average return was negative for the remainder of the month.

In his paper “Turn-of-Month Evaluations of Liquid Profits and Stock Returns: A Common Explanation for the Monthly January Effects” Joseph Ogden tested his hypothesis that the standardization of payments in the United States at the turn of each calendar month generally induces a surge in stock returns at the turn of each calendar month (Ogden 1259). Ogden also looked at daily CRSP market return from 1969-1986. He found that during months with tight monetary policy the turn-of-the-month anomaly was more prevalent. He measured tight monetary policy by the spread between Fed funds rate and the yield of a 30-day Treasury bill. He used his findings to justify the hypothesis that regularity in payments explain the turn-of-the-month anomaly. This theory is often referred to as the “payday” theory.

Chris Hensel and William Ziemba developed a trading strategy of investing in the S&P500 index during turn-of-the-month days and in Treasury bills for the rest of the month (Hensel and Ziemba 18). From 1928-1993 they found that their switching strategy outperformed a buy-and-hold strategy by 0.63% per year. Following in the footsteps of Hensel and Ziemba, Kunkel and Compton developed their own trading strategy by exploiting the turn-of-the-month anomaly in retirement accounts and variable annuities. Their hypothesis was by switching in a tax-deferred, no transfer cost retirement fund they can exploit the anomaly while avoiding transfer costs and tax liabilities of account switching (Kunkel and Compton 11). During turn-of-the-month days they invested in the College Retirement Equities Fund (CREF) equity account, and during non-turn-of-the-month days they switched into a Teachers Insurance and Annuity Association (TIAA) money market fund. They found that their switching strategy realized a 2.1% return more per year than a buy and hold strategy of the same equity.

Years after Kunkel and Compton developed their trading strategy, a fund trading scandal broke out when New York State Attorney General Eliot Spitzer filed charges against Canary Capital Partners LLC. Canary Capital was allowing for late-trading and market timing, allowing special investors to purchase and sell mutual funds after hours. In other words, Canary was capitalizing on new information by purchasing prices from the past. Also, the article in *Bloomberg Business Week* “A Primer on the Mutual-Fund Scandal” noted that an assistant professor at Stanford, Eric Zitzewitz, “found evidence of market timing and late trading across many fund families he studied. His research shows that an investor with \$10,000 in an international fund would have lost an average of \$110 to market timers in 2001 and \$5 a year to after-market traders,” (Carroll). This new rule has led to more fees and charges for those who switch in and out of mutual fund accounts, and more specifically hurt the Kunkel and Compton trading scheme.

Most recently, Wei Xu and John J. McConnell continued the work of their predecessors by using CRSP daily return and expanding the research to 1987-2005 along with the period of 1897-2005 in their paper “Equity Returns at the Turn of the Month” (Xu and McConnell 3).

They first separated the data into different periods of time (1926-1986, 1987-2005, 1926-2005) and looked for differences between the averages of the different trading days. More specifically, they looked at the same four day span as Lakonishok and Smidt beginning with the last trading day of the month and ending with the third trading day of the following month. After looking at both the Value-Weighted and Equal-Weighted returns they found statistical significance in differences between the means of the average daily turn-of-the-month and the return for all-other-days in all three time periods (Xu and McConnell 9). They contended that market participants did not earn a premium for bearing market risk outside of the four day trading range of the turn-of-the-month (Xu and McConnell 12).

Xu and McConnell expanded their research by exploring if the anomaly is confined to small and low-priced stocks, calendar year-ends or calendar quarter-ends, increases in risk-free rate or interest rates in general at the turn-of-the-month, and if it is confined to the US. Xu and McConnell do not find significance in any of the previously listed confinements of the turn-of-the-month anomaly. They also tested Ogden's hypothesis that the turn-of-the-month anomaly is caused by investors who receive majority of their wages, dividends, and interest earnings at month end. First, they tested if trading volume is higher on average over turn-of-the-month days than others by looking at daily NYSE trading volume in shares and dollars using CRSP data. They found that there is no evidence of higher volumes at the turn-of-the-month (Xu and McConnell 24). Next, they investigated daily net mutual fund flows using TrimTabs Daily Mutual Fund Flow data from 1998-2005. Because many individuals have a portion of their compensation directly deposited into mutual fund accounts, it would be expected that net mutual fund flows to increase during the turn-of-the-month. They found no pattern in any of the days of the month that would follow some sort of turn-of-the-month pattern (Xu and McConnell 25).

Section 3: Sample Selection, Methodology, Variable Definitions

This paper seeks to continue to work of Xu and McConnell by aggregating daily market returns for Value-Weighted and Equal-Weighted returns of the market from 2005-2013 and 1926-2013 to find continued evidence of the turn of the monthly anomaly. For comparison purposes, the same test will be conducted for the S&P 500. Yale Hirsch, publisher of the *Stock Trader's Almanac*, believes a shift in the turn-of-the-month anomaly happened in the mid-1980s due to investors who have attempted to capitalize on this end of month/beginning of month rally. By looking at these aggregate daily return graphs, a movement throughout different periods of history is expected to be seen.

Continuing, t-tests for unequal variance will be tested on turn-of-the-month days (Day -1 through Day 3) as defined by Lakonishok and Smidt to look for significant difference between the means. Day -1 represents that last trading day of the month, while Day 1 represents the first trading day of the month and so on. Tests will be conducted for the periods 1926-2013, 1975-1989, 1990-2004, and 2005-2013. T-tests for unequal variance will also be tested on the new turn of the month days (Day -4,-1) to find an increase in significance levels throughout the history of the market until 2013.

To show the market premium for holding returns in only the turn-of-the-month days, difference charts from 1926-2013 and 2005-2013 will be used for both the old turn-of-the-month days (Day -1,3) and new turn-of-the-month days (Day -4,-1). Average return for the old (new) turn-of-the-month days is subtracted by the average return of the rest of the month per year and will be graphed. This tests shows if the market premium for the old turn-of-the-month days has decreased in recent years and if the market premium for the new turn-of-the-month days has increased in recent years.

Finally, a trading strategy is tested that capitalizes on the turn-of-the-market anomaly. Due to the fees and charges many investment firms and mutual fund companies impose on their investors, this strategy may be more for a passive investor. The strategy tests how monthly contributions of \$1000 into the Equal-Weighted and Value-Weighted market indexes are affected by which day they are contributed in during different time periods. The strategy assumes that the \$1000 is contributed at the end of the trading day. For example, when looking at Day 1, the \$1000 is added to the account at the end of the trading day and is not affected by the percent change in the S&P 500 for that day. The growth of these contributions will be examined for the periods 1975-1989, 1990-2004, and 2005-2013.

In the sections market returns aggregation, t-tests for unequal variance, and trading strategy the period of 2009-2013 in the Equal-weighted and Value-Weighted indexes are tested to give an idea what has happened in the most recent years after the 2008 financial crisis. While these statistics will give a better idea of what is happening in the present, there are inside and outside factors to consider. First, there is much less data available from this five year period versus a fifteen year period; thus, individual days with carry more weight. Second, this period focuses on the recovering of the economy, and positive returns are expected across the board instead of concentrated days like the turn-of-the-month. Also, the Federal Reserve has gone through three rounds of “Quantitative Easing” since the recession, where it has been buying back government securities to help lower interest rates and increase the money supply. Low interest rates allow companies to take more risk and thus produce higher returns for their shareholders. This program is not sustainable and the Federal Reserve has already begun tapering this buy-back program. While it is hard to find a “normal” period for the stock market, the past five years have definitely not been one.

Section 4: Empirical Evidence

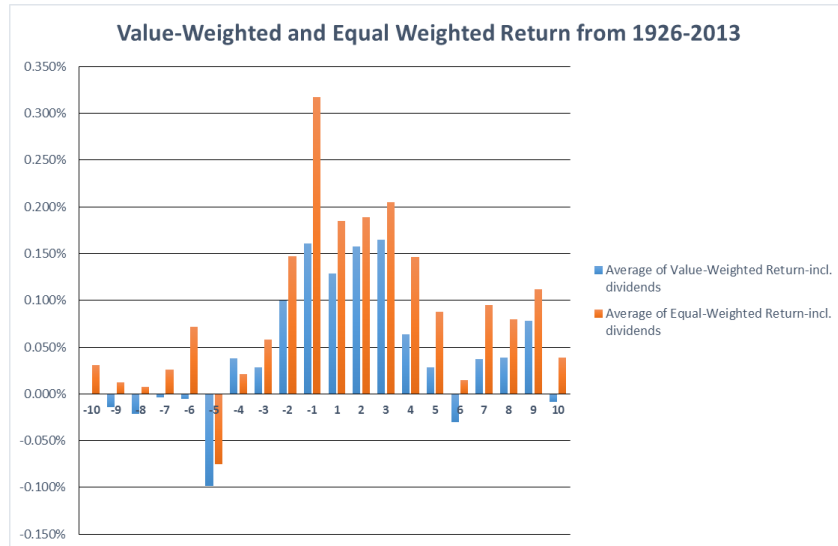
1. Market Returns Aggregation

The average return for each trading day of the month is now examined using CRSP data of the Value-Weighted and Equal Weighted market data and of the S&P 500. According to Xu and McConnell, “The CRSP database includes New York Stock Exchange (NYSE) stocks beginning with 1926, American Stock Exchange (AMEX) stocks beginning with 1962 and Nasdaq stocks beginning with 1972,” (2006). The data is split up into two periods (continuing on the work of Xu and McConnell) from 1926-2013 and 2005-2013.

Figure 1 below shows the average stock market returns for the period 1926-2013. Over the 88 year period, Day 3 (the third trading day of the month) has the highest average VW

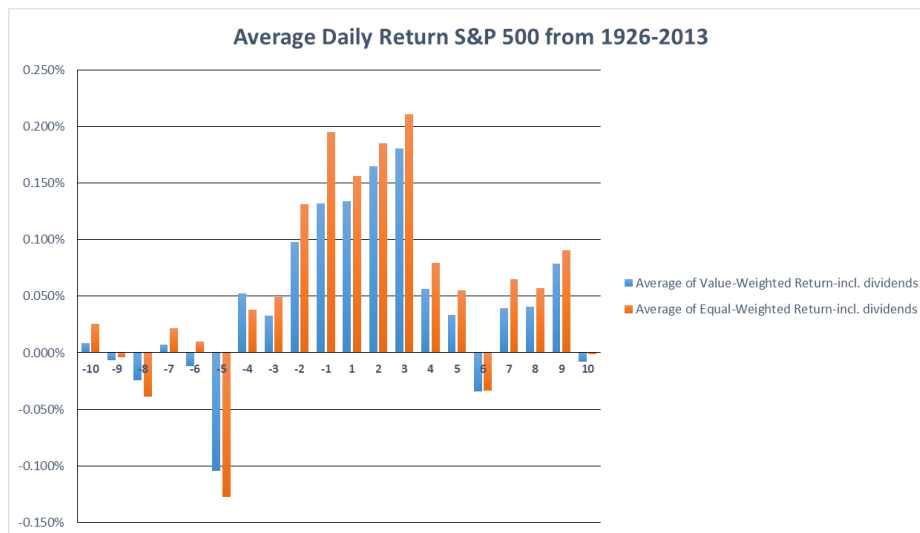
(value-weighted) return of 0.165%. On the other hand, Day -1 has the highest EW (equal-weighted) return of 0.318%. Days 3, -1, 2, 1 (respectively) are have the four highest average VW market return over the period. The four highest average EW market return over the period are Days -1, 3, 2, 1. These days are the same days that Lakonishok & Smidt (along with Xu & McConnell) used to define as TOM (turn-of-month) days.

Figure 1



Continuing, Figure 2 shows the average VW and EW stock return from the S&P 500 from 1926-2013. For VW return, Day 3 provides the highest average return of 0.181%. For EW return, Day 3 provides the highest average return of 0.211%. The four highest average VW stock returns are Days 3, 2, 1, and -1, respectively. The four highest average EW stock returns are Days 3, -1, 2, and 1, respectively. As seen in both figures, the highest average return days continue to coincide with the defined TOM days.

Figure 2

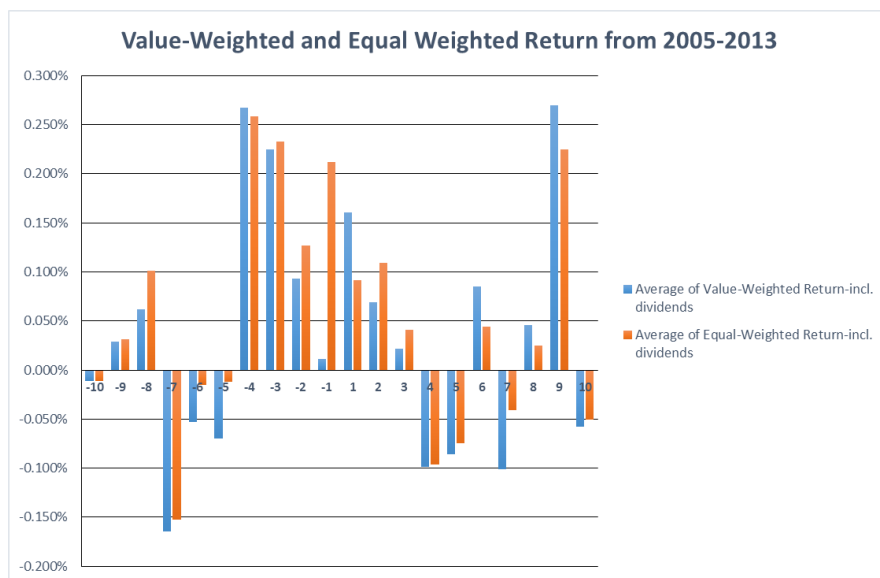


Continuing, the aggregated VW & EW market returns and the S&P 500 return for the period 2005-2013 can be seen below in Figures 3 & 4 to find more evidence of TOM days or if other days have become stronger in the more recent years due to investors anticipating the anomaly. The hypothesis is that the Days -4, -3, and -2 will have higher averages than they did in the 1926-2013 period. These days will be called the “new TOM days”, which have benefited from the backwards shift in the anomaly.

As seen below in Figure 3, there seems to be a shift in the highest average return days of the month. Surprisingly, Day 9 has the highest average VW weighted return of 0.270%. For EW return, Day 9 has the third highest average market return of 0.225%. During this period, October 13, 2008, which is a Day 9, has a VW return of 11.48% and an EW return of 10.74%. This huge jump was caused as “governments and central banks around the world mounted an aggressive, coordinated campaign to unlock the global flow of credit,” (Grynbaum 1). More details regarding the bank bailouts were beginning to be released which caused a large counter-trend during the 2008 recession. When this day is removed from our data set, the average return for Day 9 during this period is 0.165% and 0.127%, which aligns better with the rest of the data.

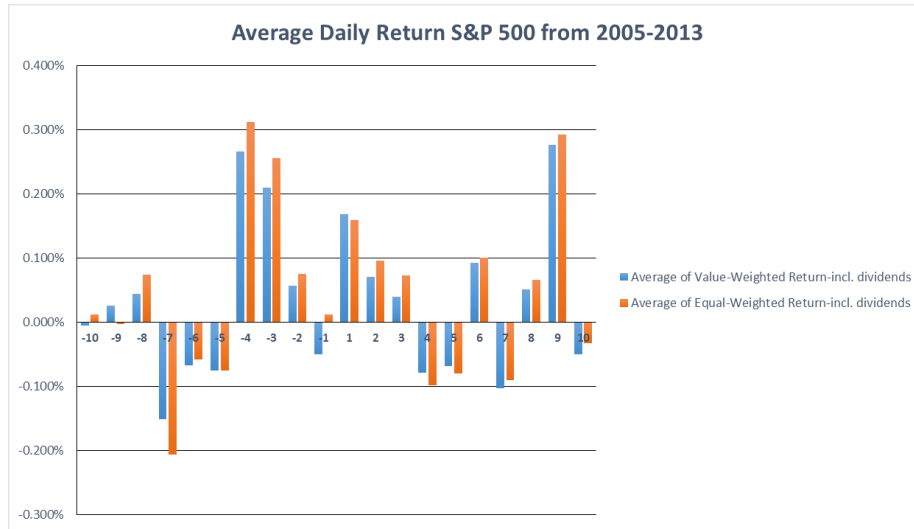
Excluding Day 9 to focus on the beginning/end of the month, the four highest average VW market returns for the month during this period are -4, -3, 1, and -2 with returns of 0.267%, 0.225%, 0.160%, and 0.93%, respectively. As for EW market returns, the top four (excluding Day 9) are days -4, -3, -1, and -2 with returns of 0.258%, 0.233%, 0.212%, and 0.127% , respectively. Observations during the 2008 financial crisis have also caused great outliers during this period. For example, December 1, 2008 has a VW return of approximately -8.94%. This great of an effect is not seen on Day -1 VW weighted return, even though it has a surprisingly low average return of .011%.

Figure 3



Looking at Figure 4, a similar pattern in the S&P 500 can be seen that was also found in Figure 3. Day 9 ranks first in VW market returns (0.276%) and second in EW market returns (0.292%). Excluding Day 9, the top four days of VW market returns are Days -4, -3, 1 and 6 (0.266%, 0.210%, 0.168%, and 0.093%), respectively. The top four days for EW market returns are Days -4, -3, 1, and 6 (0.311%, 0.256%, 0.159%, and 0.100%), respectively.

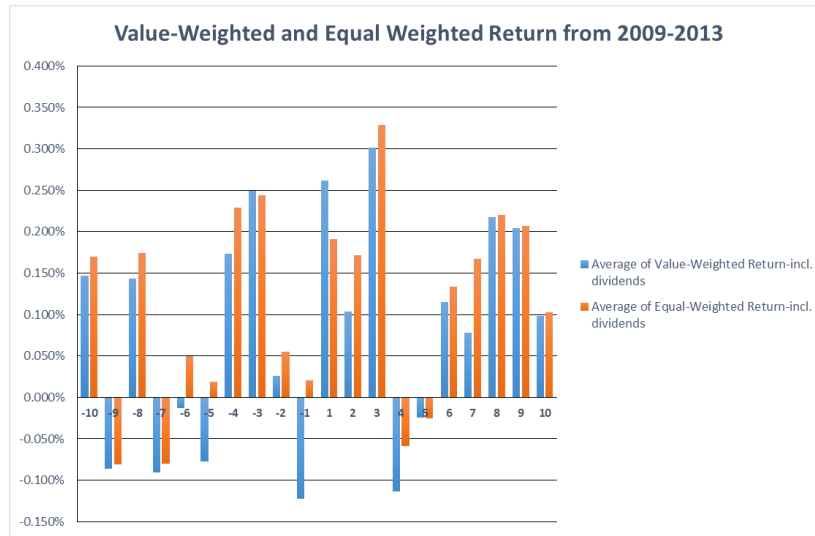
Figure 4



An interesting day to pay special attention to is Day -5. In all four graphs, Day -5 has some of the lowest averages when compared to the rest of the days of the month. Day-5 also occurs right before the new TOM days begin. During the 2005-2013 period, Day -5 is preceded by, on average, two similar “down” days of the month (Day -6 & Day-7). Given a buy-low, sell high strategy, this day may be one of the best days in the month to invest monthly contributions. This theory will be tested later in the paper.

The final figure, Figure 5, shows the average returns for the past five years. This chart shows extreme average returns across the entire month. High returns seem to come in groups of days: Days -4 through 3 (excluding Day -1), and Days 6 through 10. Throughout the research, this is the first time to find high returns in the middle of the month in a group, usually high returns in the middle of the month sit on islands by themselves (for example, Day 9 in Figure 4). If the “new” turn-of-the-month are defined as Days -4 through -1, and the old turn of the month as Days -1 through 3, Figure 5 shows what seems to be a combination of the two (once again, excluding Day -1). With only six out of twenty days of the month producing poor returns, it is not expected to find statistical significance in either the new turn-of-the-month or old turn-of-the-month in the next section.

Figure 5



II. T-Tests for Unequal Variance

Next, the old TOM Days (-1, 3) are tested against the rest of the month for significance in both the Value-Weighted and Equal-Weighted Indexes. Also observed are the new TOM days (Days -4,-1) for significance against the rest of the month for both indexes. Table 1 is split into four time periods to show the growth of the significance of the new TOM days and the decline in significance of the old TOM days.

As seen in the graph below, both the old TOM days and the new TOM days are statistically significant for the longest period 1926-2013. Note the decline in the old TOM day's t-statistic from one period to the next, with the exception of Equal Weighted from period 1975-1989 to 1990-2004. A critical value (T-crit) is used to help determine if the hypothesis that the average daily return is to be rejected or accepted. If the calculated value is less than the critical value (T-crit), then the null hypothesis is failed to be rejected. Using a T-crit of 1.65, significance in all periods can be seen except for new TOM VW & EW in the 1975-1989 period, and old TOM VW & EW in 2005-2013 period.

As expected, Days (-1,3) have strong p-values throughout the older periods, proving significance at the 5% level in all periods and 1% level in all periods except EW 1975-1989. Hirsch predicted the movement in the mid-1980s (Hirsch 1), and by taking a closer look the significance of the new TOM days (Days (-4,-1)) can be seen, starting to increase from the period 1975-1989 to 1990-2004.

What is more interesting is how strong the new TOM days become in the most recent period, 2005-2013. The lack of significance during period 2005-2013 at the 5% and 1% level for the p-value for Days (-1,3) tells that these days are not trading as strong as they have in the past; on the other hand, Days (-4,-1) are trading with significance at the 5% level and for EW at the 1% level.

Table 1

CRSP Value-Weighted Market Returns								
	1926-2013		1975-1989		1990-2004		2005-2013	
	Days (-1,3)	Days (-4,-1)	Days (-1,3)	Days (-4,-1)	Days (-1,3)	Days (-4,-1)	Days (-1,3)	Days (-4,-1)
Mean	0.15%	0.08%	0.18%	0.09%	0.14%	0.10%	0.08%	0.15%
T-Stat	7.79	2.8	3.92	0.85	2.69	1.65	0.71	2.1
P-value (one tail)	0.000	0.003	0.000	0.197	0.004	0.049	0.239	0.018
CRSP Equal-Weighted Market Returns								
	1926-2013		1975-1989		1990-2004		2005-2013	
	Days (-1,3)	Days (-4,-1)	Days (-1,3)	Days (-4,-1)	Days (-1,3)	Days (-4,-1)	Days (-1,3)	Days (-4,-1)
Mean	0.22%	0.14%	0.21%	0.11%	0.26%	0.22%	0.12%	0.21%
T-Stat	9.7	3.45	2.15	0.82	5.26	4.24	1.42	3.27
P-value (one tail)	0.000	0.000	0.016	0.205	0.000	0.000	0.078	0.001

Notes: The T-stats test the null hypothesis that the average daily return is not significantly different from zero. Significance levels are for one-tailed tests.

Table 2 only shows the same information for the period 2009-2013. As expected, no significance is found in either the old TOM days or the new TOM days. Looking back at Figure 5, the majority of the days in each month during the period gave yielded positive returns.

Table 2

CRSP Value-Weighted Market Returns			CRSP Equal-Weighted Market Returns		
	2009-2013			2009-2013	
	Days (-1,3)	Days (-4,-1)		Days (-1,3)	Days (-4,-1)
Mean	0.14%	0.08%	Mean	0.18%	0.14%
T-Stat	0.85	0.10	T-Stat	1.03	0.49
P-value (one tail)	0.197	0.458	P-value (one tail)	0.152	0.312

Notes: The T-stats test the null hypothesis that the average daily return is not significantly different from zero. Significance levels are for one-tailed tests.

III. Difference Charts

The investigation of the movement of the turn-of-the-month anomaly backwards towards the fourth to last trading day of the month continues with the use of difference charts. The first two difference charts take the difference between the average return of the old TOM days and the average return for the rest of the month using both Value-Weighted and Equal-Weighted market data for the periods 1926-2013 and 1993-2013. This difference gives the premium of the TOM days over the returns of the rest of the month. The second two difference charts graph the same periods and indexes as the first two charts, but instead find the premium of the new TOM days over the rest of the month. A gradual decrease in the difference for the old TOM days and likewise a gradual increase in the new TOM days is expected to be seen. A trend line has also been plotted for the difference in the Value-Weighted Index returns to show if there is a gradual decline, and the Value-Weighted does not have as much variance as the Equal-Weighted does. Figure 6-9 can be found on pages 10 and 11.

Figure 6

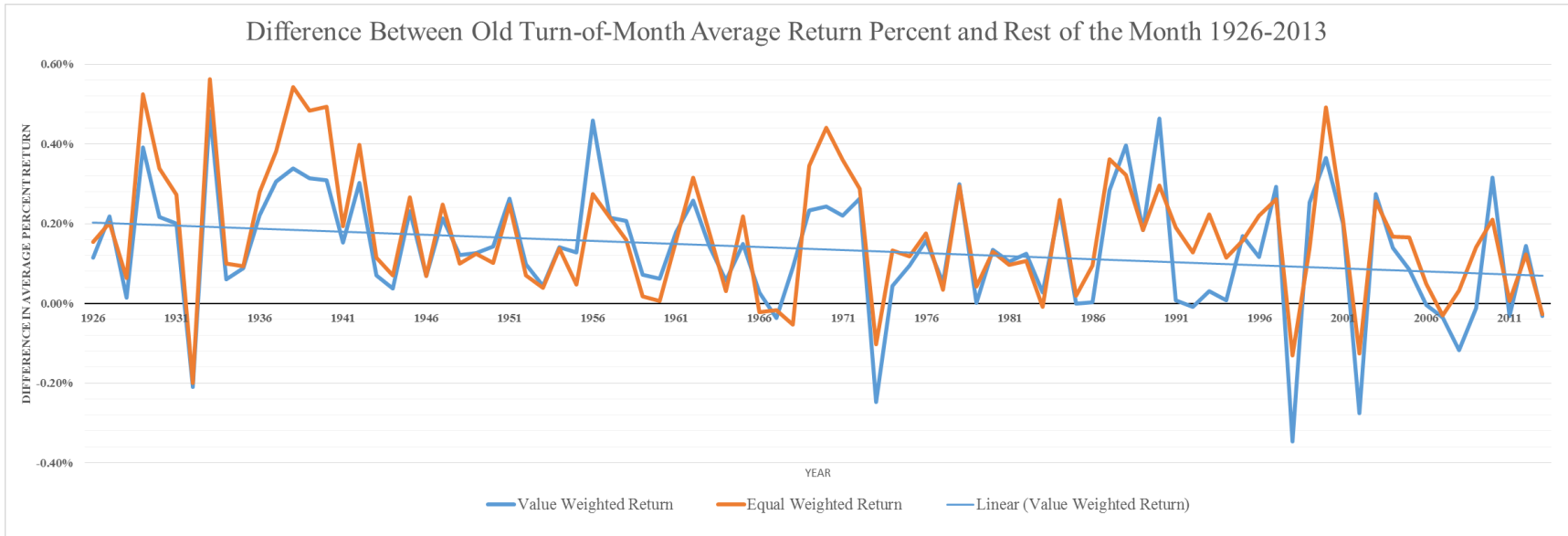


Figure 7

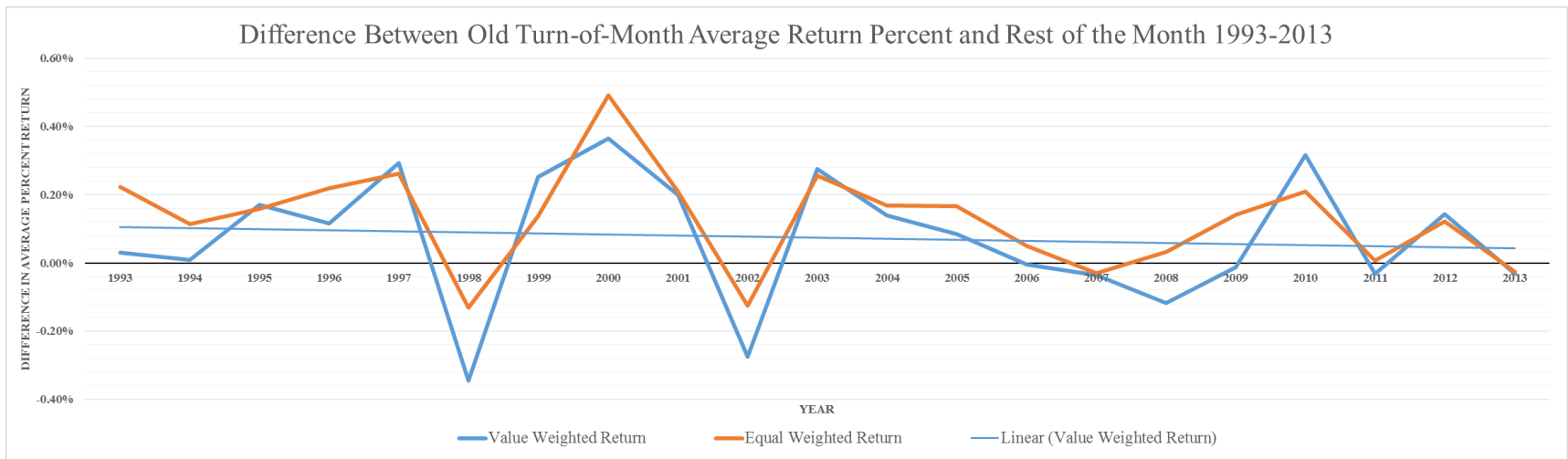


Figure 8

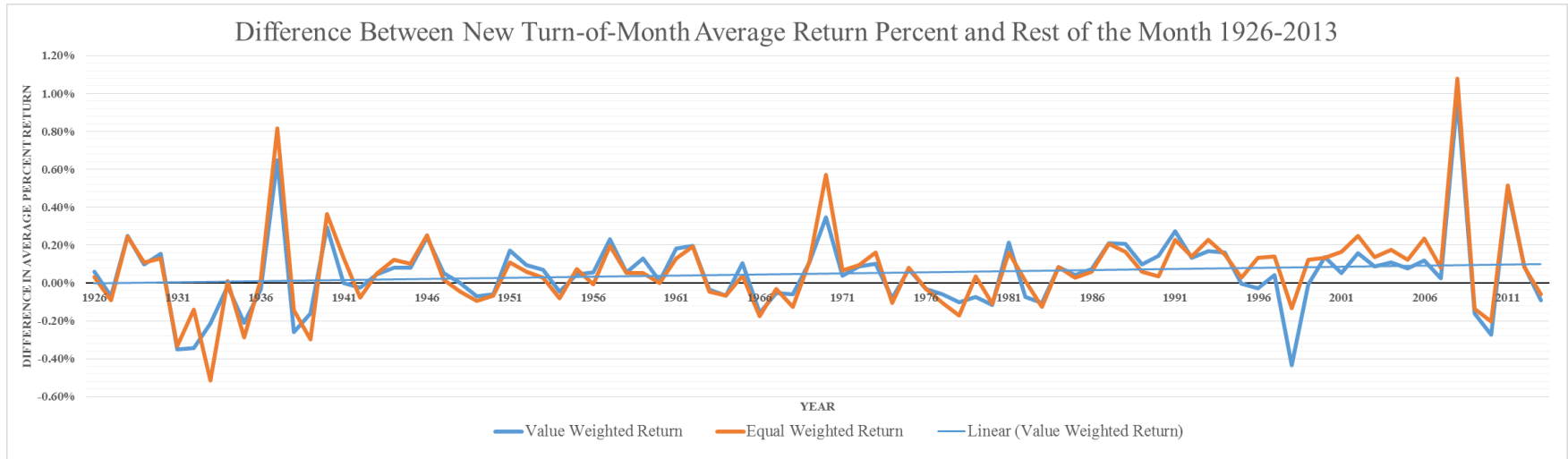
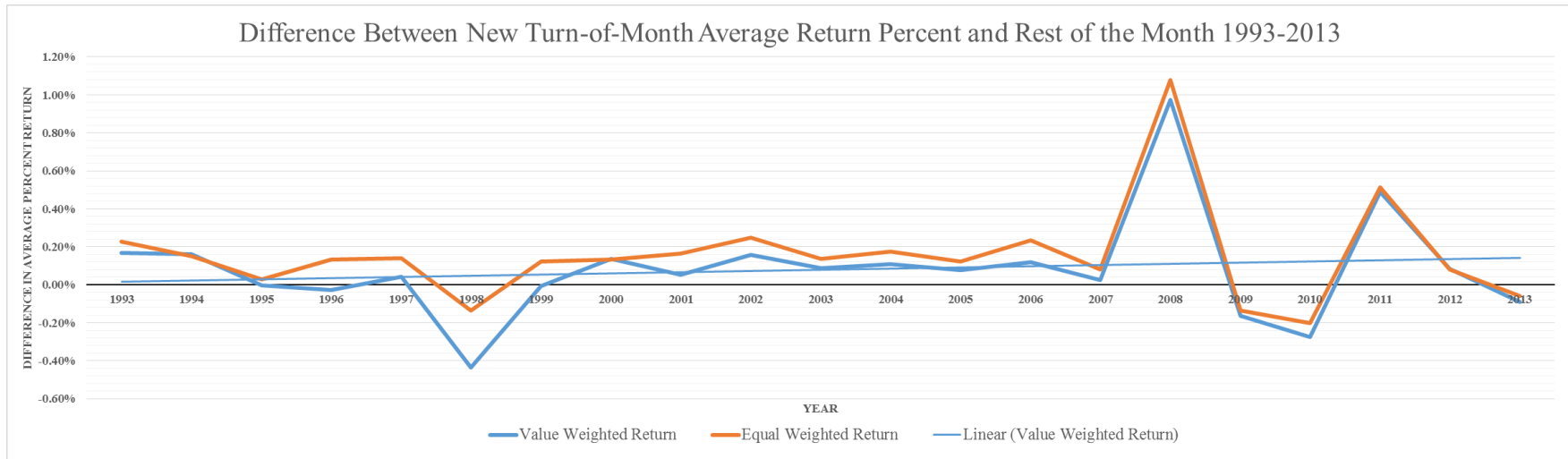


Figure 9



Looking at Figure 6 above, it is hard to see any true trend in the difference between the old TOM days and the rest of the month. However, looking into the twenty year graph in Figure 7, a slow decline in the strength of the TOM days is seen. Years such as 2002 and 2008 are interesting to look at to see the effect of the internet bubble in 2002 and the financial crisis. While these graphs are not enough evidence to prove the movement of the turn-of-the-month anomaly, they are a nice visual graph to see the excess return of these four special days.

Figure 8 and Figure 9 tell a different story than the other difference graphs. They show a gradual increase in the new TOM days. Looking at the twenty year graph, the new TOM held a consistent positive difference during the 2000s. In fact, during the 2008 recession the new TOM days saw on average a percent higher return than the rest of the month. Like with the previous graphs, enough evidence cannot be provided to prove a movement in the anomaly.

III. Trading Strategy Test

In this section, the passive trading strategy of investing in the Value-Weighted and Equal-Weighted market indexes is examined. The investment begins with \$0 at the beginning of the following periods: 1975-1989, 1990-2004, 2005-2013 and 2009-2013. These four periods have been picked to show if the best day of the month to make a contribution has changed throughout the last 40 years. Throughout each period, \$1,000 is contributed on different days of the month. For example: for the Trading Day 1 strategy, \$1,000 is contributed on the first day of every month (12 contributions per year) for the entire period. Continuing, for Trading Day 2 strategy, \$1,000 is contributed on the second of every month. This is examined from Days -9 (the 9th to last trading day of the month) through Day 10 (the tenth trading day of the month). Day -10 was not included because in the month of February there is not a tenth to last trading day of the month, and thus there would be no contribution made which would cause a huge outlier to the test. There were no other external forces on these investments outside of the daily return on the S&P 500 index. This test was conducted to see if there is opportunity for passive investors to take advantage of this anomaly by simply choosing a certain day to make their monthly contributions into their 401(k), IRA's, or personal investments.

Table 3 (below) shows the returns from the period 1975-1989. In both indexes the first day of the month is the best day of the month for contributions, with 0.75% and 1.55% differences above their respected means (Value and Equal Weighted). Better returns were expected to be seen out of Day -1, considering it is a part of the Lakonishok & Smidt TOM days; however, in this period (and periods to come) it is one of the worst days to make monthly contributions according to this trading strategy. Perhaps it is due to the fact that the contribution is held for so long that the "life" of each contribution in the portfolio is short-lived when compared to the contributions made at the beginning of the month. Outside of this day, the beginning of the month produces the highest returns for monthly contributions made. It is also important to note the similarity seen in both indexes. They both follow similar patterns, Equal-Weighted is just more extreme in both positive and negative returns throughout the period.

Despite the investors not realizing any of the high returns seen on Day +1, this day is consistently the best day to make investments for all periods of the study until 2005-2013. Even

though the investor pays a higher price on the first day of the month, he/she would not have seen a benefit by postponing his/her contribution or making it before the month's beginning. Perhaps this day benefits from being a part of the entire TOM period.

Table 3

Value-Weighted 1975-1989				Equal-Weighted 1975-1989			
Trading Day	Final Market Value	Rank	% Difference from Mean	Trading Day	Final Market Value	Rank	% Difference from Mean
-9	\$656,735.62	19	-0.62%	-9	\$973,424.82	14	-0.70%
-8	\$659,504.76	11	-0.20%	-8	\$976,002.32	11	-0.44%
-7	\$659,252.01	13	-0.24%	-7	\$975,230.90	12	-0.51%
-6	\$659,327.07	12	-0.23%	-6	\$973,760.67	13	-0.66%
-5	\$659,097.83	14	-0.27%	-5	\$972,617.60	15	-0.78%
-4	\$658,650.77	17	-0.33%	-4	\$971,943.09	16	-0.85%
-3	\$658,734.13	16	-0.32%	-3	\$971,553.55	17	-0.89%
-2	\$658,773.07	15	-0.32%	-2	\$970,604.37	18	-0.99%
-1	\$657,366.89	18	-0.53%	-1	\$967,376.95	19	-1.32%
1	\$665,827.96	1	0.75%	1	\$995,444.61	1	1.55%
2	\$664,748.36	2	0.59%	2	\$993,538.52	2	1.35%
3	\$663,605.84	4	0.42%	3	\$990,820.59	3	1.08%
4	\$663,599.85	5	0.42%	4	\$989,446.81	4	0.94%
5	\$663,697.01	3	0.43%	5	\$988,595.02	5	0.85%
6	\$663,056.80	6	0.33%	6	\$987,138.37	6	0.70%
7	\$662,276.73	7	0.21%	7	\$985,082.03	7	0.49%
8	\$661,569.92	8	0.11%	8	\$983,133.10	8	0.29%
9	\$660,491.11	9	-0.06%	9	\$980,680.88	9	0.04%
10	\$659,970.52	10	-0.13%	10	\$978,891.82	10	-0.14%
Average	\$660,857.17			Average	\$980,278.21		

Continuing, Table 4 (below) gives the returns for the period 1990-2004. Similar patterns can be seen between this period and the prior one. The first trading day of each month produces the best returns; Day -1 is one of the worst days for contributions, and, as a whole, the first half of the trading month is much better than the second half. It is interesting to note that the Value-Weighted index has a maximum return percentage of only 0.30% above the mean. This only accumulates to \$1,205.92 above the mean return, and also only gives a range of \$3,218.93. The Equal-Weighted index, on the other hand, has a range of \$63,859.66 and the difference between the best trading day and the average is \$30,582.29.

The period 2005-2013 (Table 5 below) gives completely different results than the previous two periods. As predicted in the beginning of the paper, Day -5 is one of the strongest days to invest monthly contributions (The best day of the month for the Value-Weighted index and the second to best day for the Equal-Weighted Index). Day -6 is the second (first) best trading day for the Value (Equal)-Weighted index. These days come right before the "new" turn-of-the-month days of high returns. The new turn-of-the-month days (Days -4,-1) have some of the worst returns out of the entire month, which is not surprising considering that they are investing in the middle of the TOM bubble. These days miss out of the entirety of the month and suffer from it, much like the second half of the month in the previous two periods.

Table 4

Value-Weighted 1990-2004				Equal-Weighted 1990-2004			
Trading Day	Final Market Value	Rank	% Difference from Mean	Trading Day	Final Market Value	Rank	% Difference from Mean
-9	\$406,652.30	19	-0.49%	-9	\$2,871,379.94	14	-0.30%
-8	\$407,134.23	17	-0.37%	-8	\$2,871,878.80	12	-0.28%
-7	\$407,786.01	16	-0.22%	-7	\$2,874,817.47	11	-0.18%
-6	\$407,877.05	15	-0.19%	-6	\$2,871,671.81	13	-0.29%
-5	\$409,147.81	9	0.12%	-5	\$2,870,603.70	15	-0.33%
-4	\$408,734.06	11	0.02%	-4	\$2,868,073.05	16	-0.41%
-3	\$408,401.65	13	-0.06%	-3	\$2,865,556.27	17	-0.50%
-2	\$407,878.87	14	-0.19%	-2	\$2,861,101.13	18	-0.66%
-1	\$407,126.60	18	-0.38%	-1	\$2,846,695.63	19	-1.16%
1	\$409,871.23	1	0.30%	1	\$2,910,555.29	1	1.06%
2	\$409,279.46	7	0.15%	2	\$2,901,621.18	2	0.75%
3	\$409,262.71	8	0.15%	3	\$2,897,814.85	3	0.62%
4	\$409,331.88	6	0.16%	4	\$2,894,538.22	4	0.51%
5	\$409,576.27	4	0.22%	5	\$2,893,187.76	5	0.46%
6	\$409,703.27	2	0.25%	6	\$2,890,552.40	6	0.37%
7	\$409,631.22	3	0.24%	7	\$2,887,213.76	7	0.25%
8	\$409,499.99	5	0.20%	8	\$2,884,188.63	8	0.15%
9	\$409,117.90	10	0.11%	9	\$2,881,572.44	9	0.06%
10	\$408,628.37	12	-0.01%	10	\$2,876,445.59	10	-0.12%
Average	\$408,665.31			Average	\$2,879,972.00		

Table 5

Value-Weighted 2005-2013				Equal-Weighted 2005-2013			
Trading Day	Final Market Value	Rank	% Difference from Mean	Trading Day	Final Market Value	Rank	% Difference from Mean
-9	\$174,952.33	11	-0.04%	-9	\$219,692.65	11	0.02%
-8	\$174,869.26	16	-0.09%	-8	\$219,530.83	13	-0.06%
-7	\$175,207.03	7	0.10%	-7	\$219,996.68	6	0.16%
-6	\$175,469.35	2	0.25%	-6	\$220,348.43	1	0.32%
-5	\$175,563.23	1	0.30%	-5	\$220,347.33	2	0.32%
-4	\$174,893.04	13	-0.08%	-4	\$219,441.25	15	-0.10%
-3	\$174,547.04	17	-0.28%	-3	\$218,981.99	17	-0.31%
-2	\$174,389.68	18	-0.37%	-2	\$218,653.67	18	-0.46%
-1	\$174,382.80	19	-0.37%	-1	\$218,035.00	19	-0.74%
1	\$175,140.21	9	0.06%	1	\$219,823.22	9	0.08%
2	\$174,931.25	12	-0.06%	2	\$219,455.12	14	-0.09%
3	\$174,874.44	14	-0.09%	3	\$219,391.02	16	-0.12%
4	\$175,213.64	6	0.10%	4	\$219,870.41	8	0.10%
5	\$175,332.57	5	0.17%	5	\$220,002.09	5	0.16%
6	\$175,196.74	8	0.09%	6	\$219,974.64	7	0.15%
7	\$175,421.59	3	0.22%	7	\$220,181.72	4	0.24%
8	\$175,359.82	4	0.19%	8	\$220,227.84	3	0.26%
9	\$174,871.11	15	-0.09%	9	\$219,668.94	12	0.01%
10	\$174,972.60	10	-0.03%	10	\$219,805.55	10	0.07%
Average	\$175,030.93			Average	\$219,654.13		

The last trading day of the month continues to be one of the worst trading days to make contributions. The first trading day of the month seems to be out of place looking at the previous four trading days and the following two trading days. The importance of the first trading day of the month may have significance outside of the turn-of-the-month anomaly, considering that the anomaly may have shifted in the last twenty years yet the first day of each month continues to show high returns. The percent differences from the mean and the ranges for each of the indexes

do not produce the same extremes that the previous two periods have given us. Instead of seeing ranges of \$3,218.93 and \$63,859.66 for the Value and Equal Weighted indexes (respectively), ranges of \$1,180.43 and \$2,313.43 are seen.

Finally, Table 6 shows results of the trading strategy from the last five years. Day 1 has once again come out as the best day of the month for contributions, despite the theory that the turn-of-the-month has regressed backwards. The returns look similar to two periods prior to 2005-2013, with the first half of the month showing stronger results than the second half. Once again, Day +1 was the best day of the month to make contributions. For the Value-Weighted Index, there is only a 0.79% difference between Day +1 and the mean, which results in a \$740.48 gain. The range for the Value-Weighted index is \$1,302.02. The Equal-Weighted index, on the other hand, has a difference of 1.31% between Day +1 and the mean which yields a gain of \$1,313.15, and has a range of \$2,296.91.

Table 6

Value-Weighted 2009-2013				Equal-Weighted 2009-2013			
Trading Day	Final Market Value	Rank	% Difference from Mean	Trading Day	Final Market Value	Rank	% Difference from Mean
-9	\$93,898.83	11	-0.17%	-9	\$100,172.84	10	-0.22%
-8	\$93,737.31	15	-0.34%	-8	\$99,945.07	15	-0.44%
-7	\$93,790.70	14	-0.28%	-7	\$99,979.00	14	-0.41%
-6	\$93,849.38	12	-0.22%	-6	\$100,029.39	12	-0.36%
-5	\$93,938.99	9	-0.12%	-5	\$100,000.48	13	-0.39%
-4	\$93,686.69	17	-0.39%	-4	\$99,600.51	16	-0.79%
-3	\$93,494.40	19	-0.60%	-3	\$99,405.61	19	-0.98%
-2	\$93,531.84	18	-0.56%	-2	\$99,448.00	18	-0.94%
-1	\$93,700.86	16	-0.38%	-1	\$99,454.39	17	-0.93%
1	\$94,796.42	1	0.79%	1	\$101,702.52	1	1.31%
2	\$94,648.61	2	0.63%	2	\$101,421.30	2	1.03%
3	\$94,326.77	7	0.29%	3	\$100,982.29	6	0.59%
4	\$94,519.44	4	0.49%	4	\$101,180.19	4	0.79%
5	\$94,540.79	3	0.52%	5	\$101,182.08	3	0.79%
6	\$94,444.02	5	0.41%	6	\$101,065.42	5	0.67%
7	\$94,330.66	6	0.29%	7	\$100,797.44	7	0.41%
8	\$94,094.47	8	0.04%	8	\$100,533.28	8	0.14%
9	\$93,929.61	10	-0.13%	9	\$100,339.97	9	-0.05%
10	\$93,802.91	13	-0.27%	10	\$100,158.36	11	-0.23%
Average	\$94,055.93			Average	\$100,389.38		

Looking over all of the data in this section, the percent differences from the mean do not seem too staggering. The greatest percent difference from the mean is 1.55% in the first period. While these are not near the percentages that are yielded in other studies where the strategy is to only hold during turn-of-the-month periods, this information does still show the importance of selected the right day to make investments. Even a 0.30% difference between days can mean thousands of dollars to a retirement account if the wrong day to make investments is selected. Making investments at the beginning of the month may be a safer bet than investing in the second half of the month, given the research.

Section 6: Conclusion

Research of the “turn-of-the month” anomaly has spanned across the last thirty years. Ariel first noting this anomaly in 1987, and Lakonishok and Smidt (1988) defined the interval as Days -1 through 3. Hensel and Ziemba attempted a trading strategy to take advantage of the anomaly, and Joseph Odgen explained the anomaly with his “payday” hypothesis. More recently, in 2006 Xu and McConnell attempted to further the works of others and tested the payday hypothesis. They were able to disprove the notion that investor’s 401(k) contributions affected the market by looking at mutual fund cash flows. The turn-of-the-month anomaly has continued up through 2013, and also may have seen a shift backwards in recent years to form a “new” turn-of-the-month period of Days (-4, 1).

First, CRSP data was used to design market aggregations charts to show the average return of different days in a month throughout different periods. The research matched different papers that preceded this one, although the chart of 2005-2013 show higher returns during the “new” TOM period. Then, the difference between the means of “old” TOM days versus the rest of the month and “new” TOM days against the rest of the month for different periods was tested. An increase in significance in the “new” TOM days throughout the year was found; on the contrary, the “old” TOM days saw declining significance. This idea is also displayed in the difference charts, where the difference between the mean return of TOM days and the rest of the month is plotted throughout two separate periods. Finally, a passive contribution trading strategy was implemented based on both “old” and “new” TOM days. While the difference between contributing on different days of the month does not seem to make much of a difference, the data generally shows higher returns for the first half of the month versus the second half.

Additional research may be done to find more evidence as to why the anomaly has fallen backwards into the latter half of the month in recent years, and perhaps a trading strategy similar to Kunkel and Compton using this “new” TOM day period where money is invested in only the “new” TOM days and put into a money market account for the remainder of each month should be tested. This would require more daily data from recent years. Also, during a conversation with Joseph Castrodale, an investment Banker at Stephens Inc., he notes that in his personal opinion the TOM anomaly may be caused by institutional traders attempting to meet month end quotas by selling off parts of their portfolio, thus causing stock prices to fall (personal communication, April 20, 2014). Overall, the investigation into the “turn-of-the-month” anomaly will continue to confuse and fascinate researchers into the future.

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