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SELL IN MAY AND GO AWAY: IS IT STILL A RELIABLE INVESTING STRATEGY?

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ABSTRACT

This study examines whether the Sell in May and Go Away (or Halloween Effect) trading strategy still exists in the United States markets and if still has an opportunity to earn abnormal returns. This study stems its differences from previous works in the literature in that it looks at investment style portfolios as well as industry portfolios in both an equal weight and value weighted fashion. Then a trading strategy is provided with the results from the research. The research has found that the Sell in May and Go Away effect has been getting slightly stronger over time. It also shows that it is more prominent in the equal weighted portfolios and in smaller companies than larger ones. Overall, a trading portfolio that follows the strategy of Sell in May and Go Away has a better return to risk ratio than a buy and hold strategy.

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Objective

This research paper's main objective is to look at the age old adage of Sell in May and Go Away and to determine if it is still around. Our research will look into 12 United States industries as well as 6 portfolios based on size and book-to-market. We will look to find this effect in 89 years of data as well as in 30 year intervals. If the Sell in May and Go Away effect is still apparent in today's markets, we then look to see if there are ways to try to take advantage of the arbitrage opportunity. We will create trading strategies with the portfolios that do exhibit the effect and compare their performances with those of simple buy-and-hold portfolios.

Introduction

Sell in May and Go Away has been an almost historical adage. It is a simplistic trading strategy that has existed long before analytical research was around. Now, it has gained new publicity and research has been buzzing all around the subject, professionals and nonprofessionals have seen its effects and even implemented it as part of their trading strategies. Sell in May and Go Away is simply the notion that stocks will gain a higher return in the months of November through April when compare to those months of May through October and thus selling a stock in May and holding risk free assets[1] would be a more profitable strategy with lower risk than a conventional buy and hold strategy.

At the core of the research we are trying to support the efficient market hypothesis[2] or to disprove it with the data, the theory of a trading effect often suggests that there are arbitrage opportunities; however, if stock markets are informationally efficient, no such "anomaly" should exist over extended periods of time. As Fama (1970, 1991) and Jensen (1978) emphasize, in a semi-strong efficient market, it should be impossible to profit from publicly available information. And, if such risk-adjusted abnormal returns net of all costs are nevertheless possible, in an event of an arbitrage the effect should go away almost as immediately as it was found to exist. Bouman and Jacobsen (2002) support the Halloween strategy and claims that it offers an arbitrage opportunity to earn returns. Other studies in the same field have also confirmed that there is still a Sell in May and Go Away Effect that provides returns (Jacobsen and Zhang, 2012; Andrade et al., 2013, Swinkels and van Vliet, 2012). The Sell in May and Go Away effect has been around for

[1] Risk free assets here are referring to United States issued government bonds.
[2] Efficient market hypothesis is an investment theory that states it is impossible to "beat the market" because stock market efficiency causes existing share prices to always incorporate and reflect all relevant information.

many years and in different markets and is still existent today. This leads to many questions that have been answered but more to be asked.

A simple yet intuitive framework was implemented to simulate the effect of whether the Sell in May and Go Away effect was apparent in the United States Markets. The works of prior studies and frameworks were carefully read and considered when developing our own. However, methodology we follow is not as similar. In addition to analyzing the data within a holistic frame work, we have also been able to break the data into smaller time periods to test for outliers and other patterns. Also, after analyzing the data, we were able to test and implement an efficient trading strategy that coincides with the researches findings.

Our study allows us to explore a new area of research that also builds on the ideas of those studies that have come before us. There has been a lot of general analysis of the United States market and different markets around the world and even more analysis on strategies (Swinkels, 2012; Jacobsen and Zhang, 2012; Zhang and Jacobsen, 2012; Andrade et al., 2013). Most notably, Dichtl and Drobetz (2014) were not able to confirm that the Halloween strategy outperformed a buy-and-hold strategy or any other monthly seasonality-based strategy. Our avenue of research stems into the specific United States markets and more importantly into the specific industries and investment style portfolios. There has been both support and disapproval of the effect in the general market as a whole but there has been only one paper focusing on different sectors/industries (Jacobsen and Visaltanachoti 2009). and no study investigating the effect on different investment styles. Also our research looks at two different types of portfolios which will allow for greater analysis of the areas we are researching. The value weighted portfolios and the equal weight portfolios allow us to gain insight on the firm size and if they play a role in eliciting the effect.

The results were very interesting. First, we found that our study confirmed results of previous research. We did not use the regression model however we were still able to see that the Sell in May and Go Away effect is significant today. Second, when looking at the data we found that the effect was growing throughout the last 89 years and that small firms exhibit stronger Sell in May and Go Away effect. However, when tested, we were unable to find an arbitrage opportunity therefore our study is still in line with the theory of efficient markets (Fama, 1970, 1991; Jensen, 1978). The portfolios constructed to take advantage of the effect exhibit lower risk and higher risk-adjusted returns

The paper presented today is broken down into multiple chapters. Chapter 1 is a brief overview of the literature. It explores previous research that have been conducted on the subject of Sell in May and Go Away as well as the results of the research. Chapter 2 thoroughly explains the methodology involved with this research. It explains the process of what and how the data was tested to derive the results. Chapter 3 presents the analysis of the data; it is broken into multiple sections. It explains what is important within the calculations. Chapter 4, the conclusion, explains the results and how it is relevant to the question asked, is Sell in May and Go Away still a reliable trading strategy today? Finally, chapter 6 explores the future of research to come within the field of Sell in May and Go Away. It looks at the weakness of this research as well as what can be done in the future to further understand the Sell in May and Go Away effect.

Chapter 1
Literature Review

Sven Bouman and Ben Jacobsen (2002) explored this effect in 37 countries from April 1982-August 2003. They conducted research using linear regression equations consisting of dummy variables to examine whether stock returns are indeed significantly lower during the May-October period than during the remainder of the year. They found that the effect were significant in European counties as well as many others. They concluded, through all their data collection and calculations, that 36 countries out of the 37 exhibited the effect that returns in May through October are lower, and that 20 out of 37 markets have higher returns during November through April. They also concluded that this effect was exploitable and is able to be taken as another example of market inefficiency.

Edwin D. Marberly and Raylene M. Pierce (2004) have researched the same topic with emphasis on the S&P 500 futures. Edwin D. Marberly and Raylene M. Pierce (2004) used the data set that was originally developed by Sven Bouman and Ben Jacobsen (2002) but Edwin D. Marberly and Raylene M. Pierce adjusted their equations for outliers such as the monthly declines in October 1987 and August 1998. Edwin D. Marberly and Raylene M. Pierce found that the "Sell in May and Go Away" effect does not exist within the original data that Sven Bouman and Ben Jacobsen after they adjusted for the extreme months in 1987,1998.

Witte (2010) in a paper criticizes Edwin D. Marberly and Raylene M. Pierce's (2004) regression setup, claiming that the data was slightly misrepresented in producing the results. He shows that if data outliers are handled using a robust regression strategy, Edwin D. Marberly and Raylene M. Pierce (2004) would not have been able to come up with the same conclusions.

Sandro C. Andrade et al. (2013) conducted a research paper to which they determined that the adage Sell in May and Go Away remains to be good investment advice since the effect prevails in the financial markets as well as others such as FX Carry Trade and Credit Risk. Sandro C. Andrade et al. (2013) showed that the Sell in May effect is pervasive in financial markets, as it is present across a wide variety of trading strategies that is able to reap returns for aggregate risk taking.

Lucey and Zhao (2008) analyze the Halloween effect in the U.S. stock market using monthly CRSP Stock File Capitalization Decile Indices. They conclude that evidence for the Halloween effect is weak, and attribute it more to the January effect.

Dzhabarov and Ziemba (2010) also include the Halloween effect in their comprehensive study of seasonal anomalies in the U.S. stock markets. In contrast to their findings for most other anomalies, they conclude that the Halloween effect continues to exist.

Jacobsen and Zhang (2012) use all available stock market data for the 108 countries that have a stock market. They conclude that investors who exploit the Halloween effect achieved higher risk-adjusted returns than buy-and-hold investors even after the publication of Bouman and Jacobsen's (2002) study. They deem the Halloween effect as "a strong market anomaly that has strengthened rather than weakened in the recent years." Jacobsen and Zhang (2012) also use price index data and argue that dividend payments do not affect their results if there is no clustering in a specific month. This may be problematic when looking at a specific type of trading strategy. If there is a model based on a buy-and-hold for the year, the investor would be gaining dividends on all 12 months when compared to the investor implementing the Halloween strategy where the investor only gains 6 months' worth of dividend returns. Zhang and Jacobsen (2012) omit

transaction costs in their simulations, which also adversely affects the buy-and-hold benchmark performance compared to the Halloween strategy.

Jacobsen and Visaltanachoti (2009) test the Halloween effect for U.S. sectors. They observe the effect for more than two-thirds of the sectors and industries studied, and find it can be exploited to improve an investor's risk-return trade-off in a sector rotation strategy.

In summary, the above papers have all done their fair share of research into the "Sell in May and go Away" strategy. There seems to still be a conflict within the schools of economics since some authors supports the validity of the investing strategy while others find that there is no room left for any profits to be made due to efficient market theory. However, all of these studies focus on the U.S. stock market and other international markets. Most studies except for Jacobsen and Visaltanachoti (2009) failed to look at if the effect exists in all U.S. industries. In addition, to the best of my knowledge no research in the literature has focused on the Sell in May and Go Away effect on different investment styles based on firm size and book-to-market.

Chapter 2
Methodology

In order for the test to be done there had to be consideration for a way to accurately test the matter. Two hypotheses were developed to understand the effect and if they are indeed significant. These hypotheses were tested with data that were collected off of the FAMA French website[3]; 6 size and book to market portfolios, 12 industry portfolios and risk free rate. The data used started on November 1926 to November 2015. All returns that were taken from the website were based off of monthly returns without ex-dividend calculations.

Small-cap investment styles feature smaller companies with higher volatility and higher returns, historically, they have outperformed big-cap funds. Big-cap funds are more developed companies with less volatility, they have dependent dividends and good company stability. In general, small-caps perform better post-recession periods and big-caps perform better during economic expansion and slow downs. When looking at the book to market, there are value or growth stocks. Value stocks carry less risk than growth stocks because they are usually found with larger, more-established companies, growth stocks, less-stable companies that may also experience severe price declines.

The range of data is adequate to provide a well populated sample size to test the hypothesis; however, we do not discount for the known shocks, such as the depressions and bubbles, and other anomalies that occurred within these 89 years. The statistical method used to calculate these key statistics take everything into account.

[3] The data collected was all from FAMA's website, http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. The 6 portfolio data set was from "6 Portfolios Formed on Size and Book-to-Market (2 x 3)", the 12 industry portfolio was from "12 Industry Portfolios" and the risk free data returns were from "Fama/French 3 Factors".

Hypothesis Test One[4]

H null: $\boldsymbol{\mu}_1 - \boldsymbol{\mu}_2 \leq 0$

H alt: $\boldsymbol{\mu}_1 - \boldsymbol{\mu}_2 > 0$

Hypothesis one tests if any of the portfolio types, such as specific industries or investment styles, actually exhibit a significant difference in returns to be classified as the Sell in May and Go Away effect. The test compares the returns of November through April to the returns of May through October. With each portfolio, a measure of average return, standard deviation from the mean, numeric count for the number of months, the 95% confidence interval of the difference of the two means were all computed.

If the calculations resulted that the lower limit of the confidence interval of the chosen type is above a value of zero, meaning that there is significant difference in returns, then it follows the alternate hypothesis and is able to be tested for hypothesis two. If the results are that the lower limit of confidence interval of the the selected type is below the value of zero, then the null hypothesis cannot be rejected. It can be said that with a 95% confidence interval that if the returns of November through April returns are higher than the rest of the year, then that specific type classifies as an anomaly exhibiter.

The same test was also conducted on the same set of data but the data was broken down into 30 year segments. This was able to provide a view of a smaller time frame, it also showed whether nor not the effect of Sell in May and Go Away was becoming stronger over the years or weaker.

[4] μ_1 is used to represent the average returns for November through April, μ_2 is used to represent the average returns for May through October.

Hypothesis Test Two[5]

H null: $\boldsymbol{\mu}_2 \geq R_f$

H alt: $\boldsymbol{\mu}_2 < R_f$

This hypothesis only applied to those tested types that already display the Sell in May and Go Away phenomenon. That is all tested types whose lower limit values were greater than zero in Test one.

The second hypothesis is used to test whether μ_2 is lower than the rate of free return or not; the rate of return which is earned through holding government backed assets. If μ_2 is lower than risk free returns, then it demonstrates that the selected type is actually making less money in the market compared to the return of government back money instruments. If this is the case, it is optimal to sell the current asset and invest in risk free assets. If the null hypothesis cannot be rejected, showing that the returns of the selected type are no less than the risk free rate from May through October, then there would be no reason to sell the stock in terms of strictly seeking returns.

To find out whether or not μ_2 was greater or less than the risk free rate we had to construct the confidence interval for μ_2- R_f. If the upper limits of the confidence interval were less than a value of zero, then it shows that μ_2 is generating significantly lower returns versus the risk free.

[5] μ_2 is used to represent the average returns of for May through October. Rf is the average risk free return over the selected data range.

Trading Portfolio Construction

After hypothesis testing was completed, the final phase of analysis was to create two trading portfolios for those types that exhibited the anomaly. The goal was to compare these two portfolios and determine which of the two would be able to provide better returns based off a stronger Sharpe ratio[6]. These two strategies were strictly data driven and did not account for transaction costs or taxes of the transactions that took place in the buy and sell May through October portfolio. Two different portfolios were developed. The first was a buy and hold portfolio where all assets are held until the end. Returns were calculated for every year[7] and then averaged. The standard deviations were calculated based of yearly returns. The risk free rate was subtracted from the portfolio average return and divided by the standard deviation. This gave us the Sharpe ratio for the portfolio.

The second portfolio bought and held stocks in November through April and then sold them in May and repurchased the next November. The same math was applied except that the returns of May through October were replaced by the respective returns of the risk free rate of those months.

[6] The optimal portfolio was decided based off of risk adjusted returns.
[7] The year calculations we used was from November through October. The annual returns over 89 years were those of every October.

Chapter 3
Data Analysis

This chapter is broken down into multiple sections. Each of these sections look at a different portfolio type or years. There are four sections for the 6 investment style portfolios: 89 Year Equal Weighted 6 investment style Portfolios, 89 Year Value Weighted 6 investment style Portfolios, 30 Years Equal Weighted 6 investment style Portfolios, and 30 Year Value Weighted 6 investment style Portfolios. The same is repeated for the 12 industry portfolio analysis. Then there is a section that looks at the data from the second hypothesis test and a section that looks at the last 30 years of hypothesis test 2. Finally, there are two sections that looks at the data of the trading portfolio that was created, 89-years overview, and a last 30 years' breakdown.

Within all of the tables there are constant key statistics that are observed. Return, which is the average return, in percentages, of all the months within the selected data range. Stdev, which is the sample standard deviation, in percentages, within all of the months within the selected data range. Upper limit and lower limit are based on the 95% confidence interval of the difference of the returns. ME stands for market equity and BM stands for book to market, ME1 being smaller than ME2.

89 Year Average Equal Weighted 6 Portfolios Based on Size and Book to Market

	Nov-Apr = 11,12,1,2,3,4		May-Oct = 5,6,7,8,9,10		95% Confidence Interval of the Difference of the Two Returns	
type	return	stdev	return	stdev	upper limit	lower limit
SMALL LoBM	1.699	7.622	0.252	8.736	2.430	0.463
ME1 BM2	2.072	6.969	0.745	8.415	2.254	0.400
SMALL HiBM	2.657	8.140	0.964	9.961	2.785	0.602
BIG LoBM	1.353	5.491	0.519	6.460	1.553	0.115
ME2 BM2	1.609	5.731	0.673	6.870	1.695	0.177
BIG HiBM	1.800	6.716	0.857	8.578	1.866	0.018

Table 1 Monthly Percentage Returns of Six Equal Weighted Portfolios

Table 1 clearly shows that from a raw comparison of returns the Sell in May and Go Away effect is apparent. The range of returns of November through April are from 1.353 to 2.657, which greater exceed the returns range of May through October, 0.252 to 0.964. The standard deviations of the November through April types are also all lower, which means they are less risky investments. The interval analysis of the November through April returns also show that there is a significant difference in returns when compared to the rest of the year. Lower limit values are well above the value of zero[8] this allows for the conclusion that these types of portfolios are generating higher returns overall in November through April.

[8] Refer to page 9 under hypothesis test one for more detailed explanation and meaning of lower limits being above or below the value of zero.

30 Years Average Equal Weighted 6 Portfolios Based on Size and Book to Market

		Nov-Apr = 11,12,1,2,3,4		May-Oct = 5,6,7,8,9,10	95% Confidence Interval of the Difference of the Two Returns	
Part a, Range 192611-195602						
type	return	stdev	return	stdev	upper limit	lower limit
SMALL LoBM	1.026	8.257	1.248	11.430	1.849	-2.293
ME1 BM2	1.553	9.121	1.602	12.239	2.194	-2.291
SMALL HiBM	2.424	11.348	2.088	15.464	3.154	-2.481
BIG LoBM	0.965	6.296	0.964	7.972	1.494	-1.491
ME2 BM2	1.222	7.699	1.313	9.618	1.719	-1.901
BIG HiBM	1.385	9.443	1.716	13.132	2.046	-2.706

Table 2 Monthly Percentage Returns of Six Equal Weighted Portfolios 1926-1956

		Nov-Apr = 11,12,1,2,3,4		May-Oct = 5,6,7,8,9,10	95% Confidence Interval of the Difference of the Two Returns	
Part b, Range 195603-198512						
type	return	stdev	return	stdev	upper limit	lower limit
SMALL LoBM	2.230	7.031	-0.049	6.703	3.706	0.852
ME1 BM2	2.504	6.149	0.347	5.364	3.356	0.958
SMALL HiBM	2.957	6.421	0.491	5.134	3.674	1.258
BIG LoBM	1.344	4.935	0.309	5.220	2.091	-0.020
ME2 BM2	1.634	4.419	0.512	4.313	2.029	0.215
BIG HiBM	2.177	4.933	0.462	4.631	2.709	0.721

Table 3 Monthly Percentage Returns of Six Equal Weighted Portfolios 1956-1985

		Nov-Apr = 11,12,1,2,3,4		May-Oct = 5,6,7,8,9,10	95% Confidence Interval of the Difference of the Two Returns	
Part c, Range 198601-201511						
type	return	stdev	return	stdev	upper limit	lower limit
SMALL LoBM	1.840	7.477	-0.442	7.199	3.803	0.761
ME1 BM2	2.157	4.937	0.285	5.723	2.980	0.765
SMALL HiBM	2.592	5.369	0.313	5.500	3.405	1.153
BIG LoBM	1.748	5.116	0.285	5.839	2.600	0.325
ME2 BM2	1.970	4.419	0.195	5.461	2.804	0.746
BIG HiBM	1.836	4.649	0.394	5.076	2.450	0.433

Table 4 Monthly Percentage Returns of Six Equal Weighted Portfolios 1986-2015

Table 2-4 is a look at the 89 years, broken down into 30 year segments. This method gives a better representation of where the effects are and in which direction it is moving over the years. Looking at the data we see that it is very different when compared to the 89 years' data analysis. In the 89 year, table 1, we saw that all portfolio types exhibited the effect, but here we see that in 1926-1956, there is no effect to be seen. However, throughout the years proceeding there seems to be the effect appearing in almost all the portfolio types in 1956-1985, and then all of them exhibiting the effect from 1986-2015. From this table we can see that there is a growth of the effect through the 89 years.

89 Year Average Value Weighted 6 Portfolios Based on Size and Book to Market

		Nov-Apr = 11,12,1,2,3,4		May-Oct = 5,6,7,8,9,10	95% Confidence Interval of the Difference of the Two Returns	
type	return	stdev	return	stdev	upper limit	lower limit
SMALL LoBM	1.529	6.872	0.436	8.167	1.999	0.188
ME1 BM2	1.858	6.265	0.689	7.671	2.009	0.328
SMALL HiBM	2.171	7.166	0.766	9.068	2.385	0.424
BIG LoBM	1.150	4.847	0.660	5.786	1.130	-0.150
ME2 BM2	1.270	5.203	0.671	6.197	1.286	-0.087
BIG HiBM	1.575	6.265	0.794	7.863	1.634	-0.072

Table 5 Monthly Percentage Returns of Six Value Weighted Portfolios

Table 5 clearly shows that from a raw comparison of returns the Sell in May and Go Away effect is apparent. The range of returns of November through April are from 1.150 to 2.171, which greater exceed the returns range of May through October, 0.436 to 0.794. The standard deviations of the November through April types are also all lower, which means they are less risky investments. The interval analysis of the November through April returns however show something different. The important numbers to note are those of the lower limit. Table 5 only shows that three types demonstrate the Sell in May and Go Away effect and they all seem to be smaller market cap type portfolios. The big portfolios all show no statistically significant sign of the effect even though they show better raw returns and standard deviations.

This finding shows that in a value weighted portfolio, the bigger market cap portfolio types have a stronger resistance to the Sell in May and Go Away effect than those of smaller portfolio types. For equal weighted portfolios since the smaller firms have equal weights as larger firms the portfolios exhibit performance closer to those of the smaller firms, which explains why all six equal weighted style portfolios show significant Sell in May and Go Away effect.

30 Years Average Value Weighted 6 Portfolios Based on Size and Book to Market

		Nov-Apr = 11,12,1,2,3,4		May-Oct = 5,6,7,8,9,10	95% Confidence Interval of the Difference of the Two Returns	
Part a, Range 192611-195602						
type	return	stdev	return	stdev	upper limit	lower limit
SMALL LoBM	0.993	7.780	1.276	10.366	1.621	-2.187
ME1 BM2	1.389	8.280	1.302	10.836	2.090	-1.917
SMALL HiBM	1.783	9.955	1.513	13.685	2.756	-2.216
BIG LoBM	0.870	5.847	1.053	7.389	1.202	-1.567
ME2 BM2	0.870	7.033	1.149	8.757	1.370	-1.929
BIG HiBM	1.261	8.824	1.546	11.922	1.893	-2.465

Table 6 Monthly Percentage Returns of Six Equal Weighted Portfolios 1926-1956

		Nov-Apr = 11,12,1,2,3,4		May-Oct = 5,6,7,8,9,10	95% Confidence Interval of the Difference of the Two Returns	
Part b, Range 195603-198512						
type	return	stdev	return	stdev	upper limit	lower limit
SMALL LoBM	1.994	6.447	0.089	6.432	3.243	0.567
ME1 BM2	2.209	5.388	0.443	5.061	2.851	0.680
SMALL HiBM	2.641	5.666	0.484	4.982	3.265	1.048
BIG LoBM	1.180	4.275	0.384	4.602	1.719	-0.127
ME2 BM2	1.392	3.994	0.522	3.882	1.687	0.051
BIG HiBM	1.945	4.480	0.490	4.297	2.367	0.543

Table 7 Monthly Percentage Returns of Six Equal Weighted Portfolios 1956-1985

		Nov-Apr = 11,12,1,2,3,4	May-Oct = 5,6,7,8,9,10		95% Confidence Interval of the Difference of the Two Returns	
Part c, Range 198601-201511						
type	return	stdev	return	stdev	upper limit	lower limit
SMALL LoBM	1.600	6.255	-0.058	7.084	3.043	0.274
ME1 BM2	1.976	4.464	0.323	5.738	2.718	0.588
SMALL HiBM	2.090	4.760	0.302	5.809	2.889	0.688
BIG LoBM	1.398	4.232	0.542	4.941	1.809	-0.098
ME2 BM2	1.547	3.952	0.340	4.805	2.119	0.296
BIG HiBM	1.519	4.438	0.345	4.903	2.143	0.205

Table 8 Monthly Percentage Returns of Six Equal Weighted Portfolios 1986-2015

In table 6-8 we see that it is very different when compared to the 89 years' data analysis, table 5. In the 89 year, table 5, we saw that only SMALL loBM, ME1BM2, and SMALL HiBM portfolio types exhibited the effect, but here we see that in 1926-1956, there is no effect to be seen. However, throughout the years proceeding there seems to be the effect appearing in almost all the portfolio types in 1956-1985, and then all of them exhibiting the effect from 1986-2015; expect for BIG LoBM. From this table we can see that there is a growth of the effect through the 89 years; however, there is something to note, although for some portfolios there is an effect after the 1956 period, the overall dominance of the non-effect period dominates the data in an 89 year look. This can be further investigated.

89 Year Average Equal Weighted 12 Portfolios Based On United States Industries

	Nov-Apr = 11,12,1,2,3,4		May-Oct = 5,6,7,8,9,10		95% Confidence Interval of the Difference of the Two Returns	
type	return	stdev	return	stdev	upper limit	lower limit
NoDur	1.767	6.097	0.566	6.881	1.980	0.421
Durbl	1.941	8.122	0.459	9.523	2.544	0.420
Manuf	2.126	7.126	0.505	8.613	2.570	0.673
Enrgy	1.874	7.656	0.782	9.238	2.110	0.074
Chems	1.960	6.251	0.545	7.438	2.238	0.590
BusEq	2.411	8.732	0.462	9.063	3.017	0.881
Telcm	1.943	7.155	0.557	6.889	2.229	0.543
Utils	1.134	5.777	1.118	7.269	0.804	-0.772
Shops	1.817	6.786	0.581	7.724	2.108	0.364
Hlth	2.128	6.767	0.631	7.232	2.337	0.657
Money	1.802	6.572	0.755	7.811	1.914	0.182
Other	2.137	7.556	0.411	8.967	2.720	0.731

Table 9 Monthly Percentage Returns of Twelve Equal Weighted Portfolios

Table 9 shows the range of returns of November through April are from 1.134 to 2.411, which greater exceed the returns range of May through October, 0.252 to 0.964. The standard deviations of the November through April types are mostly lower, with the exception of Telcm which is 7.155 in November through April and 6.889 in May through October. The interval analysis of the November through April returns also show that there is a significant difference in returns when compared to the rest of the year. Lower limit values are well above the value of zero with the exception of Utils type, which is lower and does not exhibit the effect. This is consistent with the results of Table 1. In an equal weighted situation, the majority of portfolio types will exhibit the effect.

30 Years Average Equal Weighted 12 Portfolios Based On United States Industries

		Nov-Apr = 11,12,1,2,3,4		May-Oct = 5,6,7,8,9,10	95% Confidence Interval of the Difference of the Two Returns	
Part a, Range 192611-195602						
type	return	stdev	return	stdev	upper limit	lower limit
NoDur	1.214	7.524	1.365	9.505	1.630	-1.932
Durbl	1.515	10.526	1.504	13.749	2.554	-2.533
Manuf	1.748	9.347	1.587	12.367	2.438	-2.116
Enrgy	1.805	8.867	1.481	11.436	2.450	-1.802
Chems	1.331	7.736	1.502	10.088	1.697	-2.038
BusEq	1.853	9.311	1.399	11.288	2.604	-1.696
Telcm	0.894	6.307	1.145	7.341	1.171	-1.673
Utils	0.933	8.777	1.748	11.482	1.307	-2.939
Shops	1.091	8.081	1.619	10.623	1.432	-2.489
Hlth	1.316	6.293	0.857	8.095	1.966	-1.047
Money	1.538	8.905	1.567	11.773	2.139	-2.198
Other	1.806	10.030	1.335	12.998	2.883	-1.941

Table 10 Monthly Percentage Returns of Twelve Equal Weighted Portfolios 1926-1956

		Nov-Apr = 11,12,1,2,3,4		May-Oct = 5,6,7,8,9,10	95% Confidence Interval of the Difference of the Two Returns	
Part b, Range 195603-198512						
type	return	stdev	return	stdev	upper limit	lower limit
NoDur	2.227	5.671	0.409	4.803	2.910	0.726
Durbl	2.307	6.899	0.260	5.865	3.377	0.717
Manuf	2.376	6.027	0.091	5.288	3.463	1.107
Enrgy	1.985	6.615	0.667	6.677	2.699	-0.063
Chems	2.296	5.535	0.326	5.036	3.069	0.871
BusEq	2.860	7.969	-0.070	7.453	4.533	1.327
Telcm	2.704	6.228	0.410	5.512	3.516	1.072
Utils	1.343	3.621	0.742	3.527	1.343	-0.142
Shops	2.260	6.154	0.384	5.305	3.070	0.683
Hlth	2.586	6.075	0.600	6.056	3.246	0.725
Money	2.145	5.629	0.362	4.859	2.876	0.691
Other	2.501	6.387	0.234	5.776	3.532	1.002

Table 11 Monthly Percentage Returns of Twelve Equal Weighted Portfolios 1956-1985

		Nov-Apr = 11,12,1,2,3,4	May-Oct = 5,6,7,8,9,10		95% Confidence Interval of the Difference of the Two Returns	
Part c, Range 198601-201511						
type	return	stdev	return	stdev	upper limit	lower limit
NoDur	1.858	4.723	-0.076	5.249	2.969	0.900
Durbl	2.000	6.272	-0.388	6.839	3.747	1.028
Manuf	2.253	5.346	-0.163	6.315	3.629	1.204
Enrgy	1.833	7.314	0.198	8.934	3.326	-0.057
Chems	2.250	5.123	-0.191	6.112	3.610	1.273
BusEq	2.520	8.833	0.058	7.882	4.197	0.728
Telcm	2.228	8.553	0.115	7.585	3.788	0.439
Utils	1.127	3.164	0.864	3.691	0.975	-0.449
Shops	2.097	5.851	-0.260	6.015	3.587	1.128
Hlth	2.479	7.734	0.436	7.391	3.611	0.477
Money	1.725	4.307	0.335	4.451	2.297	0.482
Other	2.103	5.460	-0.336	6.118	3.640	1.237

Table 12 Monthly Percentage Returns of Twelve Equal Weighted Portfolios 1986-2015

Looking at the data we see that it is very different when compared to the 89 years' data analysis. In the 89 year, table 9, we saw that almost all portfolio types exhibited the effect, but here we see that in 1926-1956, there is no effect to be seen. However, throughout the years proceeding there seems to be the effect appearing in almost all the portfolio types in 1956-1985, and then most of them exhibiting the effect from 1986-2015. From this table we can see that there is a growth of the effect through the 89 years. Overall, the returns of November through April and May through October are a lot closer in 1926-1956 than the rest of the years.

89 Year Average Value Weighted 12 Portfolios Based On United States Industries

		Nov-Apr = 11,12,1,2,3,4		May-Oct = 5,6,7,8,9,10	95% Confidence Interval of the Difference of the Two Returns	
type	return	stdev	return	stdev	upper limit	lower limit
NoDur	1.207	4.283	0.756	4.940	1.005	-0.104
Durbl	1.525	7.419	0.642	8.004	1.809	-0.043
Manuf	1.573	6.148	0.490	7.236	1.888	0.277
Enrgy	1.344	5.973	0.715	6.208	1.360	-0.102
Chems	1.378	5.410	0.670	6.092	1.400	0.017
BusEq	1.640	7.251	0.585	7.812	1.959	0.151
Telcm	1.088	4.380	0.632	4.842	1.010	-0.097
Utils	0.894	5.006	0.853	6.083	0.709	-0.628
Shops	1.316	5.521	0.724	6.185	1.295	-0.112
Hlth	1.412	5.029	0.775	6.124	1.310	-0.035
Money	1.353	5.963	0.691	7.616	1.483	-0.159
Other	1.379	5.785	0.299	7.304	1.870	0.289

Table 13 Monthly Percentage Returns of Twelve Value Weighted Portfolios

Unlike the other tables, in table 13 most of the portfolio types do not have lower limits above the value of zero. Most of these portfolio types do not exhibit the effect, only Manuf, Chems, BusEq, and Other show a sign. It is consistent with table 5. There we saw that most of the big portfolio types did not exhibit the effect, conversely, this is transferred over when we look into the industries. The reason why most industry portfolios do not exhibit the effect is that large firms have much higher weights in value weighted portfolios. In terms of other statistic, the November through April returns and standard deviations are still better when compared to the rest of the year.

30 Years Average Value Weighted 12 Portfolios Based On United States Industries

		Nov-Apr = 11,12,1,2,3,4		May-Oct = 5,6,7,8,9,10	95% Confidence Interval of the Difference of the Two Returns	
Part a, Range 192611-195602						
type	return	stdev	return	stdev	upper limit	lower limit
NoDur	0.743	4.835	0.717	5.858	1.142	-1.090
Durbl	1.200	9.775	1.813	10.658	1.512	-2.737
Manuf	1.095	8.259	1.329	9.869	1.657	-2.124
Enrgy	1.131	7.268	1.048	7.632	1.631	-1.465
Chems	1.234	7.113	1.351	8.058	1.462	-1.696
BusEq	1.482	8.789	1.130	10.156	2.325	-1.621
Telcm	0.536	4.153	0.947	5.282	0.576	-1.398
Utils	0.687	6.835	1.090	8.812	1.235	-2.041
Shops	0.647	6.738	1.282	7.758	0.874	-2.145
Hlth	1.180	5.902	0.702	7.572	1.888	-0.932
Money	1.149	7.521	1.060	10.622	2.001	-1.822
Other	0.791	7.115	0.882	9.899	1.700	-1.882

Table 14 Monthly Percentage Returns of Twelve Value Weighted Portfolios 1926-1956

		Nov-Apr = 11,12,1,2,3,4		May-Oct = 5,6,7,8,9,10	95% Confidence Interval of the Difference of the Two Returns	
Part b, Range 195603-198512						
type	return	stdev	return	stdev	upper limit	lower limit
NoDur	1.568	4.114	0.689	4.350	1.758	-0.001
Durbl	1.197	5.192	0.560	4.979	1.693	-0.420
Manuf	1.540	4.821	0.059	4.764	2.477	0.485
Enrgy	1.246	5.283	0.766	5.072	1.556	-0.595
Chems	1.228	4.440	0.317	4.635	1.854	-0.031
BusEq	1.776	5.576	0.217	5.470	2.706	0.411
Telcm	1.578	3.767	0.357	3.855	2.012	0.428
Utils	1.067	3.821	0.706	3.925	1.165	-0.444
Shops	1.563	5.097	0.607	5.099	2.014	-0.104
Hlth	1.744	4.643	0.684	5.559	2.123	-0.005
Money	1.477	4.674	0.545	5.229	1.962	-0.098
Other	1.782	5.320	0.089	5.551	2.823	0.564

Table 15 Monthly Percentage Returns of Twelve Value Weighted Portfolios 1956-1985

		Nov-Apr = 11,12,1,2,3,4	May-Oct = 5,6,7,8,9,10		95% Confidence Interval of the Difference of the Two Returns	
Part c, Range 198601-201511						
type	return	stdev	return	stdev	upper limit	lower limit
NoDur	1.309	3.795	0.863	4.467	1.305	-0.413
Durbl	2.174	6.486	-0.447	7.158	4.036	1.206
Manuf	2.080	4.643	0.081	5.993	3.110	0.888
Enrgy	1.653	5.117	0.331	5.602	2.433	0.210
Chems	1.671	4.177	0.342	4.922	2.275	0.384
BusEq	1.662	7.027	0.408	7.038	2.712	-0.202
Telcm	1.151	5.053	0.591	5.235	1.626	-0.506
Utils	0.928	3.720	0.764	4.226	0.989	-0.660
Shops	1.736	4.411	0.283	5.299	2.463	0.443
Hlth	1.314	4.398	0.939	4.923	1.342	-0.592
Money	1.434	5.316	0.470	5.800	2.116	-0.189
Other	1.562	4.582	-0.074	5.544	2.689	0.582

Table 16 Monthly Percentage Returns of Twelve Value Weighted Portfolios 1986-2015

Table 14-16 has no identifiable patterns. Table 14-16 is consistent with all previous 30 year tables in that all portfolio types in 1926-1956 do not exhibit the Sell in May and Go Away effect. After 1956, the data shows that there is no growth in a specific portfolio type. In 1956, some portfolios such as Telcm show that they exhibit the effect but the proceeding years it shows that the effect has disappeared. BusEq, shows that in the first 30 years, there is no sign, but the second 30 years that there is an effect, then it disappears again, but over all in the 89 years it does exhibit the effect. Telcm is the same pattern but does not exhibit the effect overall. It is interesting to note that Telcm, Utils, Shops, and Other in part a, have lower average returns in November through April. Overall, the returns of November through April and May through October are a lot closer in 1926-1956 than the rest of the years. The only thing we can see is that, the portfolio types who in table 13, do not show the effect also have multiple years zero effect.

Because this is a value weighted portfolio some of the changes and findings may be attributed to new companies being added into the portfolio, or a shift in the way the portfolio is weighted.

Hypothesis Test 2

		May-Oct = 5,6,7,8,9,10	95% Confidence Interval of the Difference of the Two Returns	
Average equal weight				
type	return [9]	stdev	upper limit	lower limit
SMALL LoBM	-0.032	8.766	0.713	-0.777
ME1 BM2	0.460	8.441	1.178	-0.257
SMALL HiBM	0.680	9.986	1.529	-0.169
BIG LoBM	0.235	6.479	0.786	-0.316
ME2 BM2	0.389	6.889	0.975	-0.196
BIG HiBM	0.573	8.597	1.304	-0.158
Average value weight				
SMALL LoBM	0.152	8.194	0.848	-0.545
ME1 BM2	0.405	7.693	1.059	-0.249
SMALL HiBM	0.482	9.089	1.255	-0.290
Average equal weight				
NoDur	0.282	6.912	0.869	-0.306
Durbl	0.175	9.553	0.987	-0.637
Manuf	0.221	8.641	0.955	-0.514
Enrgy	0.498	9.255	1.285	-0.289
Chems	0.261	7.465	0.896	-0.373
BusEq	0.178	9.092	0.951	-0.595
Telcm	0.273	6.915	0.860	-0.315
Shops	0.297	7.755	0.956	-0.363
Hlth	0.347	7.252	0.963	-0.270
Money	0.471	7.833	1.136	-0.195
Other	0.127	8.992	0.892	-0.637
Average value weight				
Manuf	0.206	7.261	0.823	-0.412
Chems	0.386	6.115	0.905	-0.134
BusEq	0.301	7.836	0.967	-0.365
Other	0.015	7.325	0.638	-0.608

Table 17 Average Returns After Risk Free of all May Through October Portfolios

[9] Returns for all hypothesis test values are the average difference of May through October and risk free rate.

Table 17 shows all of the portfolio types that have passed the first hypothesis test, they have followed the alternate hypothesis in which their November through April returns are greater than May through Octobers. These results are all of the statistics for the May through October portfolios. Here they were tested to see if their returns would be significantly lower than that of the risk free returns.

The data shows that although there are significant differences in returns when it came to November through April versus the returns of May through October, the portfolios of May through October still were generating higher returns when compared to the risk free returns. The interval calculations show that all the upper limits are well above the value of zero; the range of upper limits were 0.638 to 1.529.

All tested types cannot reject the null hypothesis, which indicates that it is not more profitable to sell the portfolio in May. The assets should not be sold to purchase risk free assets.

Hypothesis Test 2 Last 30 Years

		May-Oct = 5,6,7,8,9,10	95% Confidence Interval of the Difference of the Two Returns	
Average equal weight				
type	return	stdev	upper limit	lower limit
SMALL LoBM	-0.709	7.190	0.348	-1.767
ME1 BM2	0.019	5.723	0.860	-0.823
SMALL HiBM	0.052	5.497	0.860	-0.757
BIG LoBM	0.035	5.831	0.893	-0.822
ME2 BM2	-0.061	5.448	0.740	-0.863
BIG HiBM	0.139	5.060	0.884	-0.605
Average value weight				
SMALL LoBM	-0.326	7.072	0.714	-1.366
ME1 BM2	0.067	5.736	0.910	-0.777
SMALL HiBM	0.042	5.800	0.895	-0.812
Average equal weight				
NoDur	-0.316	5.274	0.460	-1.091
Durbl	-0.662	6.831	0.343	-1.667
Manuf	-0.435	6.306	0.493	-1.362
Enrgy	-0.064	8.883	1.242	-1.371
Chems	-0.447	6.108	0.452	-1.345
BusEq	-0.230	7.871	0.928	-1.387
Telcm	-0.147	7.571	0.966	-1.261
Shops	-0.494	6.037	0.394	-1.382
Hlth	0.183	7.373	1.267	-0.902
Money	0.079	4.457	0.735	-0.577
Other	-0.597	6.115	0.302	-1.497
Average value weight				
Manuf	-0.190	5.976	0.689	-1.069
Chems	0.093	4.920	0.816	-0.631
BusEq	0.099	7.027	1.132	-0.935
Other	-0.337	5.533	0.477	-1.151

Table 18 Average Returns After Risk Free of all May Through October Portfolios

Table 18 shows that all values of the upper limit are above the value of zero. It is consistent with the findings in the 89-year hypothesis test. The last 30 years still exhibit no signs of arbitrage; therefore, all portfolio types should not be sold in May through October.

Portfolio and Trading Strategy

			Buy and hold			Sell in May
Average equal weight						
type	return	stdev	sharpe	return	stdev	sharpe
SMALL LoBM	12.253	30.942	0.284	11.768	20.649	0.402
ME1 BM2	17.879	28.765	0.501	14.104	18.588	0.572
SMALL HiBM	23.062	33.261	0.589	18.003	21.891	0.664
BIG LoBM	11.549	20.540	0.393	9.475	14.843	0.404
ME2 BM2	14.194	21.387	0.501	11.109	14.816	0.515
BIG HiBM	15.969	23.679	0.528	12.319	17.250	0.513
Average value weight						
SMALL LoBM	12.237	28.167	0.311	10.666	18.953	0.379
ME1 BM2	15.859	24.464	0.506	12.715	16.735	0.552
SMALL HiBM	17.867	26.395	0.545	14.793	19.321	0.586
Average equal weight						
NoDur	14.968	25.262	0.455	12.168	16.551	0.525
Durbl	14.983	31.727	0.363	13.216	21.139	0.461
Manuf	16.429	28.260	0.458	14.505	18.685	0.590
Enrgy	17.311	33.649	0.411	12.887	20.490	0.459
Chems	15.636	24.635	0.494	13.532	17.397	0.578
BusEq	18.883	36.288	0.425	16.620	24.736	0.531
Telcm	17.518	32.724	0.429	13.877	22.131	0.470
Shops	15.750	29.306	0.419	12.828	20.352	0.460
Hlth	18.429	32.026	0.467	14.875	21.573	0.528
Money	16.639	28.143	0.468	12.586	19.096	0.477
Other	15.984	30.207	0.414	14.775	21.332	0.530
Average value weight						
Manuf	12.567	21.834	0.416	10.833	15.619	0.471
Chems	12.663	20.216	0.454	9.682	14.880	0.417
BusEq	13.872	26.594	0.391	11.477	19.771	0.405
Other	10.301	22.405	0.305	9.900	16.757	0.383

Table 19 Comparison of the Portfolios' Performances Based on the Annual Returns of the 89 Year Period

In Table 19 we look at the results of the two trading portfolios. The buy and hold portfolio demonstrates a strong performance in terms of portfolio returns but is accompanied by the high levels of risk. The range of returns of the buy and hold portfolio, 10.301 to 23.062, out performs Sell in May. The Sell in May portfolio is a lot weaker when looking at the returns as the portfolio type with the highest return is only 18.003 for when the return for the hold is 23.062. The volatility is also a lot lower, with a minimum of 14.880 compared to holding's 20.216, which is a good thing for this portfolio when it comes to looking at risk adjusted returns. This is to be expected because we are losing six-month worth of asset holdings and replacing them with risk free assets. Table 10 also has results for the Sharpe ratios for each portfolio type. Overall, almost all of the Sell in May portfolios have higher Sharpe ratios[10] when compared to the holding portfolio. This shows that using the trading strategy of buying in November selling in May and repurchasing in November provides better risk adjusted returns when compared to a buy and hold strategy.

[10] When looking at Sharpe ratios, the higher the ratio the better; the max is 1 and the min is 0. The higher the ratio is, the more return you get for every increment of risk you take.

Portfolios and Trading Strategy Last 30 Years

			Buy and hold			Sell in May
			Average equal weight			
type	return	stdev	sharpe	return	stdev	sharpe
SMALL LoBM	8.904	27.941	0.184	10.908	15.374	0.465
ME1 BM2	16.249	22.648	0.552	13.564	11.560	0.848
SMALL HiBM	19.897	25.278	0.638	16.549	13.263	0.964
BIG LoBM	13.268	18.897	0.503	11.056	11.416	0.639
ME2 BM2	14.363	18.468	0.574	12.517	9.400	0.932
BIG HiBM	14.867	18.855	0.589	11.546	9.930	0.784
			Average value weight			
SMALL LoBM	9.522	22.987	0.251	9.839	14.105	0.431
ME1 BM2	14.981	19.353	0.580	12.550	11.121	0.791
SMALL HiBM	15.632	20.505	0.579	13.422	13.166	0.734
			Average equal weight			
NoDur	12.102	19.823	0.421	11.868	11.278	0.719
Durbl	11.116	26.703	0.276	12.590	15.362	0.575
Manuf	13.841	22.825	0.442	14.283	11.996	0.877
Enrgy	13.200	31.617	0.299	11.144	18.341	0.403
Chems	13.493	20.434	0.476	14.507	12.395	0.867
BusEq	17.606	37.338	0.371	15.647	21.533	0.552
Telcm	18.844	42.870	0.352	14.239	21.980	0.477
Shops	12.723	24.655	0.364	13.357	13.784	0.696
Hlth	20.853	40.585	0.421	15.742	22.419	0.535
Money	14.648	22.768	0.478	11.217	13.448	0.555
Other	11.882	23.542	0.345	13.320	12.508	0.764
			Average value weight			
Manuf	13.817	17.494	0.575	13.237	9.852	0.962
Chems	12.847	13.906	0.654	10.768	10.436	0.672
BusEq	13.575	25.380	0.387	10.605	16.526	0.414
Other	9.797	18.240	0.331	9.944	10.891	0.568

Table 20 Comparison of the Portfolios' Performances Based on the Annual Returns of the Last 30 Years

The last 30 years do not show that the buy and hold portfolio is stronger than the Sell in May portfolio. The Sharpe ratios for the last 30 years are slightly stronger in comparison throughout some portfolios. It is consistent with the data from the 89-years overview of each portfolio, Sell in May portfolios are still stronger on a risk adjusted basis.

Chapter 4
Conclusion

In the end, our research was very comprehensive and supported the theory of Sell in May and Go Away. It showed that the effect is still strong in the United States markets however the data still shows that arbitrage is unlikely; this research supports the theory of market efficiency.

89 Year Overall

Our research found that the Sell in May and Go Away effect appears in all of the portfolio categories tested, average equal weight 6 investment style portfolios, average value weight 6 investment style portfolios, average equal weight 12 industry portfolios, average value weight 12 industry portfolios. The effect is more prominent in the equal weighted portfolios than the value weighted portfolios of both 6 investment style portfolios and 12 industries due to the way the portfolios are set up. Within the equal weighted portfolios, every portfolio type was exhibiting the Sell in May and Go Away effect except for Utils. Within the 6 value weighted investment style portfolios, the only portfolio types that exhibited the effect were smaller market cap investments, which was also reflected when looking at the industry portfolio types.

30 Years Break Down

Our research also showed that the effect of Sell in May and Go Away was a growing effect over the 89 years. When looking at the 89-year statistic it was clear that the effect was there, but only when looking at the 30-year break downs can we see that in the first two 30-year break downs, there was no effect to be seen in any portfolio type, equal weighted or value weighted. In the following 30 years we see that the effect begins to appear in most portfolio types. This is true for

the 12 industry equal weighted, 6 equal weighted investment style portfolios, and smaller value weighted investment style portfolios; however, even though in the more recent 60 years, the larger investment style value weighted portfolio types demonstrate the effect, over the entire 89 years, the effect is nonexistent and overpowered by the first 30 years. The 12 industry value weight portfolio has no patterns that can be distinguished, the first 30 years is non exhibiting, but the proceeding 60 years show different portfolio types exhibiting the effect and then not exhibiting it.

Hypothesis Two

The research has also found that within all of the portfolio types that show the effect, none of the types were able to underperform the returns of the risk free rate. All returns in May through October were not significantly lower than the risk free rate. This confirms that there are no arbitrage opportunities even though there is a difference in terms of returns in November through April versus May through October, supporting efficient hypothesis theory.

Portfolio and Trading Strategy

Our constructed trading portfolios show that a Sell in May strategy[11] is optimal compared to the buy and hold portfolio when it comes to risk adjusted returns. All Sharpe ratios for the Sell in May portfolios are higher than those of the buy and hold portfolios expect for, BIG HiBM. Assets bought in November should be held till May and then sold for risk free assets, then repurchased in the following month of November.

[11] Only portfolio types that passed the first hypothesis test were considered in the trading strategy. We only wanted to see if the May through October returns in portfolio types that show the effect were better when compared to the risk free rate in a risk adjusted bases.

Chapter 5
Future Inquiry

After all is done and said there is still much more to be done for this specific stock market trading anomaly. It is apparent that there is somewhat of an effect; it shows that there are significant differences in average returns when comparing November to April returns versus the May to October returns. In the future the data analysis should be a lot more complex and in depth. The research that was conducted here is simplistic in nature only because we were exploring a new side of the investment styles and industries and found many interesting results. Also the scope of the search was not entirely comprehensive because the data set was only from Fama French portfolios and consisted of 89 years of only the United States stock, market.

For future analysis there should definitely be more emphasis on the amount of data that is taken into account. With more data and more varied data, that is looking at different indexes and markets and sub categories within different countries, it will shed more light on the trading anomaly. With these more in-depth analyses on the investment styles and industries maybe there will be a useful comparison or correlation that may follow, or even better it may show a remarkable trading behavior that only exist in some countries. It may show that the anomaly is strictly behaviorally driven or something even more compelling.

For future analysis a good look into the investment styles and industries with a lot more data would be better for the outcomes but there also has to be an emphasis on the data range. It would also be wise to look for the effect in specific time periods such as strictly looking at depression periods and high grow periods; looking into different periods of the economy may allow for other insights and strategies.

The trading strategy provided was very bare bone. It used historical data to provide us with the average returns and standard deviation of each type of portfolio. It also does not account for trading costs. Furthermore, different strategies can also be developed instead of being restrained to testing two types of portfolios, hold or buy and sell.

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