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The Role of Size-Related Seasonal Anomalies in Today's Stock Market

A thesis submitted in partial fulfillment of the
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By

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Abstract:

This analysis determines if seasonal strategies as they were observed in the past are currently viable or if the abnormal returns once generated by these strategies have dissipated or reversed due to overuse by investors and market efficiency. The purpose of this analysis is to provide insight into investor behavior within the realm of seasonality, and to use this seasonal behavior to determine if a successful investment strategy can be devised by "timing the market". In order to address this problem, three separate investment strategies are presented and regressions are run against the market using the S&P 600 index, with a contrarian twist: the strategies are simulated in the reverse of the conventional manner in which they were originally presented.

1. Introduction

The initial hypothesis of this study maintains a contrarian approach to the stock market, assumes investors do not always exhibit rational behavior, and asserts that if one approaches seasonal trends from the opposite perspective of the general investing public, then abnormal returns will be generated.

It is no mystery that the goal of almost every investor is to uncover a winning strategy that beats the market, and even better, a strategy that beats the market and is useful for a number of years. Over the past three decades, there has been a significant amount of research regarding timing the stock market. Can an investor achieve a winning strategy by simply following seasonal trends? Should an investor buy stocks at the beginning of January such that the investor receives an added risk premium? If so, should an investor narrow this investment to small cap stocks? Would it be wise to "sell in May and go away?" These questions are addressed through previous publications and this study. This analysis concludes that January Effect and May Effect index returns are no different than any other month and therefore are not observed as stock market anomalies over the study period; however, certain contrarian seasonal strategies do prove to be profitable when taking firm size into account.

Before launching into the details and results of this study, it is first important to note the financial concepts upon which this study is based. These concepts include seasonality, the size effect, and contrarianism.

1.2 Seasonality

Seasonality is a well-tested phenomenon in the stock market and overall economy. The most prominent seasonal anomaly is known as the January Effect. Donald B. Keim found in 1981 that abnormally high returns occurred over several decades in the month of January, and historically no other month has shown this magnitude of profitability (20). Most researchers contend the reasoning behind this is the outperformance of small cap stocks and also the buying back of stocks which were sold in December in order to create a loss to reduce capital gains taxes. The month of May has received a large amount of attention as well, but in the opposite light of January. May is said to be the month that executives cash in their vacation hours and take their families out of town, selling their portfolios first. Such actions, when committed on the large scale, drive down stock prices and thus lower portfolio profitability. The idea of the executive summer vacation has caused a market-wide trend of "selling in May and going away."

While tax season is by no means a natural season, it does occur every year and according to investor George Muzea, plays a large role in market behavior. Muzea, a contrarian investor for many years, published a book called *The Vital Few Versus the Trivial Many* in 2005. As Muzea points out in his book, individuals have until December 31 to offset losses with gains for taxation purposes, which as indicated before, is part of the reason for the January Effect. What most people do not realize, Muzea states, is that the mutual fund industry, by law, balances gains and losses by October 31 every year (177). Any rational investor would know that whenever there is a trend of mass buying and selling, there is an opportunity for arbitrage. This period represents the third seasonality pattern examined in this report. These three seasonal trends

are under scrutiny in this paper for determining their current role in the stock market and if they can be used for maintaining abnormal profits.

1.3 The Size Effect

Because this study incorporates the size effect into each strategy presented, it is important to note that there has been much debate about why there is a difference in returns between large cap and small cap stocks. Irwin Friend and Larry Lang, in their paper, "The Size Effect on Stock Returns: It is Simply a Risk Effect Not Adequately Reflected by the Usual Measures" studied the reasoning behind the size effect and to the best of their ability, the answer was twofold. First, small cap stock betas have an upward bias due to the smaller volume at which they are traded. In this sense, the risk of small cap stocks is overstated due to lack of trading data. Second, the January Effect amplifies the bias because most of the size effect that is observable during a fiscal year occurs during the month of January (Friend, Lang 2-3).

Friend and Lang organized NYSE stocks according to their quality (A+ through C) based on stability and growth. Quantitative weights were assigned based on the number of times annual earnings increased and decreased over the 20-year study period. These rankings gave Friend and Lang numerical rankings of 1 through 7 for each security. Running regressions on the significance of a stock's quality indicated a negative relationship between quality and size of the firm. Firm size then plays a major role in analyzing a security's risk (Friend, Lang 4). We can use this knowledge in order to formulate a small-cap strategy that should theoretically produce higher returns if the size effect holds true.

1.4 Contrarianism

To go against the grain is the prevailing ideology of a contrarian's path to profitability. No investor wants to admit that he didn't sell at the top; however, contrarians believe that during a bubble, this mentality is what continues to drive asset prices higher and ultimately leads to the crash during which prices are revalued at lower prices according to supply and demand. A contrarian, through various indicators, understands when a bubble is forming and either sells before the imminent burst, or buys when the masses are selling. Most contrarians would likely report that this is the most consistently profitable way of conducting investments as well as the most rational. A fundamental argument of a contrarian would be that while stock momentum surely works, there comes a time when market efficiency reverts overpriced assets back to their mean and this process of efficient re-pricing creates an opportunity for capital gains.

1.5 Relating these three concepts

In order to analyze whether seasonal and size trends are still present in the market, three investment strategies are presented with a contrarian twist. Further details about each strategy are found in their respective sections in this paper. S&P 600 daily individual close stock prices are used for the period 2000-20010 in order to test each contrarian seasonal strategy against the index. The S&P 600 is a small capitalization, market value weighted index that includes 600 of the smallest public firms' securities in the United States. This particular index was chosen due to the fact that historical research has determined that much of the abnormal seasonal January returns are traced back to small cap stocks, as investors are compensated for the added risk of putting money into a small firm. In this sense, while each strategy determines if a specific seasonal trend still exists, it concurrently indicates if small cap stocks continue to yield abnormal returns by virtue of being small cap.

This particular date range (2000-2009) is utilized for a couple of reasons: There is a vast amount of empirical evidence supporting the January Effect through the 1980s, but no scholarly publications were found that supported the January Effect in recent years. The presence of seasonality was strong in the past, but this study is not concerned with the market decades ago; instead, this study uses more current information in order to provide a snapshot of the market now. In addition, this date range includes two massive market bubbles – the tech stock boom and crash in the early 2000s and the more recent housing market crisis. If it is true that seasonality is simply a stone in the wall of finance, then seasonal anomalies should present themselves every year, including years of boom and bust.

1.6 Methodology

The daily individual stock prices for all stocks in the S&P 600 were exported out of Compustat and imported into Microsoft Excel. The respective buy and sell prices for each strategy were extracted into separate spreadsheets. For example, the contrarian sell in May and stay strategy uses June 1 as the purchase date and August 31 as the sell date, so for this particular strategy, June 1 and August 31 prices for each stock are segregated. The individual stocks are then ranked by their market values on the purchase date and broken into ten groups based on their market values. Each group contains 10% (60 stocks) of the index. Group 1 includes the stocks with the lowest market values, and Group 10 includes the stocks with the highest market values in the index. Each decile can be considered a stand-alone portfolio, and all portfolios are rebalanced at the beginning of each holding period, such that Group 1 always contains the lowest market value stocks at the beginning of every holding period and Group 10 always

contains the highest market value stocks at the beginning of every holding period. A holding period return is calculated for each year and group.

This study is only interested in the decile with the smallest market capitalization stocks and the decile with the largest market capitalization stocks over the strategies, so only results for Group 1 and Group 10 for each strategy are presented. It is important to note that Group 10 does not represent large cap stocks, as it is still a small cap index, though it does include the largest of the small cap stocks. All investment strategies in this study are applied to Group 1 and Group 10 portfolios for comparison purposes; this yields two sets of returns for each strategy. A portfolio standard deviation is generated for each group and these standard deviations are used for risk-to-return measurements, which are compared against the market. Sharpe ratios and Treynor ratios are calculated for Group 1 and Group 10 for all study years. These ratios indicate whether or not the portfolios are reasonable investments when taking risk into account.

All returns are compared to the index holding period return, using the entire index as a benchmark, i.e., comparing the strategy returns to the returns on the full index. Because all strategies presented in this paper can only be performed one time per year, a table of simple holding period returns is presented for each strategy as well as a table that includes the Sharpe and Treynor ratios of each portfolio for every year, which are used to compare each portfolio's risk-adjusted return to the market's risk-adjusted return. A regression is then run with the strategy returns as the y-variable and S&P 600 index returns as the x-variable. The regressions are used to test whether or not each portfolio's returns are statistically different from the S&P

600 index returns. Each of the following sections gives information regarding past research on seasonal trends, expands on the methodology of the strategy, and provides the strategy results.

2. Problems & Limitations

Along with most statistical market analyses, this study faces a number of limitations. First and foremost, the amount of daily data required in order to perform a test on timing the market is enormous. In order to ensure the accuracy of timing and the breadth of securities examined, the number of years tested are in turn negotiated downward. While this short date range is extremely valuable, it limits the amount of data points that are used as inputs for regressions. In this sense, it is important to note that the regression results could be substantially different if more data points (more years) were included.

Because of the short time period, the regressions that are presented for each strategy cannot be viewed as ironclad. While this is an unfortunate fact, the specific time frame used for this study (2000-2009) provides an upside to the study. As mentioned in the abstract, the point of this study is to scrutinize the recent feasibility of seasonality, “recent” being the optimal term. If the seasonal trends in question were steadfast pillars of the securities market, they certainly would withstand market bubbles. Because there are two bubbles that peaked and burst from 2000 to 2009, the study period makes for a perfect test run of the age-old seasonal principals and illustrates that despite the verbal support of the January and May Effects, this study’s empirical evidence suggests these pillars are not bubble-proof.

It is important to note that the amount of stocks used to test these strategies is relatively small. The S&P 600 represents only a fraction of the market basket of stocks, and is therefore not representative of the full market. In addition, only a total of 20% of the stocks in the index are used to test each strategy, which means roughly 120 stocks are used to test each strategy. In finance, it is common to use the word, "market" as terminology to represent the benchmark against which a portfolio is compared. This paper uses "market" terminology as synonymous to the S&P 600 index, which is the benchmark used in this study to gauge how well or how poorly each portfolio performs over the study period.

In order to simplify the profitability outlook for each strategy, transactions costs are ignored. Because each strategy has a specific buy and sell date, transactions costs would be paid twice per year on each stock in the portfolio. If these costs were taken into account, the real profit of each strategy would decrease by the amount of total transactions costs paid.

Additionally, all three strategies presented in this paper have relatively long holding periods, ranging from one-month to three-month holding periods. This type of strategy would not work for all investors, as some investors prefer shorter holding periods because of the opportunity cost of tying up funds. It would be easy for an antsy investor to lose patience with at least one of these strategies, especially if he/she had to watch the portfolio lose money over certain periods with the hopes of a rally in the future.

This analysis cannot include stop and limit orders, which would very likely increase the profitability as well as lower the risk of all the strategies. While these orders can easily be

included when putting any methodology into practice, it would have been impossible to obtain unbiased results in a retroactive study. Although stop and limit orders are important to a trader's strategy, they would only muddle what we are trying to observe, which is the profit making capability of timing the market in a seasonal manner.

3. Is the January Effect still in Effect?

3.1 Previous Research/Publications

In 1981, Donald B. Keim was the first to uncover the relationship between small-firm stocks and January abnormal returns. Keim's study used NYSE-AMEX data for the period 1963-1979. His findings stated simply, "nearly fifty percent of the average magnitude of the risk-adjusted premium of small firms relative to large firms over this period is due to anomalous January abnormal returns" (Keim 14). Keim and many researchers since Keim's study maintain that small-cap stocks outperform large-cap stocks mostly because individuals require a risk premium in order to invest in riskier, smaller businesses. Furthermore, Keim indicated that much of the January abnormal returns were observed over the first two weeks of January, an anomaly that was quantified in the market for the next two decades (Keim 31).

In addition to Keim's findings, Richard West and Seha Tinic's 1983 research supports the fact that not only does January have a higher risk premium than all months, it is the only month that has a consistently positive and statistically significant relationship between risk and return (West and Tinic 562). West and Tinic's study proves betas for all months except January are very low and close to zero (566). January's higher beta presents January as a riskier month during which to hold securities. Although this discovery was made, the two were unable to draw conclusions

on just why January is a riskier month. Unlike Donald Keim, West and Tinic did not base their research on large versus small cap stocks, but rather market return versus risk. Investors therefore are compensated for the additional units of risk they take on for the month of January, albeit small cap stocks generate a higher risk premium.

The tenet of the widely studied January Effect states that small-cap stocks will outperform the market if purchased the last trading day of December and sold the last trading day of January. Many researchers suggest this effect is somewhat present in large cap stocks as well, but to a lesser degree than small cap stocks. The consensus regarding the reasoning for the January Effect is that investors sell off stocks in December, creating tax losses in order to offset capital gains for the year. This drives December prices down, which causes investors to purchase at a higher than normal volume during the month of January in order to take advantage of cheap stock prices. The high volume of January buys, according to the theory, pushes stock prices back up, engendering abnormal returns by the second week of the month.

There is no doubt that January has proven to be a profitable month for many companies and investors in the United States historically, but could one still put the January Effect to use today in order to beat the market? Have investors become so accustomed to the January anomaly that the effect is more from the *anticipation* of large January returns, leading to overpricing in late December and a reversion to lower prices in late January? Has investor behavior priced the effect into the market such that abnormal returns are no longer observable?

3.2 Assumptions

In order to conceptualize the structure and results of this study, it is important to note the preliminary assumptions this study makes. First, it is assumed that small cap stocks will yield higher returns than large cap stocks during the month of January based on a great deal of research completed by other investors. For this reason, this study segregates the largest and smallest market value stocks in the S&P 600 so that the degree of difference in market cap is examined.

Second, I make the assumption that investors have changed their January investment behavior over time, such that the January Effect is no longer a positive seasonal anomaly. I have three ideas as to the cause of the change. First, in anticipation of the January Effect, it is possible that investors who want to take advantage of low December prices have begun buying too early, which smoothes out the affects of overselling and creates a wash through December and January. Second, I suspect investors currently place less emphasis on the December 31 "dump date" and either sell off bad investments earlier through stop losses or even hold onto losing stocks through January in hopes that the January Effect and first quarter rally will cause stocks with less than stellar performance to make a comeback.

My third suspicion is that investors have become increasingly smart about their market moves, which means limiting losses by staying out of the market when it appears too risky or maintaining a low risk strategy, which does not coincide with assuming higher January risk as part of the strategy. My belief is that the two bubbles over the past ten years have made

investors not only more creative, but less apt to follow possibly worn out trends such as seasonality.

If my second and third suspicions are accurate, then there is no significant aggregate difference between January returns and any other month, and no difference will be observed over the study period of 2000-2009. In point of opinion, any remaining abnormal return found during the month of January is not due to tax loss sells, but due to good non-seasonal investment strategy, or pure luck. If there has been a lack of interest in the once anomalous January returns, then abnormal returns will not be observed in any group of stock, including small cap stocks, during the month of January. However, if my first suspicion holds true, December prices are no longer low and middle to end of January prices are no longer high. If investors are buying too early, then December is overbought and prices are too high, making January a month of mean reversal, whereby stock prices decline to market efficient prices. This leads to my tested assumption, which is that employing a contrarian January Effect strategy may be more profitable than the traditional approach. Therefore, this study assumes there is a money making opportunity in employing the reverse of the January Effect.

3.3 Data and Methodology

The contrarian January Effect strategy that is tested for the purpose of this investigation is a simple short sale strategy and is based on the underlying assumptions above. The close price on the last trading day in December is used as the sale price and the close price on the last trading day in January is used as the buyback price for all individual stocks in the S&P 600. As mentioned in the Introduction, the S&P 600 individual stocks are separated by market value into

ten deciles using Excel at the beginning of each holding period. Group 1 is a portfolio of the smallest market value stocks, and Group 10 is a portfolio of the largest market value stocks in the index; these groups are used as the databank over which the contrarian January Effect strategy is tested.

A sum for all buy dates is computed, and a sum for all sale dates is computed over each group and each year. These sums are then used to generate a holding period return per year per group. In this sense, a return is given for all nine years and all ten groups, but Group 1 and Group 10 are the only portfolios to which this study gives heed due to the emphasis on the importance of firm size. For the purpose of obtaining a holding period return, it is assumed that all short positions are liquidated upon expiration of the holding period.

Once the results are obtained for Group 1 and Group 10 for each segment of January, the returns are then compared to S&P 600 index returns (using the index close prices) on a long position, purchasing the index on the last trading day of December, and selling the index the last trading day of January. The end result is presented in Table 1 and Table 2 in the Results section below.

3.4 Results

First, it is important to discuss what each column in the table represents, as this format is used to present results in the other two strategies as well. "Group 1" in Table 1 presents the holding period returns per year for shorting the smallest market value stocks in the S&P 600 over the holding period (Dec 31 – Jan 31). "Group 10" represents the holding period returns per year for

shorting the largest market value stocks in the S&P 600 over the holding period. "Market HPR" represents the holding period returns that one would receive each year if he/she bought the S&P 600 index on December 31 and sold it on January 31. Again, please note that the word "Market" does not represent the full market, it is simply terminology to note the S&P 600 as the benchmark against which the portfolio returns are compared.

Table 1

Contrarian January Effect strategy returns compared to the market – Full month of Jan: December 31 – January 31

Year	Group 1	Group 10	Market HPR	Market AR	G1 - MHPR	G10 - MHPR
2001	-21.12%	2.07%	-9.57%	10.57%	-11.55%	11.64%
2002	-7.22%	1.65%	-0.94%	-15.13%	-6.29%	2.59%
2003	-5.08%	2.83%	0.79%	34.02%	-5.87%	2.04%
2004	-8.39%	-2.18%	-3.76%	21.39%	-4.63%	1.58%
2005	5.31%	2.57%	2.03%	8.65%	3.28%	0.54%
2006	-9.09%	-6.00%	-7.73%	12.36%	-1.36%	1.72%
2007	-1.26%	-2.59%	-3.01%	-1.02%	1.75%	0.43%
2008	7.00%	6.01%	5.22%	-31.17%	1.78%	0.79%
2009	12.60%	19.98%	6.92%	22.16%	5.69%	13.06%
Average	-3.03%	2.70%	-1.12%	6.87%	-1.91%	3.82%
stdev	10.20%	7.40%	5.52%	20.07%	N/A	N/A

Market HPR represents the holding period of this strategy Dec 31 – Jan 31
Market AR represents the annual return for the index over the full year (first trading day to last trading day).

"Market AR" represents the returns one would receive each year if he/she bought the S&P 600 each year on January 1 (or closest trading day) and sold it at the end of the year. This column is used solely for comparison purposes so that one can view how each portfolio performs relative to the index for the full year even though the portfolio holding period is not a full year. The "G1 – MHPR" column takes the holding period returns from the Group 1 column and subtracts the respective return from the "Market HPR" column. The results in this column indicate whether Group 1 is outperforming or underperforming the S&P 600 each year and by how much. The

"G10 – MHPR" column follows the same logic, but is computed to see whether Group 10 results are outperforming or underperforming the S&P 600 each year. Note that the returns presented for the Group 1 and Group 10 portfolios are a simple holding period return and have not been annualized because the strategy cannot be performed more than one time per year.

S&P 600 during the Holding Period (Market HPR)

The Market HPR columns of Table 1 represent the results for purchasing the full S&P 600 index during the full month of January (December 31 through January 31). Note that these returns represent a long strategy as opposed to a short strategy. In theory, if the January Effect held true, holding the market index for the full month of January should be profitable every year since January historically produces larger returns than any other month. Quite the opposite has occurred over the nine years studied. The S&P 600 is only profitable four out of the nine study years during the month of January. The S&P 600 holding period returns averages -1.12% (in comparison to an average of 6.87% for the index for the full year), indicating a lack of presence of the once abnormal January returns in the S&P 600 over the 2001 through 2009 study period. A positive average between 2000 and 2009 would be anticipated if the January Effect were still present in today's stock market; therefore, the negative average of -1.12% produced by this study is not enough to indicate a complete reversal of the January Effect, although it is enough to state that the January Effect is fading.

Group 1

Shorting the smallest cap stocks in the S&P 600 also produces varied results due to the fact that the January Effect (from an overall market perspective) has proven to trend neither profitably

nor unprofitably over the study period. Group 1 of the S&P 600 is profitable only three out of the ten years studied and beats the market for the holding period four times. The "G1 – MHPR" column presents many negative returns, depicting that Group 1 underperforms the S&P 600. On average, Group 1 underperforms the S&P 600 by -1.91% per year, which is not an enormous under performance but certainly does determine that Group 1 stocks are not usable for investment purposes over the month of January for both a short sale or a long strategy, as if these stocks were used for a long strategy, they still would not perform well relative to the S&P 600. If an investor placed $1,000,000 into the Group 1 portfolio and continued to reinvest profits/losses, he would lose a total of $297,005 and would end up with $702,995, only 70.3% of the original investment dollars.

Group 1 is not a profitable strategy, though it does give rise to the fact Keim's observations during the 1980s are not observable during this study period in the same way they were observed in his study. As already mentioned, Keim found that January experienced statistically higher returns than all other months every year. If this study's results supported that finding, Group 1 would yield consistently high negative returns, which would indicate that a long strategy would be more profitable than the short strategy presented. On average, a long strategy would in fact be more profitable, though it would not be profitable every year, which is what Keim's research found in previous years.

Keim's results gave rise to the idea the abnormal returns in January are due mostly because of the risk premium associated with small cap stocks, which means a reversal of the January Effect would be most noticeable in the Group 1 stocks, since they are the smallest. Group 1, the

smallest stocks tested, would yield an average of 3.03% gain each year if the portfolio were a long position rather than a short position. To summarize, any negative return in Table 1 for Group 1 can be seen as support for the January Effect, and any positive return for Group 1 can be seen as evidence against the presence of the January Effect. In 2001, for instance, if Group 1 stocks were longed instead of shorted, a positive 21.12% holding period return would have been gained, as well as a positive 7.22% in 2002, 5.08% in 2003, and 8.39% in 2004. This certainly means that in the earlier years of the study there appears to be a residual January Effect, though in more recent years, beginning in 2005, it seems as though the effect is fading. Negative returns for years 2001 through 2004 for Group 1 support the January Effect, though in 2005 the month of January begins yielding positive returns, and 2008 and 2009 yield high positive returns, which indicates that the January Effect as it was observed in the past is not observable over the study period, because if it were, as mentioned before, all returns would be negative. Because the results are clearly varied, randomness is likely a portion of the explanation for the results.

Without a doubt, one is better off longing the S&P 600 index for the full year, indicated by more consistently positive returns and overall a positive 6.87% average return. For this reason, the smallest stocks in the S&P 600 should not be used for investment purposes during the month of January for either a long position or short position as the results from 2001 – 2009 are too varied to assume consistent results will occur in the future.

Group 10

The largest cap stocks out of the S&P 600 perform better than the smallest stocks. Group 10 outperforms the S&P 600 over the holding period every year and generates a positive return

eight out of ten years. Looking at the "G10 – MHPR" column indicates Group 10 stocks outperform the S&P 600 over the holding period every year, though most years, the outperformance is only a fraction of a percentage point. If one put $1,000,000 into this strategy in 2001 and continued to re-invest profits, he/she would have $1,280,428 at the end of 2009. This means the largest market value stocks in the S&P 600 perform better than the S&P 600 index as well as perform better than the smallest market value stocks in the S&P 600, which may be by pure chance, or may be an indicator that larger stocks are better suited for this strategy than smaller stocks. One could argue that if there has been a complete reversal of the January Effect, that reversal has occurred in the largest of the small cap stocks. This difference raises the question of the significance of firm size in the strategy. To what degree does firm size play a role in the formation of these returns and to what degree is the actual holding period of the strategy responsible for the results? This study does not examine the real empirical difference firm size makes, though this provides a foundation for a future study.

In addition, because Group 10 stocks are still small cap stocks, if the January Effect were still present, Group 10 stocks would, theoretically, have yielded predominantly negative returns and averaged a negative result over the study period, which is not the case. The results for Group 10 cannot be used to conclude that the January Effect still exists, though due to the varied Group 1 results, they also cannot be used to refute the existence of the January Effect. One would need to test the significance of January's daily returns against all other months' daily returns in order to achieve a better picture of January's performance in the overall market, which is presented later in this paper.

The proposed January Effect strategy in this paper does not produce useful results from an investment perspective, but may be useful in debunking the concept of January seasonality. It is evident that no underlying trend can be observed in the above results. The strategy both outperforms and underperforms the market for various years between 2001 and 2009, with no evident directional significance. Based on Table 1 information alone, one cannot conclude definitively that shorting small cap stocks at the end of December and buying them back at the end of January is a profitable investment. In the reverse, if one were to reverse all group returns shown above, one also cannot assert that purchasing small cap stocks at the end of December and selling them at the end of January is a profitable investment.

Examining Risk Measures

Table 2 presents Sharpe ratios and Treynor ratios associated with the returns generated from Group 1, Group 10, and the S&P 600 during the holding period. Although neither portfolio produced stellar results, it is nevertheless important to measure how much compensation each portfolio gives per unit of risk. It is not enough for a portfolio to yield high returns as most investors are considered to be risk averse. These ratios are useful in determining the rationality of an investment based on its level of risk. Financial advisors sometimes use Sharpe and Treynor ratios (or equivalent measurement) in order to place their client's money in the appropriate assets according to their risk and return preferences.

The Sharpe ratio is defined as excess return (risk premium) per unit of risk of an asset, and is computed by subtracting the risk-free rate by the portfolio return then dividing the result by the portfolio standard deviation. Standard deviation is a measurement of volatility, which is

interpreted in finance as risk. A stock with high volatility relative to other stocks or the market has a high standard deviation, and therefore, high risk. The higher the Sharpe ratio, the more return an investor receives for every unit of risk he assumes. In essence, this ratio is an indicator of how well an investor is compensated for the level of risk he accepts.

Table 2

Contrarian January Effect strategy returns and standard deviations compared to the market – Full month of Jan: December 31 – January 31 on an annualized basis

		Sharpe Ratio			Treynor Ratio		
Year	**RF**	**Group 1**	**Group 10**	**Market**	**Group 1**	**Group 10**	**Market**
2001	0.44%	-2.114	0.220	-1.812	0.010	0.016	-0.100
2002	0.14%	-0.722	0.204	-0.195	0.009	0.015	-0.011
2003	0.10%	-0.508	0.369	0.125	0.016	0.027	0.007
2004	0.08%	-0.830	-0.305	-0.694	-0.013	-0.022	-0.038
2005	0.20%	0.501	0.320	0.332	0.014	0.024	0.018
2006	0.36%	-0.927	-0.859	-1.464	-0.037	-0.063	-0.081
2007	0.43%	-0.165	-0.407	-0.622	-0.018	-0.030	-0.034
2008	0.24%	0.664	0.780	0.903	0.034	0.057	0.050
2009	0.01%	1.235	2.697	1.251	0.118	0.199	0.069

The negative Sharpe ratios simply mean a risk-less asset would be a more appropriate investment for the year. Group 10 provides higher excess returns per unit of risk than the market every year. Group 1 on the other hand, yields lower compensation per unit of risk than the market. In order for a portfolio to have higher returns per unit of risk than the market, the portfolio must either yield higher returns or lower risk (standard deviation) or both. In the case of Group 1, portfolio returns are lower than S&P 600 returns and Group 1 has a higher portfolio standard deviation (shown in Table 1) than the S&P 600. Group 10, however, tends to perform better than the market from a return perspective and even though it does have a higher

portfolio standard deviation, its returns are high enough to compensate slightly more for risk than the S&P 600.

Very similar to the Sharpe ratio, the Treynor ratio measures the amount of return received in comparison to risk, though the ratio uses beta as the risk measure instead of standard deviation. Beta is also a measurement of risk used in finance, though it measures systematic risk as opposed to total risk. The Treynor ratio is computed by subtracting the risk-free rate from the portfolio's return for the year, and this result is then divided by the portfolio beta. This ratio is also known as the reward-to-volatility ratio. Treynor ratios for Group 10 tend to be slightly higher than the Treynor ratios for the S&P 600, which means again that Group 10 compensates better for risk than the S&P 600 does. This result is very interesting considering it is atypical for stock portfolios to compensate better for risk than the market. It is more common for stock portfolios that have higher returns than the market to have higher risk such that risk adjusted returns are lower than the risk adjusted returns of the market.

Regression Results

The results of regressing Group 1 and Group 10 for the full month of January are presented below in Table 3. Beta and alpha coefficients are presented for each group as well as the standard errors that are associated with these coefficients.

The regressions use the returns on each strategy as the y-variable and the market index returns over the holding period as the x-variable. The null and alternative hypotheses for both regressions state,

H_o: $\alpha = 0$

H_a: $\alpha \neq 0$

The regression equation is stated as $y = \alpha + \beta X + \varepsilon$ for each of the regressions tested.

Table 3

Regression results: X-variable=Market, Y-variable= strategy returns

	Group	Beta (β)	β Standard Error	Alpha (α)	α Standard Error
	1	1.698634	0.273590	-0.011313	0.014570
S&P 600	**10**	1.005025	0.335381	0.038256	0.017860

The null hypothesis that $\alpha = 0$ infers that there are no excess returns generated by the portfolio, meaning that there is no statistical difference between portfolio returns and the S&P 600 returns. Alpha, also known as Jensen's alpha, is used to determine if one asset or set of assets is outperforming or underperforming another set of assets on a risk-adjusted basis. A positive alpha indicates outperformance, where a negative alpha indicates underperformance. In order to reject the null hypothesis that $\alpha = 0$ at the 95% confidence level, and confirm that the portfolio returns are different from the S&P 600 returns, the t statistics must be greater than 2.26 and the p-values must be lower than .05 because there are 9 observations in this regression. Neither Group 1 nor Group 10's p-values or t statistics meet this benchmark, so we cannot reject the null that there is no statistical difference between portfolio returns and S&P 600 returns; therefore both portfolios do not outperform the market.

These regressions also tests whether or not beta equals 1, that is, whether the slope of the line that describes the portfolio is the same as the slope of the line that describes the S&P 600. In this case, the slope (beta) also refers to portfolio risk. Excel defaults to test whether or not beta is equal to zero, so true t statistics are calculated using the formula $(\beta - 1) / SE$ where SE is the standard error of the beta. Group 1 yields a significant beta, meaning we can reject the test of $\beta = 1$. This indicates Group 1's risk is statistically higher than S&P 600 risk. Group 10's beta t statistic is not significant, meaning Group 10 is neither riskier nor less risky than the S&P 600.

With this information alone, it appears as though there is no evidence supporting the January Effect as a seasonal trend, either in the positive or negative direction. More specifically, there is no evidence to support that January gains abnormal returns in small cap stocks, as the smallest firms tested performed worse than the largest firms tested. When compared to Donald Keim's findings from the period 1963 through 1979 it can be determined that although the January Effect has not necessarily disappeared among small cap stocks, it certainly is fading.

Donald Keim observed that the size and January Effects put together did not always yield profitable returns. In fact, he concluded that one could count on the stability of the January Effect and in the same respect, be guaranteed of the instability of the size effect (Keim 19). In essence, during Keim's time period of study, the January Effect always generated abnormal returns. If this were still true today, every return listed under both "Market HPR" columns in Table 1 would be positive. Therefore, the January Effect over the past nine years has not always yielded profitable returns. In point of fact, the results in Table 1 are convoluted to the point that it would be foolish for an investor to rely on the age-old tenets of the January Effect as an

application to any investment strategy. Furthermore, the only conclusion that can be drawn regarding the above results is that the January Effect as it was observed in the past is not observed over the study period. In order to further understand the month of January as it compares to other months from a return perspective, regressions are run using the S&P 500 and S&P 600 and are presented in the following section. These regressions are useful in determining whether or not January daily returns are statistically different from any other months' daily returns, and therefore indicate if the January Effect is observed in the overall market during the study period.

3.5 Testing January's returns against all other months

The above results indicate that the January Effect is not as strong as it was observed in the past. In order to look deeper into this, a regression is run to determine if January returns are statistically different from all other months in the overall market. Both the S&P 500 and S&P 600 are used so as test if the overall market shows a January Effect. Using both indexes gives slightly more breadth to the study in order to ensure more of the market basket of stocks is included in the analysis.

Daily returns are generated from daily S&P 600 close prices for the years 2000 through 2009 and dummy variables are created for each month except for January. January's dummy variable is eliminated such that the regression tests statistical difference of all other monthly returns against January daily returns. The daily market returns for all days and months are the inputs for the y-variable and February through December dummy variables for each trading day are the inputs for the x-variable.

The null and alternative hypotheses state:

H_0: January's daily returns are not statistically different from all other month's daily returns.

H_a: January's daily returns are statistically different from all other month's daily returns.

The regression equation is therefore as follows:

$$y = \alpha_1 + \beta_2 D_2 + \beta_3 D_3 + \beta_4 D_4 + \beta_5 D_5 + \beta_6 D_6 + \beta_7 D_7 + \beta_8 D_8 + \beta_9 D_9 + \beta_{10} D_{10} + \beta_{11} D_{11} + \beta_{12} D_{12}$$

If the original January effect still holds between 2000 and 2010, January returns should be statistically different from the returns of all other months. This would mean all other months would have negative coefficients (indicating that their returns are lower in comparison to January) and their p-values and t statistics would show significance. However, if the January Effect is not observed in the overall market during the study period, then January returns will not be statistically different from all other months' daily returns and all p-values and t statistics will not be significant.

The latter statement is correct, and for all months, we fail to reject the null hypothesis that January daily returns are not statistically different from all other month's returns. In order to reject the null, all t statistics must be greater than 2.18 and all p-values must be less than .05 and as shown below, this benchmark is not met for any month. It is interesting to note that all months except for February and September show higher daily returns (though this result is not significant) than January. If the results were significant, this would mean February and

September are the only two months that have lower statistical returns than January, where the remaining months would have higher returns than January.

The regression results for the S&P 500 are presented below.

SUMMARY OUTPUT – S&P500

Regression Statistics	
Multiple R	0.055118
R Square	0.003038
Adjusted R Square	-0.001345
Standard Error	0.014013
Observations	2514

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	11	0.001497	0.000136	0.693120	0.746327
Residual	2502	0.491333	0.000196		
Total	2513	0.492830			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept (Jan)	-0.000765	0.000984	-0.778097	0.436586	-0.002694	0.001163
February	-0.000714	0.001411	-0.506246	0.612728	-0.003480	0.002052
March	0.001491	0.001367	1.090610	0.275549	-0.001190	0.004171
April	0.001874	0.001386	1.352239	0.176421	-0.000844	0.004592
May	0.001427	0.001375	1.037898	0.299418	-0.001269	0.004122
June	0.000085	0.001375	0.062024	0.950549	-0.002610	0.002781
July	0.000571	0.001378	0.414593	0.678476	-0.002130	0.003273
August	0.001210	0.001361	0.889089	0.374041	-0.001459	0.003878
September	-0.000386	0.001398	-0.276209	0.782410	-0.003127	0.002355
October	0.000898	0.001359	0.660849	0.508770	-0.001767	0.003564
November	0.001264	0.001389	0.909883	0.362972	-0.001460	0.003988
December	0.001132	0.001379	0.820917	0.411772	-0.001572	0.003837

Because there has been a great deal of excitement historically regarding the combination of January returns coupled with the size effect, the same regression is run for the S&P 600

including the same null hypothesis, alternative hypothesis, and regression equation. If historical evidence of a size effect and abnormal returns during the month of January stands true today, the S&P 600 more than the S&P 500 should yield different returns for January, that is, the null hypothesis should be rejected, all months should report negative coefficients, and all p-values and t statistics for all months should be significant if January daily returns are statistically different from all other months' daily returns. The results are presented below.

SUMMARY OUTPUT – S&P 600

Regression Statistics	
Multiple R	0.048099
R Square	0.002314
Adjusted R Square	-0.002076
Standard Error	0.015965
Observations	2512

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	11	0.001478	0.000134	0.527026	0.886307
Residual	2500	0.637171	0.000255		
Total	2511	0.638648			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept (Jan)	-0.000295	0.001120	-0.263116	0.792483	-0.002492	0.001902
February	-0.000242	0.001609	-0.150248	0.880581	-0.003398	0.002914
March	0.001013	0.001557	0.650559	0.515391	-0.002040	0.004066
April	0.001816	0.001579	1.150508	0.250045	-0.001279	0.004912
May	0.001103	0.001566	0.704566	0.481146	-0.001967	0.004174
June	0.000653	0.001568	0.416313	0.677216	-0.002421	0.003727
July	-0.000130	0.001570	-0.082795	0.934021	-0.003208	0.002948
August	0.001211	0.001550	0.781193	0.434763	-0.001829	0.004251
September	-0.000639	0.001593	-0.401167	0.688332	-0.003762	0.002484
October	0.000230	0.001549	0.148374	0.882060	-0.002807	0.003267
November	0.000566	0.001583	0.357366	0.720848	-0.002538	0.003669
December	0.001880	0.001571	1.196656	0.231554	-0.001201	0.004962

The results for the S&P 600 are not significant. We are unable to reject the null hypothesis for all months. January's returns from 2000 to 2009 are not statistically different from all other months, indicating the January Effect is not present over this time period. The Efficient Market Hypothesis holds in this case that financial markets are informationally efficient on the aggregate level.

3.6 Additional Notes

Because historical evidence suggests that the primary reason for January abnormal returns is accounted for by firm size, one must look deeper into the size effect over the study period in order to test its recent significance. If one were to take this study one step further, a regression based on firm size and quality, (using dummy variables for firm size) would produce answers as to what degree firm size plays a role in producing abnormal returns versus what degree the holding period effects the returns. In addition, one could repeat this study using mid or large-cap stocks because the largest stocks tested in this study outperform both the market and the smallest stocks tested, which could indicate the shorting the month of January may be profitable when investing in larger stocks.

Another possible expansion of this study would be to test whether or not Keim's finding that most of January's abnormal returns occur in the first two weeks of the month is true today within the contrarian study. The test presented in this paper would be repeated but for the first two weeks of January and the last two weeks of January in order to compare the contrarian portfolio performance to the full month. It would be interesting to see if the previous result of

statistically high abnormal returns in the first two weeks of January maintain the same effect but on a contrarian basis.

4. Sell in May and Go Away

4.1 Previous Research/Publications

There is an old adage that investors should "sell in May and go away." According to investor standards, following this procedure will not only make investors a great deal of money, but will also save investors from the woes of capital losses. Sy Harding in his Article, "Sell in May and Go Away: Proven Seasonal Strategies for Any Investor," recommends selling everything on May 1 and buying everything back on November 1 (Harding). While there is no exact science determining just how long one should "stay away," the general consensus has been somewhere between August and November.

Jeff Benjamin, author of "Sell in May and go away? It still holds true, research shows," states that if one invested $10,000 in the DJIA every May through October period starting in 1950, total loses would amount to $474. For this reason, Benjamin maintains that for this reason, selling in May is still a great idea. "Following the pattern in 2008," Benjamin states, "would have helped investors avoid a 27.3% drop in the Dow" (Benjamin). As many researchers have stated, Benjamin concurs that the reasoning behind this slump in May is largely attributable to brokers and executives taking summer vacations. If Benjamin is correct, the underlying observable trend in May is overselling, followed by under buying throughout the summer vacation period? The driving down of prices due to continual selling makes for a prime market for buy and hold

strategies. While staying out of the market for a few months is likely desirable for busy portfolio managers, overselling in the market leaves an opening for an untapped, and generally very simple, buy strategy.

4.2 Assumptions

Similar to the January Effect, the selling in May concept is likely over traded. In this sense, the volume of stock sells in May drives security prices down, a perfect situation for a long strategy. The strategy presented in this section is the contrarian version of the "Sell in May and Go Away" strategy, which means the major underlying assumption this section is that investor behavior has created the perfect sinusoidal wave for buying in May and selling in August, when an onset of early investor purchasing has driven stock prices back up.

An additional assertion attached to this strategy is that the two gentlemen referenced above, Harding and Benjamin, are not necessarily incorrect in their findings, but their research is misguided with a narrow scope of view. For instance, Benjamin's assertion that holding the DJIA from 1950 to 2010 results in a loss is likely accurate, but in reality, this amounts to only a 4.74% holding period loss (not adjusted for by inflation). Given the rate of booms and busts in the U.S. market, this same result may be true for any arbitrary holding period. The complexity of the U.S. stock market makes anomalous trends, especially those described on a massive scale in the media, dangerous frames of reference for utilization as buy and sell signals.

Similar to the ideas proposed in the January Effect section, this paper maintains that investor behavior has simply changed over time such that seasonal anomalies are not held in the same

regard by investors as they used to. An article by Paul La Monica, "Pump up the volume? Traders on vacation" serves as support for this assumption, as trading volume in March 2011 was the lightest it has been since December 2009. La Monica asserts that traders would typically use the recent news of geological disaster and political unrest (the earthquake in Japan, political upheaval in Egypt, etc) to make a profit (or protect against losses) in the stock market, but they simply have not done so (La Monica). Investors are waiting for more news regarding how current global events will affect the U.S. economy before making any major investment decisions. In this sense, instead of waiting until May to lighten trades, investors seem to be doing so now, a sure indicator that changing economic climates make for changing investment strategies.

4.3 Data and Methodology

As stated prior to this section, daily individual stock data from the S&P 600 is the databank over which this strategy is tested. All individual stock close prices from the S&P 600 between 2000 and 2009 are imported into Excel and then are ranked into deciles based on market value. Groups 1 through 10 are then considered individual portfolios. These portfolios are rebalanced per holding period (once per year), again based on market value. June 1 (or the closest trading day) is the purchase date and August 31 (or the closest trading day) is the sale date. This is referred to in this paper as the "Buy in May and Stay" strategy. Returns are then generated for all years and groups, but Group 1 and Group 10 are the two groups of interest, representing the smallest of the small cap and largest of the small cap.

Holding period returns are produced for each group and year. These two sets of returns are then benchmarked against the index over the same holding period, using the index's close price on June 1 and August 31 over the study period as the holding period prices. All returns are also compared to performance of the S&P 600 for the full year. This is only to get an idea of how the strategies perform in comparison to an investment in the market for the full year. Because the strategy requires an investment for only part of the year, it is interesting to determine whether that investment for a fraction of the year performs better than the S&P 600 for the entire year. The results of this strategy are presented below.

4.4 Results

Table 4

Contrarian "May Effect" strategy returns compared to market holding period return and annual market return

Year	Group 1	Group 10	Market HPR	Market AR	G1 - MHPR	G10 - MHPR
2000	26.81%	11.94%	6.81%	13.01%	20.01%	5.13%
2001	7.35%	-9.72%	-15.02%	10.57%	22.37%	5.30%
2002	-10.83%	-13.67%	-23.04%	-15.13%	12.21%	9.37%
2003	32.56%	9.46%	9.03%	34.02%	23.53%	0.43%
2004	5.47%	-1.38%	3.12%	21.39%	2.35%	-4.49%
2005	17.82%	1.81%	7.26%	8.65%	10.56%	-5.45%
2006	2.90%	-6.16%	-2.92%	12.36%	5.82%	-3.24%
2007	-0.45%	-10.85%	-4.48%	-1.02%	4.03%	-6.37%
2008	7.97%	-10.21%	-7.85%	-31.17%	15.82%	-2.36%
2009	31.96%	2.54%	15.07%	22.16%	16.89%	-12.53%
Average	12.16%	-2.62%	-1.20%	7.48%	13.36%	-1.42%
stdev	14.58%	8.92%	11.78%	19.02%	N/A	N/A

<u>S&P 600 during the holding period (Market HPR)</u>

Examining the results from the market index during the holding period, June 1 through August 31, the S&P 600 yields positive returns five out of the ten study years from 2000 to 2009,

although, the market index holding period returns underperform the S&P 600 for the full year (Market AR) every year from 2000-2009. This is to be expected because the holding period only represents one quarter of the trading year. The full index averages -1.20% over the holding period, versus 7.48% for the entire year, a further indication that the holding period does not represent a sound investment time frame when only taking the market index into account and not choosing stocks, filtering for specific criteria. Note that this does not mean one should avoid purchasing stocks in the beginning of June and selling them in August; it simply means an investor will reap higher returns if he/she holds the index for the full year instead of the period from June to August.

From a return perspective alone, there can be no conclusive statements made regarding whether or not there is a seasonal trend revolving around the month of May over the years 2000 through 2009. One would need to see either a majority of positive index returns for the holding period in order to make the assertion that selling in May and going away is irrational, or a majority of negative index returns for the holding period in order to make the assertion that selling in May and going away is a rational decision.

Group 1

As shown in Table 5, the smallest cap stocks of the S&P 600 (Group 1) outperform the market during the holding period June through the end of August every year from 2000 to 2009. When taking firm size into account, the contrarian May strategy seems to hold some worth, as Group 1 is profitable for eight out of the ten study years. Group 1 averages higher returns over the ten year period than the index over the holding period, at 12.16% versus -1.20%, a strong indicator

that the added filter for firm size makes all the difference in the performance of this particular strategy. Again note, these are holding period returns, which means in order to obtain an annual return, one would need to invest in a different asset the rest of the year, such as a t-bill. If an investor placed $1,000,000 into this strategy in 2000 and reinvested profits, he/she would have $2,918,594 at the end of the holding period in 2009, nearly triple the original investment. While this is a highly desirable result, the full effect can only be obtained when a commitment is made to the strategy for the entire investment horizon. Many investors would lose faith in the strategy in 2002 when the portfolio loses 10.84%. If an investor took this to be a sign that the strategy does not work and liquidated his investment, he would not have the opportunity to make the 32.56% gain the following year in 2003. Therein lays the obvious difficulty in attempting to time the market.

It is worth mentioning that Group 1 has higher risk (standard deviation) than the market, at 14.58% versus 11.78%. This result is to be expected because Group 1 is a stock portfolio (stock portfolios typically carry higher risk than simply holding an index) comprised of small cap stocks, which are historically more volatile than large cap stocks. In this sense, it is important to view Group 1 from a return per unit of risk perspective. The portfolio may have higher returns on average than the market, but can it compensate as well for risk as the market? Table 5 in the Examining Risk Measures section provides an answer to this question.

Now compare the strategy results for Group 1 to the market index returns for the full year (simply for the sake of comparison). The Group 1 portfolio outperforms the S&P 600 for the full year for five out of ten years, despite the fact that the strategy is only in the market three

months out of the year. In addition, the S&P 600 gains an average of 7.48% return per year over the study period, lower than the Group 1 strategy average. While the strategy outperforms and underperforms the market roughly an equal number of years, the aggregate return on the portfolio is higher than the market for the full year.

Based on this evidence, selling in May and going away is not likely a foolproof strategy. In point of fact, depending on the stock portfolio, selling in May could eliminate a profit making opportunity. Although timing alone for this strategy is not profitable, one can see profits during this time frame when taking firm size into account. In order to look deeper into this particular seasonal anomaly, I extended the holding period from August 31 to November 1 and ran the same tests. Group 1 outperforms the index eight out of ten years from 2000 to 2009. The extra few months of momentum added to the back end of the strategy results in an average of 16.16% holding period return per year. This six-month strategy, far outperforming the market, could easily be utilized as an investment tool provided one is willing to rebalance the portfolio and accept a relatively long holding period.

Group 10

Interestingly, the largest market value stocks (Group 10) in the S&P 600, which are still considered to be small cap stocks, only outperform the market for the holding period four out of ten years. Group 10 averages a -2.62% return during the ten years, a drastic underperformance in comparison to the Group 1 stocks. If an investor put $1,000,000 into Group 10 stocks in 2000 and continued to reinvest profits/losses each year, he/she would only have $738,629, losing

26.14% of the investment capital. In addition, the "G10 – MHPR" column indicates a strong underperformance of this portfolio, especially in the later years of the strategy.

These results should beg the question; to what extent are the profitable results from Group 1 related to firm size only? The size effect seems to make a much stronger impact on portfolio returns for this strategy than it does for the January Effect strategy. There are two potential reasons for the difference in performance between Groups 1 and 10. The first explanation relates to Friend and Lang's findings that firm quality accounts for much of a stock's returns. It is possible that the smaller of the large cap stocks happen to be "high" quality firms, which would explain a higher return from Group 1. The second explanation is that the smallest of the small cap stocks simply continue to have a larger associated risk premium than the highest market value stocks in the index, which drives their returns upward.

Examining Risk Measures

Table 5 displays the measurements for risk-adjusted returns for Group 1, Group 10 and the market over the June 1 through August 31 holding period.

Table 5

Contrarian "May Effect" risk measures

		Sharpe ratio			Treynor ratio		
Year	**RF**	**Group 1**	**Group 10**	**Market**	**Group 1**	**Group 10**	**Market**
2000	1.53%	1.734	1.167	0.448	0.239	0.165	0.448
2001	0.83%	0.447	-1.183	-1.345	0.062	-0.167	-1.345
2002	0.42%	-0.771	-1.580	-1.991	-0.106	-0.223	-1.991
2003	0.24%	2.217	1.034	0.746	0.306	0.146	0.746
2004	0.36%	0.350	-0.195	0.233	0.048	-0.028	0.233
2005	0.83%	1.165	0.110	0.545	0.161	0.015	0.545
2006	1.25%	0.113	-0.831	-0.354	0.016	-0.117	-0.354
2007	1.13%	-0.108	-1.343	-0.476	-0.015	-0.189	-0.476
2008	0.40%	0.519	-1.189	-0.700	0.072	-0.168	-0.700
2009	0.04%	2.189	0.280	1.275	0.302	0.040	1.275

The results in Table 5 indicate that the Group 1 portfolio generally produces higher excess returns per unit of risk than the market. Both the Sharpe and Treynor ratios tend to be higher for Group 10 than for Group 1 or even the market. In general, this means that in comparison to the market, the portfolio either must yield higher returns, lower risk, or both. In this case, the portfolio yields higher returns than the market, but also bears higher risk (given by the standard deviations in Table 4), yet the returns are high enough to compensate slightly more for risk than the market. This is a simple indication that the portfolio returns can compensate for risk slightly better than the market can for this particular portfolio.

The Sharpe and Treynor ratios for the market and for Group 10 are negative for several of the study years, which mean an investor would be better off investing in a risk-free asset from a return-to-risk perspective than investing in either the S&P 600 over the holding period or Group 10 stocks. Additionally, the market tends to perform better than Group 10 on a risk-adjusted basis, again making Group 10 an undesirable investment.

Regression Results

Table 6 presents the regression results for the contrarian Sell in May and Go Away strategy, with strategy returns as the y-variable and market holding period returns as the x-variable. The null and alternative hypothesis are stated as,

H_o: $\alpha = 0$

H_a: $\alpha \neq 0$

The regression equation is stated as $y = \alpha + \beta X + \varepsilon$ for each of the two regressions tested

Table 6

Regression results using strategy returns as y-variable and market HPR as x-variable

	Group	Beta (β)	β Standard Error	Alpha (α)	α Standard Error
	1	1.056998	0.227487	0.134278	0.025577
S&P 600	**10**	0.632180	0.147217	-0.018628	0.016552

The regression results are very clear for this strategy. The null hypothesis is rejected at the 95% confidence level for ten degrees of freedom for the Group 1 portfolio as its p-value associated with its alpha is lower than .05, at .00077 and its t statistic is higher than 2.23 at 5.249. This effectively means that the Group 1 portfolio outperforms the S&P 600. The null hypothesis is not rejected for Group 10, which means Group 10's returns do not statistically outperform the S&P 600. In this sense, there is a type of May seasonality within the smallest of the small cap stocks, though through the parameters of this study, it is the opposite seasonality that has been reported over the years through the media. This fact is confirmed by the positive and significant Jensen's alpha, illustrating Group 1 outperforms the market, converse to traditional belief.

Please note that although this regression shows significance for the Group 1 portfolio, there are only ten input observations for this regression, which makes this regression far less accurate than say a regression including 100 observations. In this sense, any significance viewed in these strategy portfolios would need to be re-evaluated over a much larger time period in order to secure confidence in accuracy.

In testing the risk of the portfolio in comparison to the market, we fail to reject the hypothesis that β=1 for Group 1, which means that Group 1 returns are neither riskier or less risky than the S&P 600. Group 10's risk, however, is statistically lower than the S&P 600 given by the

significant beta of .6321, which is lower than the market, indicating $\beta \neq 1$. It is interesting to note that Group 1's risk is not different from the S&P 600 risk despite the fact that its returns do statistically outperform S&P 600 returns.

At first glance, based on returns and regression results, it would be easy to state that firm size accounts for much of the explanation for the abnormal returns, since small cap stocks outperform both the index for the holding period and the index for the full year; however, why then, do the largest of the small cap stocks not show significant results as well? In order to answer this question, one must scrutinize the size effect itself – just how significant is firm size in producing abnormal returns? To further this study, one would need to run a regression using dummy variables for firm size in order to test if small cap stocks are significantly different from all other stocks during the period 2000 through 2009. In order for the above results to make sense, the test would need to confirm that the polar smallest stocks are the most profitable, while the mid to higher range market capitalization stocks in the S&P 600 show mediocre to inferior results.

Both the returns and regression results for the Group 1 May strategy point to the fact that there is an opportunity to make profit by buying the smallest cap stocks in June and selling them in August, an action against which investors have generally chided. Furthermore, lengthening the holding period to the beginning of November yields stronger results, engendering a six month strategy that beats the market for the full year. Granted, in order for the investment to be profitable, only the smallest cap stocks should be held over the holding period. It is interesting to note that this point that the inconsistency of the size effect, as reported by Keim in the past

may now be more consistent. Again, this can only be confirmed by testing the size effect empirically.

In order for the analysis of this strategy to be complete, a regression must be run in order to test the significance of June, July and August returns against all other months. Doing so will determine if this time period shows statistical difference from the rest of the year and furthermore, whether this time period yields statistically higher or lower returns than any other part of the year.

4.5 Testing May's returns against all other months

Similar to the regression that tested January returns against all other months in the previous section, a regression is run testing the significance of May's returns in comparison to all other month's returns. The May strategy results indicate that contrary to popular belief, one does not necessarily need to sell in May and buy back in the fall. In order to conduct this regression, Daily returns are extracted from daily S&P 500 historical close prices and dummy variables are created for each month except for June, July, and August. These months' dummy variables are eliminated in order to test statistical difference of all other monthly returns against this time period. The daily market returns for all days and months are the inputs for the y-variable and all month dummy variables for each trading day except for June, July, and August are the inputs for the x-variable.

The null and alternative hypotheses state:

H_0: June, July, and August's daily returns are not statistically different from all other month's daily returns.

H_a: June, July and August's daily returns are statistically different from all other months Daily returns.

The regression equation is therefore as follows:

$$y = \beta_0 + \beta_1 D_1 + \beta_2 D_2 + \beta_3 D_3 + \beta_4 D_4 + \beta_5 D_5 + \beta_9 D_9 + \beta_{10} D_{10} + \beta_{11} D_{11} + \beta_{12} D_{12}$$

If historical statements that May produces lower returns than all other months are true, then the regression should produce conclusive results that May returns are different from all other months. This regression can be approached from two perspectives. First, the contrarian May investment strategy presented in this paper contends that May's low prices make for a great "buy" opportunity, therefore, if this assumption is true, then June, July and August's returns should be different from all other months and therefore should produce significant results in the positive direction in a regression. However, the second approach contends the return results indicate profitability only in the smallest cap stocks, which is likely more of a size-related anomaly than a seasonal trend. In this sense, May should not be significantly different than any other month because the profitability of the strategy came from narrow parameters of size, not from seasonality. The efficient market hypothesis should hold that no profitable investment should arise from a seasonal standpoint alone.

The regression results for the S&P 500 are presented below.

SUMMARY OUTPUT – S&P500

Regression Statistics	
Multiple R	0.052505
R Square	0.002757
Adjusted R Square	-0.00083
Standard Error	0.01401
Observations	2514

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	9	0.001359	0.000151	0.769124	0.645217
Residual	2504	0.491471	0.000196		
Total	2513	0.492830			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-0.000135	0.000551	-0.244604	0.806783	-0.001216	0.000946
Jan	-0.000630	0.001127	-0.559297	0.576009	-0.002841	0.001580
Feb	-0.001345	0.001152	-1.167672	0.243050	-0.003603	0.000913
March	0.000860	0.001097	0.783882	0.433184	-0.001292	0.003012
April	0.001244	0.001121	1.109346	0.267387	-0.000955	0.003442
May	0.000796	0.001107	0.719237	0.472062	-0.001374	0.002967
Sept	-0.001017	0.001136	-0.895009	0.370868	-0.003244	0.001211
Oct	0.000268	0.001088	0.246199	0.805549	-0.001866	0.002402
Nov	0.000634	0.001125	0.563108	0.573412	-0.001573	0.002840
Dec	0.000502	0.001113	0.450934	0.652076	-0.001680	0.002684

The Intercept represents the June, July and August results as a comparison to other months. Just like the results for January, we fail to reject the null hypothesis that June, July and August's daily returns are not statistically different from all other month's daily returns. All months produce p-values that are greater than .05 and t-statistics that are less than 2.18, indicating a lack of difference between May and all other months.

The same test is completed using the S&P 600 to see if the small cap index produces different results. For the purpose of the regression, the null and alternative hypotheses and the regression equation are the same as for the S&P 500 listed above. The results for the regression are presented below.

SUMMARY OUTPUT – S&P600

Regression Statistics	
Multiple R	0.044798
R Square	0.002007
Adjusted R Square	-0.00158
Standard Error	0.015961
Observations	2512

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	9	0.001282	0.000142	0.559039	0.831394
Residual	2502	0.637366	0.000255		
Total	2511	0.638648			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0.000294	0.000628	0.467874	0.639915	-0.000938	0.001526
January	-0.000589	0.001284	-0.458446	0.646672	-0.003108	0.001930
February	-0.000831	0.001315	-0.631774	0.527592	-0.003409	0.001748
March	0.000424	0.001250	0.339207	0.734482	-0.002028	0.002876
April	0.001228	0.001277	0.961078	0.336606	-0.001277	0.003732
May	0.000514	0.001261	0.407851	0.683418	-0.001959	0.002988
September	-0.001228	0.001294	-0.948616	0.342908	-0.003766	0.001310
October	-0.000359	0.001240	-0.289604	0.772144	-0.002790	0.002072
November	-0.000023	0.001282	-0.018143	0.985526	-0.002537	0.002491
December	0.001292	0.001268	1.018489	0.308544	-0.001195	0.003778

The same is true for the S&P 600 as the S&P 500. We fail to reject the null hypothesis that June, July, and August's returns are not statistically different from all other month's returns. This indicates that regardless of firm size, this time period's returns are similar to the returns of all other months. It is very likely that the profitability of the contrarian May strategy was only due to the fact that firm size was a factor, and was not related to the holding period.

4.6 Additional Notes

How can one account for the results given in Table 5 given that the above regression indicates the period of June through August plays no role in the abnormal returns of the strategy? This paper suggests one hypothesis to answer this question – investors sell their riskier stocks in May in an effort to lower their portfolio's risk during the summer vacation months to avoid the monitoring that must be required to hold a portfolio of risky stocks. In this sense, this study asserts that "selling in May" occurs under the parameter of asset risk and those assets with less risk are likely held in the portfolio. This selling causes the price to fall, which is what makes these smallest, riskiest stocks prime targets for purchasing in May. In this way, firm size is the only observable reason behind the high Group 1 portfolio returns, which can only be confirmed by regressing firm size in a future study.

Additionally, given aforementioned information regarding firm quality and firm size, it is likely that the results of this strategy would be even more desirable if firm quality were taken into account. If this study were to be reconstructed, individual stocks would be filtered by firm quality as well as firm size in order to observe the difference in results. In addition, as already mentioned, a regression testing the size effect is necessary in determining the degree of coincidence in the reported findings.

5. A Contrarian Strategy by a Contrarian

5.1 The Vital Few vs. the Trivial Many

George Muzea, author of *The Vital Few and the Trivial Many* has made a lifestyle and a living out of contrarian investing. He follows media indicators during market up trends and down trends

in order to spot bubbles and pick bottoms or tops for investing. Muzea argues that the "follow the herd" mentality is exactly what leads to the bust after the boom. The masses behave irrationally, and this lack of rationale is precisely the platform for a profitable investment strategy.

One of Muzea's many money-making strategies was introduced earlier in this paper. The concept of Tax Loss Buys can be practiced every year in October. Mutual fund managers must offset capital gains with losses each tax year by October 31. This, according to Muzea, "creates an artificial supply for stocks in the September-October period each year as the mutual fund money managers sell their losers to offset capital gains they had during the year" (177). Muzea states that between 1986 and 2005, 67% of all market tops have taken place in the first quarter of the year, and 86% of market bottoms have occurred in the last quarter (178). Therein lays our investment opportunity. This study tests the returns of small cap versus large cap stocks purchased October 31 and sold February 15.

Of course, Muzea would never recommend that an investor to pick just any bundle of stocks to purchase in October and sell in February. He recommends that one follow four guidelines. First, ensure assets surpass liabilities. Subtracting current liabilities plus long term debt from current assets will result in a positive number for a good stock pick. Second, chart all stocks that meet the first criteria, and eliminate the stocks that are not in the lower third of a 10-year price history. Third, the stocks must have at least 30% institutional ownership. Last, the earnings report for the company must show a positive number for earnings the prior quarter (Muzea 178-

179). According to Muzea, once all options are whittled down to meet these criteria, one is left with an ironclad strategy that wins every time.

5.2 Assumptions

For this particular investment strategy, the assumptions are somewhat different than the assumptions for the January and May effects. First and foremost, the time period that Muzea recommends in his book for a long position is less publicized and less well known. As Muzea points out, it is common knowledge that individuals must complete all trades by December 31 in order for the gains and losses to count for the tax year. It is easy to overlook the deadline for mutual fund managers and therefore this time period is less tapped as a seasonal investment. In this sense, it is assumed that there is no mass reaction to mutual fund managers selling off chunks of their portfolios, and therefore, there is an opportunity to pick up stocks whose market prices have been driven down from overselling. In this way, just as the previous two strategies, largest and smallest stocks from S&P 600 are tested over the holding period in order to determine profitability of this time of year. It is assumed that George Muzea's suggestion of buying a set of stocks at the end of October and then selling the portfolio in February is profitable. Granted, Muzea has a number of guidelines that he follows closely in picking stocks. In order to compare his strategy to the other two, it is assumed that a firm size filter will be profitable, though likely not to the same extent as Muzea's portfolios.

5.3 Data & Methodology

The data and methodology used for this strategy is substantially identical to the other two strategies, the only difference being the buy and sell dates. October 31 (or the closest trading

day) is the purchase date and February 15 is the sell date. Just like the January Effect and May strategies, this strategy uses the bottom and top 10% market value stocks out of the S&P 600 for testing purposes. In this way, the parameters indicated by Muzea are not included in this analysis. While Muzea's proposed winning holding period is utilized, the parameters used in this analysis are related to size only, not firm strength.

Just as the results were computed for the previous two seasonal strategies, Excel is used to find returns on the smallest market value and largest market value deciles of the index. The results are then compared to the S&P 600 performance over the holding period, as well as the S&P 600 performance over the full year. The results can be viewed in Table 7 below.

5.4 Results

Table 7

Contrarian "Tax Loss Buys" strategy returns using small cap stocks versus market returns

Year	Group 1	Group 10	Market HPR	Market AR	G1 - MHPR	G10 - MHPR
2001	10.24%	-29.48%	7.93%	13.01%	2.31%	-37.41%
2002	34.94%	3.38%	10.70%	10.57%	24.24%	-7.33%
2003	13.32%	-6.01%	-7.58%	-15.13%	20.90%	1.57%
2004	27.07%	4.92%	9.72%	34.02%	17.35%	-4.80%
2005	14.31%	3.07%	10.17%	21.39%	4.14%	-7.10%
2006	23.35%	6.85%	10.58%	8.65%	12.77%	-3.73%
2007	15.02%	2.16%	8.37%	12.36%	6.65%	-6.21%
2008	-11.13%	-19.15%	-10.50%	-1.02%	-0.63%	-8.65%
2009	-0.37%	-22.18%	-18.30%	-31.17%	17.93%	-3.88%
2010	14.42%	4.26%	8.35%	22.16%	6.07%	-4.09%
Average	14.12%	-5.22%	2.94%	7.48%	11.17%	-8.16%
StDev	13.13%	13.36%	10.77%	19.02%	N/A	N/A

S&P 600 during the Holding Period (Market HPR)

The results for longing the S&P 600 for the holding period of October 31 through February 15 is different from the other two strategies presented. In the other two strategies presented, the S&P 600 yield negative holding period returns, but the holding period by itself for this Tax Loss Buy strategy performs fairly well. In this regard, there is something to be said for the holding period of October 31 through February 15. Muzea is correct in the assertion that this is a great investment holding period, which is attributed to the creation of an over-supply of stocks when mutual fund managers cut their losses by October 31. The holding period returns underperform The S&P 600 yearly returns eight out of ten years, which is normal considering the holding period only represents three and a half months of the year.

As Muzea emphasizes in his book, in order to make this strategy work, one needs to filter out the good stocks. It is not enough to assume this time period will be profitable consistently regardless of securities used in the investment. For instance, the S&P 600 during the holding period does experience high losses during certain years. In 2009 for example, the index loses 18.30% just in the three and a half months. Although the holding period is profitable seven out of ten years, the returns are varied enough to necessitate a careful choosing of stocks in order to ensure consistent profitability.

Group 1

While this study does not follow Muzea's criteria for picking stocks, filtering for firm size works extremely well in this case. Group 1 yields positive returns all years except 2008 and 2009 and outperforms the market for the holding period nine out of ten years, yielding four times the

index average return, at 14.12% versus the 2.94% for the index. In 2008, the year Group 1 underperforms the index, it only underperforms by -.6263%, a very minimal underperformance. Additionally, as reported by the "G1 – MHPR" column, Group 1 strongly outperforms the S&P 600. In 2002, for example, Group 1 has an excess return of 24.24% over the index for the holding period. It is interesting to note that Group 1 also performs better than the market for the full year, even though the investment time horizon is only less than a quarter of the year. If an investor placed $1,000,000 in this strategy in 2001, he/she would have $3,519,443 at the end of the study period, more than triple the original investment! Again, it is very important to mention that timing the market is not right for all investors. When this strategy looses 11.13% in 2008, followed by another down year in 2009, it would be easy for an investor to walk away from this strategy, which means losing out on the 14.42% gain the following year in 2010. The difficulty in committing to this type of investment is very clear, especially when losses can be as big as 11% or larger.

Group 10

Group 10 stocks from October 31 through February 15 underperform the index for the holding period nine out of ten years. The S&P 600 for the holding period has an average return of 2.94% per year, where Group 10 underperforms this result at -5.22% average holding period return per year. There is an elevated difference between smallest S&P 600 stock performance versus largest S&P 600 stock performance for the tax loss buy strategy. In addition, from an excess returns standpoint, Group 10 shows an underperformance every year except for 2003, where is outperforms the S&P 600 by only 1.57%. If an investor put $1,000,000 into this strategy in 2001,

he/she would lose $469,400, about 47% of the original investment, leaving the investor with only $530,599 at the end of 2010.

One would gain higher returns investing in the S&P 600 for the holding period or even for the full year instead of investing in Group 10 stocks. This does not come as a surprise, because larger market value stocks are more efficient than smaller market value stocks and do not present the same opportunity for abnormal returns as do small cap stocks because they are analyzed and traded at a higher frequency. In this sense, similar to the May strategy there is a clear differentiation between small and large cap stocks and it would be interesting to know to what degree size makes a difference in this case, which is left for future inquiries.

Examining Risk Measures

Table 8 below presents the Sharpe and Treynor ratios for Group 1, Group 10, and the S&P 600. It is important to look at the portfolio's return-to-risk ratios in order to evaluate whether or not the portfolios are a worthwhile investment.

Table 8

Risk measures for "Tax Loss Buys" strategy

		Sharpe ratio			Treynor ratio		
Year	**RF**	**Group 1**	**Group 10**	**Market**	**Group 1**	**Group 10**	**Market**
2001	1.88%	0.636	-2.348	0.562	0.090	-0.402	0.111
2002	0.59%	2.617	0.209	0.939	0.372	0.036	0.100
2003	0.40%	0.984	-0.480	-0.742	0.140	-0.082	-0.155
2004	0.31%	2.039	0.345	0.874	0.290	0.059	0.337
2005	0.77%	1.031	0.172	0.873	0.146	0.029	0.206
2006	1.40%	1.672	0.408	0.853	0.237	0.070	0.072
2007	1.69%	1.016	0.035	0.620	0.144	0.006	0.107
2008	0.95%	-0.920	-1.504	-1.064	-0.131	-0.258	-0.020
2009	0.05%	-0.032	-1.664	-1.705	-0.005	-0.285	-0.312
2010	0.02%	1.097	0.317	0.774	0.156	0.054	0.221

Paralleling the risk measures for the "May Effect," the Tax Loss Buys strategy for Group 1 produces higher excess returns per unit of risk every year of the study period. Group 10, however, fares less well than Group 1 in the sense that excess returns for this group are lower per unit of risk than the market every year. The fact that Group 10 generates a loss on average coupled with the fact that it does not compensate very well for risk easily rules Group 10 out for investment purposes. Just as is true for the "May Effect," Group 1 simply yields high enough holding period returns to compensate for the higher risk it generates. In this way, the Group 1 portfolio is a rational investment when transactions costs are ignored on account of high returns coupled with high risk-adjusted returns.

Regression Results

Two regressions are run against market index annual returns. Group 1 and Group 10 returns generated for this strategy are the inputs for the y-variables and S&P 600 index holding period returns are the inputs for the x-variables. Results for the two regressions are presented in Table 9, and the null and alternative hypotheses are stated as,

H_o: $\alpha = 0$

H_a: $\alpha \neq 0$

The regression equation is $y = \alpha + \beta X + \varepsilon$ for each of the regressions tested

Table 9

Regression results using Oct-Feb returns as y-variable and market returns as x-variable

	Group	Beta (β)	β Standard Error	Alpha (α)	α Standard Error
	1	0.924341	0.281132	0.113955	0.029881
S&P 600	**10**	0.780236	0.341189	-0.075153	0.036264

Again, please note that one should approach these results with caution because there are only 10 observations used in these regressions, which makes them far less accurate than regressions that include more observations. However, for the purpose of this study, the results of the regression are such: for Group 1, the null hypothesis is rejected that Tax Loss Buy returns are not different from market returns at the 95% confidence level, because the p-value is less than .05 and the t-statistic is greater than 2.23. In addition, Group 1 has a positive alpha, which indicates the returns from Group 1 outperform the S&P 600 returns. The null hypothesis is not rejected for Group 10, which means Group 10 returns are not statistically different from S&P 600 returns. Because Group 10 includes the largest of the S&P 600 stocks, it is entirely possible that these stocks are analyzed and traded at a higher volume, and are therefore more efficient. Although these stocks are still small cap stocks, for the parameters of this strategy, the smaller the stock, the better.

Approaching the regression from a risk (beta) perspective, we find the Group 1's beta is significant and lower than the S&P 600, where Group 1's beta is no different from the S&P 600. Again, the result that Group 1 statistically outperforms the S&P 600 on a risk-adjusted basis is very strange. If there were more data points included in the regression, this result may be different.

When all of this information is put together – the fact that Group 1 yields higher returns than the market on a risk-adjusted basis and statistically outperforms the market – illustrates that only when one invests in the tiniest stocks of the S&P 600 will one receive abnormal returns.

"Timing the market" has in recent years received a great deal of skepticism, especially in the realm of technical training; however, simply choosing to invest in tiny firms individually once hedge fund managers have sold off portions of their portfolios is a rational strategy even when adjusting for risk.

6. Conclusion

While separate conclusions are drawn for each seasonal anomaly in their respective sections, it is important to state the overall significance of this study. This study rejects January and May seasonality in the way it was discussed in the past. It is my belief that the importance once given to the months of January and May has faded and been arbitraged out by investors mostly because of the use of alternate investment strategies. My interpretation of the January Effect results is that the majority of investors have not executed January-related strategies over the past ten years. Instead, investors have formulated their strategies in spite of once abnormal January returns to overlook the anomalous seasonal trend.

While May returns are not statistically different than any other month, purchasing the bottom market value stocks in May is profitable, especially if held over a six month period (until November). In addition, the less known yearly trend of mutual fund managers selling stocks to create a tax loss in October can be observed as profitable seasonally. My opinion is that this is mostly due to the fact that, with the exception of Muzea's book, the "Tax Effect" has not been touted in the media to the same extent as the January Effect has been over the years; though if it were, it is unlikely the results for this portfolio would be as impressive.

Although the May strategy and George Muzea's tax loss buy strategy beat the market, is it worth making the investment? For the right investor, yes. Taking risk into account, both strategies have higher returns when adjusting for risk than the market. The investor would have to accept a relatively long holding period (roughly three months), which could pose a problem for those who prefer shorter holding periods. Had transactions costs been accounted for in this study, the returns of each strategy would be smaller and these strategies are riskier than the market index. In addition, timing the market creates problems in down years. Most investors would get discouraged if their portfolio lost money one year and potentially take their investment elsewhere. I recommend looking at all presented strategies more for the information derived about investor behavior than the profitability, and I recommend investing in the May and Tax Loss Buys strategies only if the investor is willing to assume all of the parameters mentioned.

The size effect is a key element to this paper that requires further analysis. The smallest stocks tested consistently outperform the largest stocks tested as well as the S&P 600 index. This result may or may not be contrary to Keim's finding, that the size effect is not always present but is observed in certain years. Running further tests on firm size over the time span following Keim's research (1979 to present) would provide more information on the pertinence of the size effect today.

The initial approach to this study was to target a foolproof profitable stock strategy, but through the progression of the study, the interest shifted to a focus on investor behavior as it relates to the efficient market. While the market is made efficient through investor behavior on the

macro market level, there are, nevertheless, untapped opportunities where investors have either overlooked or left a void due to trend following.

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