

# Perspectives on “sell in May and go away”: A look at recent evidence and implications

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## Abstract

This study offers three perspectives on the quote “sell in May and go away.” First, it tests the annual performance of switching from four equity mutual funds to U.S. Treasury Bills during the historically low-return period of May 1 to October 31 against that of the buy-and-hold strategy from November 1 to October 31. Second, it examines the switching strategy during the two bear and two bull markets occurring from 2000 to 2016. Third, it tests the impact of taxes on the switching strategy. Although there are signs of switching strategy effectiveness, especially during the bear markets, the results lack the statistical significance to conclude that it is superior to the buy-and-hold strategy. © 2018 Academy of Financial Services. All rights reserved.

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## 1. Introduction

Here are some memorable wall street quotes:

“You can’t fight the tape” (Hooke, 2010);

“The market can stay irrational longer than you can stay solvent” (Shilling, 1993, from J. M. Keynes, 1920);

“The trend is your friend” (Taylor, 1988); and

“Be fearful when others are greedy and greedy when others are fearful” (Buffet, 2008)

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Another well-known and popular quote is “sell in May and go away.” Its origin is traced to the British saying: “Sell in May and go away and come on back on St. Leger’s Day,” (Brecht, 2016), the day of the final race in Britain’s mid-September Triple Crown. The event marked the return of high-class citizenry from their cooler country residences to the cities, and presumably to the stock-selection hunt.

Today, according to the *Stock Trader’s Almanac* (Hirsch, 2016), the quote refers to the observation that, since 1950, stock returns, as measured by the Dow Jones Industrial Average, have advanced by nearly 7.5% during the months from November through April but only 0.30% during the months from May through October. The May–October period, in particular, is highlighted by September’s historically negative monthly return of  $-0.75\%$ , the worst performing month for equities. Such patterns were first officially published in the *Stock Trader’s Almanac* (Hirsch, 1986). Not surprisingly, given the high correlations across equity market measures, the more-diversified S&P 500 posts an average of 1.14% from November through April compared with 0.25% from May through October.

This study does not challenge these patterns; rather, it points out three additional perspectives centered on the individual investor. First, unlike in some previous studies that use data before the official publication date of the pattern (e.g., Bouman and Jacobsen, 2002; Kochman and Badarinathi, 2008; Kochman, Badarinathi, and Bray, 2014; Lucey and Zhao, 2008; Maberly and Pierce, 2004), or studies that test for the “sell in May” effect by using selected data after the official publication date (e.g., Andrade, Chhaochharia, and Fuerst, 2013; Jones and Lundstrum, 2009), the results in this study begin in 1986, the year that the pattern was first published. Thus, the results go a long way to avoid possible data mining and data-snooping biases that could significantly affect the findings in previous studies, as compellingly pointed out by Sullivan, Timmermann, and White (2001) and by Irwin and Park (2007) regarding calendar year effects in stock prices.

Second, the first two decades of the new century have witnessed, two bear markets, from 2000 to 2002 and from 2007 to 2009, and two bull markets, from 2002 to 2007 and from 2009 to deep into the next decade. How well the switching strategy has held-up during these times is an issue that is unexplored in the literature. As part of this test, there is the opportunity to assess the impact of the global financial crisis of 2008–2009 on the switching strategy.

Third, a recognized but underemphasized issue is one of taxation. The switching strategy is short-term, implying that the gains will be taxed at ordinary rates under the U.S. tax code unless they are sheltered. The buy-and-hold strategy is long-term and, therefore, receives favorable tax treatment under the U.S. tax code when gains are realized after one year (with unrealized gains theoretically being held “forever”). Thus, the after-tax rate of return should be in focus for portfolios that are not tax-sheltered, another perspective that we incorporate.

## 2. A look at the literature

The observation “sell in May” was first officially recognized and published in 1986 in the *Stock Trader’s Almanac*. Published annually since 1968, it reveals a rich array of detailed technical trading tactics and strategies, including the best and worst days to trade stocks

daily, weekly, and monthly, as well as contrarian and inside trading approaches. To assess the efficacy of these approaches, however, two salient points should be kept in mind. First, as the *Almanac*'s author, Hirsch may not be an unbiased reference. Second, technical trading strategies do not align with the large body of evidence supporting the weak form of the efficient markets hypothesis. Beginning with his seminal work on the subject, Fama (1970) has long asserted that evidence of the efficacy of technical trading strategies is sparse, a view supported in other efficient markets studies and by efficient markets advocates (e.g., Bessembinder and Chan, 1998; Chang and Lewellen, 1984; Malkiel, 1995; 2015; Poterba and Summers, 1987; Sewell, 2012). Although exceptions to it have been documented (e.g., Anderson and Smith, 2006; Lo, 2017; Prentis, 2011; Schleifer and Vishnay, 1997; Smith, 2016), Sullivan et al. (2001) point out the flaws in studies of seasonal stock price movements if the data are mined. Similarly, Irwin and Park (2007) show that, while technical trading strategies can be profitable, as indicated in 56 of 95 studies they examine, most of the evidence is subject to data snooping biases, questionable ex-post trading rules, and inaccurate risk adjustments. For the evidence to be compelling, future research must adjust for these issues, as this study attempts to do.

At the outset, the strategy “sell in May and go away” refers to the seasonal observation that the additional reward for bearing more risk is greater from November 1 to April 30 than it is from May 1 to October 31. As a result, a “pure” test of the strategy should be one of maintaining the same degree of risk as the buy-and-hold approach. This means that individual investors should increase their equity investments while the risk premium is higher, such as borrowing through margin accounts. For practical purposes, we take the position that individual investors are more likely to avoid leveraging as part of a plan to move to lower-volatile fixed-income securities, such as U.S. Treasury Bills. With respect to the literature, however, the switch is only a way to test the effectiveness of the observation, which does not explicitly call for it.<sup>1</sup>

As evidence favoring the “sell in May” strategy, Bouman and Jacobsen (2002) document the seasonal effect, also known as the Halloween indicator, because it marks the end of a volatile and unsettling period—from May through October—for stock investors. They find that the effect significantly holds up between 1970 and 1998 in 36 of the 37 developed and emerging markets, with particularly strong effects in Europe. In fact, they find British evidence of it dating back to 1694. They conclude that none of the conventional explanations can compellingly explain this puzzle.

Responding to the patterns published in the *Almanac* in 1986, Aronson and Masters (2006) back-tested the switching strategy from November 1987 through April 2006 based on their own scientific technique. The evidence pointed to annualized returns of 16.3% on the S&P 500 during the high-performance period compared with 3.9% for the low-performing months. Nonetheless, unless investors believe that “history repeats itself”—a characteristic associated with technical analysis and charting—back-testing can easily overstate future performance. That said, the performance differences lead the authors to conclude that the switching strategy offers the most effective way to earn above-average returns among the over 6,000 rules in the *Almanac*.

Kochman and Badarinathi (2008), using the S&P 500 between 1926 and 2004, document that the annualized returns for the periods November through April and May through October

are 15.6% percent and 9.1% percent, respectively. They also find that November–April outperforms May–October by 13.6%, or 19.5% versus 5.9%. However, they recommend investors stay fully invested and switch from high-beta stocks to low-beta stocks as well as sell call options. In a follow-up study, based on eight years of data covering November 2004 through October 2012, Kochman et al. (2014) show that per annum returns for November through April are 10.1%, which significantly offset the negative annualized loss of nearly 1.2% for May through October. They conclude that investors should adjust accordingly to the “sell in May” strategy.

In a comprehensive study, Andrade et al. (2013) present evidence consistent with the “sell in May” strategy. Using MSCI data in local currencies and guided by Bouman and Jacobsen (2002), they show that it is pervasive in financial markets across 37 countries, registering a mean return that exceeds the underperforming months in all 37 countries. More important, the results are not only out-of-sample but also are persistent. Their results support the findings of Bouman and Jacobsen (2002). The effect found is not only statistically significant but is also economically large, and holds across foreign exchange, carry trade, and risk premiums.

In another international study, Borowski (2015) examines the “sell-in-May” effect on 122 equity indices and 39 commodities and across several different periods. He finds, as does Andrade et al. (2013), that the effect holds for November through April. As well, he discovers that it applies to the following periods: from October 15 through May, from November 15 through May, from October 1 through May and from November 1 through May. He also shows that it holds across various return calculations, including daily mean returns. The evidence suggests that markets are not as efficient as many researchers have concluded.

On the other hand, Maberly and Pierce (2004) counter these results, at least for U.S. equities, by adjusting for two major outliers that they assert significantly drive the results of Bouman and Jacobsen: the stock market crash of 1987 and the failure of the hedge fund Long-Term Capital Management in 1998. They extend their analysis to U.S. futures markets and do not find evidence of market inefficiency from 1970 to 2003.

Lucey and Zhao (2008), recognizing the possibility of an exploitable November–April effect, search for evidence of it from 1926 through 2002, but find nothing significant. They suggest that the positive results found in previous studies reflect, at least in part, the January effect. All things considered, the evidence is not strong enough to conclude that markets are inefficient.

Jones and Lundstrum (2009) reach a similar conclusion. They rely on two periods, 1976 to 1998, as did Bouman and Jacobsen (2002), and 1991 to 2006. They use S&P 500 data and a full-year asset allocation strategy between stocks and U.S. Treasury Bills, and find that the cumulative return for a buy-and-hold strategy beats the November–April switching method, registering a return of 17.3% versus 15.0% for 1991 through 2006. Thus, in contrast to studies uncovering profitable opportunities for the “sell in May” thesis, they find that it underperforms for this period. Because this period overlaps with the years in the study by Bouman and Jacobsen (2002), Jones and Lundstrum (2009) cannot rule out that the findings of Bouman and Jacobsen (2002) may be more time-specific than noted in the literature. They point out that the S&P 500 return was 15.5% during the 1980s and 16.5% during the 1990s (each well above the annual average return on equities of approximately 10% from 1928 to

2017). Therefore, it is not clear to what extent investors would have profited from the switching strategy, especially when considering the incentive to “buy and hold,” given the bull market conditions at those times. Furthermore, and because the trading pattern was not revealed until 1986, U.S. investors could not have fully implemented the switching strategy from 1976 to 1998, for example, unless they uncovered it themselves.

Similarly, Dichtl and Drobetz (2015) revisit whether the strategy can still produce above-average market performance. In line with the work of Sullivan et al., (2001) and Lucey and Zhao (2008), they consider which investment instruments investors had at their disposal, given limited data, in the interest of mitigating data mining and snooping biases. Using a bootstrap approach, they find the “sell in May” strategy is becoming less effective over time, even disappearing in some instances. They conclude that the evidence is consistent with market efficiency.

With the three perspectives in mind, does the switching strategy outperform the buy-and-hold approach from 1986 through 2016? Alternatively, which side of the literature do the results support? In addressing these questions, this study fits within the literature on the timing of security transactions, long of interest in the *Review*. For example, early studies explore whether active stock trading outside January is worthwhile (Mann and Solberg, 1991), whether dollar-cost-averaging adds value (Knight, 1992), and whether it is profitable to trade equity mutual funds (Radcliffe, 1992). Later studies explore tax harvesting (Smith-Hwang and Smith, 2008), batch trades (Johnson and Newman, 2012), and turn-of-the-month effects (Chen, Shin, and Sun, 2015).

### 3. Mutual funds and data

The attention is on individual investors in U.S. markets, given the focus of the *Stock Trader's Almanac* and the well-documented “home bias” of U.S. investors (Coval and Moskowitz, 1999; Li and Zhao, 2016). The approach follows in the spirit of Sullivan et al. (2001) and Irwin and Park (2007) by avoiding data mining and data-snooping biases as much as possible. It also follows the recommendation of Jones and Lundstrum (2009) by beginning the analysis at the 1986 publication date and extending it through October 2016.

In the spirit of Jones and Lundstrum (2009), who take a critical stand against indices that individual investors can never realistically own, such as the S&P 500 or the Russell 2000, four mutual funds are in focus. Each has a history dating back to at least 1986 and would be available to investors during the study period. As a move toward completeness and representation across categories, the four mutual funds encompass large-cap stocks, small-cap stocks, and mid-cap stocks. They also include a balanced fund to determine if the “sell-in-May” effect holds for investors who pursue a blended investment strategy of stocks and bonds. The four funds are as follows:

- Vanguard 500 index fund (“Large-Cap Fund”)
- Clearbridge small-cap fund (“Small-Cap Fund”)
- Dreyfus mid-cap fund (“Mid-Cap Fund”)
- Vanguard Wellesley income fund (“Balanced Fund”)

The choice of funds, while realistic and prudent, is not random. It is influenced by the availability of data. Because the small-firm effect was not widely acknowledged until the 1980s, there are few small-cap and mid-cap funds that have existed from 1986 through 2016. That said, we cannot rule out some degree of survivorship bias, especially regarding the Small-Cap and Mid-Cap Funds, each of which is actively managed, as opposed to the passively-managed Large-Cap and Balanced Funds. To be as objective as possible, in the spirit of Harvey, Liu, and Hequing (2016), with the individual investor in mind, the choice of the Small-Cap and Mid-Cap Funds is random from the website of Fidelity Investments (2016). With the exception of the Large-Cap Fund, the choice of the other funds largely confines generalizations to them. Whether the results hold for similar-styled mutual funds that began at later dates and still exist today is an empirical issue left to future research.

From the perspective of individual investors, the data are “friendly.” They come from the finance section of Yahoo, where historical price data, incorporating stock splits and dividends, are readily found and are easily downloaded to compute the respective rates of return for each fund. Rates of return are compounded daily for each of them. Aligned with the view of Jones and Lundstrum (2009), the data from academic sources, such as from CRSP or COMPUSTAT, are not used, because the average active investor does not have access to them. In step with the literature, three-month U.S. Treasury Bill returns apply for the period May through October. They come from the historical series of the Federal Reserve Bank of Chicago.

Three points guide the three perspectives. First, while brokerage fees can vary widely across financial advisory firms, the variety of low-cost, discount brokerage fee services readily available leads us to assume that brokerage fees have a minimal impact on fund performance. Second, the results from the switching strategy, both in terms of returns and risk-adjusted returns, are compared with those of the traditional buy-and-hold approach. Third, as described in more detail in the next section, the Wilcoxon Signed-Rank Test, which is designed for comparative results of the kind in this study, is used to test the effectiveness of the switching strategy. These points, along with the two contrasting strands of literature, motivate the following hypothesis to be tested:

*The switching strategy, as drawn from the Stock Trader’s Almanac, does not outperform the buy-and-hold strategy annually across the four mutual funds.*

The next section presents the results with three subsections, one for the switching strategy, one for the bear-bull analysis, and one for the tax considerations. Additional subsections under the switching strategy cover annual returns and annual risk-adjusted returns based on the Sharpe portfolio performance ratio. The last section concludes the study.

#### **4. Results**

To further motivate the analysis, the examination first centers on the performance of the switching strategy relative to that of the Wilshire 5000, the broadest of all domestic market indices. The results are presented in Table 1, which includes means, medians, maximums, minimums, and volatilities, as measured by annual standard deviations.

From a return perspective, the switching strategy outperforms the buy-and-hold strategy on nine occasions, or in 30% of the years. The buy-and-hold approach registers a higher

Table 1 Summary statistics of switching from holding the Wilshire 5000 from November 1 of each year to April 30 of the next year to holding three-month U.S. Treasury Bills from May 1 to October 31 of each year

	Wilshire 5000
No. of switching outperform years	9 years
Percentage of time (over 30 years)	30.00%
Mean return (switching)	10.63%
Mean return (buy-and-hold)	12.33
Median return (switching)	11.94
Median return (buy-and-hold)	15.26
Max return (switching)	32.77
Min return (switching)	-10.24
Max return (buy-and-hold)	39.41
Min return (buy-and-hold))	-34.94
Volatility ( $\sigma$ ) (switching)	9.86
Volatility ( $\sigma$ ) (buy-and-hold)	16.07

Included are the means, medians, maximums, minimums, and standard deviations for the switching strategy and the buy-and-hold strategy.

mean return, at 12.33%, than the 10.63% for the switching strategy, a 16% difference. The volatility of the buy-and-hold approach, however, is 16.07%, or 63% higher than that of the switching strategy at 9.86%. These results indicate that the additional return earned from holding an index fund that tracks the Wilshire 5000 does not fully compensate for the additional risk incurred compared with that of the switching strategy. This difference is an incentive for individual investors to search for an alternative to the buy-and-hold strategy. Is the “sell in May” approach a worthy alternative? To answer this question, the analysis begins with an overview of the returns and volatilities for both strategies.

#### 4.1. First perspective: Returns and volatilities

The starting date, following the publication of the pattern for the first time in *the Stock Trader's Almanac* (1986), is November 1, 1986. The ending date is October 31, 2016. The switch into three-month U.S. Treasury Bills occurs from May 1 through October 31 of a given year. A summary of the results is in Table 2 for both the switching strategy and the buy-and-hold approach.

To motivate statistical tests of the difference in the results between the two strategies, in terms of salient features, for the Large-Cap Fund, the switching strategy outperforms the buy-and-hold approach on a return basis, which is a periodic stochastic process that relies on the arithmetic mean, in 8 of the 30 years.<sup>2</sup> Second, at 7.90%, the buy-and-hold mean at 10.66% is 276 basis points higher, or 34%, and the larger median difference is 643 basis points. Third, the biggest difference in return performance by year occurs during the global financial crisis, 2,429 basis points, or -36.13 versus the switching strategy at -11.84%. Fourth, and similar to the results found with the Wilshire 5000, the mean and median return differences favoring the buy-and-hold approach come at the expense of significantly higher volatility, or 15.77% versus 9.08%, a 66% increase. Given the difference in returns, this signals that the additional return earned from the buy-and-hold approach does not fully

Table 2 Summary statistics of switching from holding the four mutual funds from November 1 of each year to April 30 of the next year to holding three-month U.S. Treasury Bills from May 1 to October 31 of each year

	Large-Cap Fund	Small-Cap Fund	Mid-Cap Fund	Balanced Fund
No. of switching outperform years	8 years	15 years	11 years	5 years
Percentage of time (over 30 years)	26.67%	50.00%	36.67%	16.67%
Mean return (switching)	7.90%	11.78%	10.38%	4.62%
Mean return (buy-and-hold)	10.66	12.85	11.48	9.00
Median return (switching)	8.04	10.50	11.31	4.29
Median return (buy-and-hold)	14.47	9.50	16.00	8.78
Max return (switching)	25.98	43.24	29.77	12.94
Min return (switching)	-11.84	-23.85	-11.93	-5.30
Max return (buy-and-hold)	33.10	57.51	49.40	22.07
Min return (buy-and-hold)	-36.13	-52.90	-46.22	-14.25
Volatility ( $\sigma$ ) (switching)	9.08	13.73	10.93	3.86
Volatility ( $\sigma$ ) (buy-and-hold)	15.77	24.33	19.33	8.19

Included are the means, medians, maximums, minimums, and volatilities, as measured by annual standard deviations, for the switching strategy and the buy-and-hold strategy.

compensate for the additional risk incurred. While the “what if” claim that the buy-and-hold strategy would have shown more positive results had the financial crisis of 2008–2009, a rare event that is essentially an outlier, not occurred, the position in this study is “what occurred is what occurred.”

For the Small-Cap Fund, the switching strategy outperforms the buy-and-hold approach on a return basis in 15 of the 30 years. While the buy-and-hold approach registers the highest return during the high-return period of November through April, at 57.51%, it also incurs the largest loss, as seen in the 52.90% drop during the global financial crisis. These results are not particularly surprising when viewed in the light of the volatility of small-cap stocks. Historically, according to Ibbotson & Associates (2018), it averages 23%, and when compared with approximately 17% for large-cap stocks, the expectation is for a larger low-high range. There is also a difference of 108 basis points between the median returns, and at over 40% less volatility, additional evidence that the buy-and-hold approach is not compensating investors sufficiently for the additional risk incurred.

The Mid-Cap Fund switching strategy beats the buy-and-hold approach in 11 of the 30 years. As with the Large-Cap and Small-Cap Funds, the switching strategy carries much lower volatility than the buy-and-hold approach, 10.93% versus 19.33%. This is yet more evidence of compensation falling short of that needed to cover the additional risk for the buy-and-hold strategy.

The Balanced Fund displays a large difference in mean and median returns between the two strategies, at 4.62% versus 9.00%, a difference of 438 basis points for the means, with the spread in the medians of 449 basis points. The switching strategy outperforms the buy-and-hold method in five of the 30 years. It can be argued that this fund, while passively managed, already contains a risk-reduction element in the approximately 60% of fixed-income securities it has historically held. While the switching strategy lowers the risk of the fund from 8.19% to 3.86%, the reduction comes with a much lower return, 4.62% versus 9.00%.

Table 3 This table provides the annual rates of return for the switching strategy for each of the four funds, November 1, 1986 to October 31, 2016

	Large-Cap Fund	Small-Cap Fund	Mid-Cap Fund	Balanced Fund
1986	11.42%	18.93%	19.98%	-1.16%
1987	6.04	20.74	22.57	6.64
1988	10.88	21.59	15.61	6.38
1989	-0.58	-5.34	0.00	-1.10
1990	25.98	41.66	29.77	12.94
1991	7.55	5.71	5.46	3.98
1992	6.82	9.09	11.58	10.20
1993	-2.00	-0.68	-1.93	-5.30
1994	10.94	2.05	4.97	9.41
1995	14.26	25.10	15.73	4.11
1996	15.20	5.60	-0.61	4.38
1997	22.93	13.67	12.66	9.65
1998	22.87	43.24	25.59	3.84
1999	7.82	6.23	28.90	0.37
2000	-11.84	-3.92	-7.73	8.83
2001	2.39	28.97	19.20	3.59
2002	4.50	11.91	1.48	5.13
2003	6.32	4.03	7.25	4.19
2004	3.54	6.63	3.84	3.85
2005	10.05	12.73	14.68	4.15
2006	8.95	17.17	11.56	6.09
2007	-9.56	-23.85	-11.93	-1.13
2008	-8.50	3.53	-3.83	0.99
2009	15.64	27.78	21.21	7.67
2010	16.28	16.87	20.81	5.98
2011	12.71	13.30	11.06	6.72
2012	14.33	18.77	21.15	6.55
2013	8.26	6.09	7.08	5.51
2014	4.35	3.16	7.55	2.96
2015	-0.65	2.62	-2.15	3.24

For example, 11.42% represents the rate of return on the Large-Cap Fund from November 1, 1986 to April 30, 1987, followed by the switch into three-month U.S. Treasury Bills from May 1, 1987 to October 31, 1987.

#### 4.1.1. Yearly returns: Switching strategy versus buy-and-hold approach

For a detailed look at the summary annual rates of return in Table 2, Table 3 corresponds to the switching strategy while Table 4 refers to the buy-and-hold approach. The respective returns provide a means to test statistically the effectiveness of the switching strategy as an alternative to the buy-and-hold approach on a return basis for each of the four funds.

As expected from their respective compositions, the Balanced Fund is the steadiest performer while the Small-Cap Fund shows the most fluctuation. To test for differences, the nonparametric Wilcoxon Signed-Rank Test comes into focus. Anderson and Loviscek (2005), Derrick and White (2017), and Higgins and Peterson (1998) show its power for pairwise tests. Moreover, it is more robust with respect to outliers (e.g., the large drop in stock returns during the financial crisis of 2008–2009) and heavy-tail distributions than the “t” test. Under the null hypothesis that no difference exists in the average signed ranks of the returns between the switching strategy and the buy-and-hold strategy leads to the following “Z” statistics and “p-values” for each of the four funds:

## Tests of return differences: Switching strategy vs. buy-and-hold approach

Large-Cap:	$Z = -1.84; p = 0.03$
Small-Cap:	$Z = -0.31; p = 0.37$
Mid-Cap:	$Z = -0.84; p = 0.20$
Balanced:	$Z = -3.61; p = 0.00$

The results indicate that the buy-and-hold strategy for the Large-Cap Fund, which registers higher returns than the switching strategy in 22 of the 30 years, and that for the Balanced Fund, which outperforms it in 25 of the 30 years, display significant results at the 5% level. No significant difference appears to exist for the Small-Cap and Mid-Cap Funds. Thus, at this level of analysis, the buy-and-hold approach appears preferable to the switching strategy for the Large-Cap and Balanced Funds for investors who can tolerate the higher risks of not switching to U.S. Treasury Bills. For investors holding the Small-Cap and Mid-Cap

Table 4 This table provides the annual rates of return for the buy-and-hold strategy for each of the four funds, November 1, 1986 to October 31, 2016

	Large-Cap Fund	Small-Cap Fund	Mid-Cap Fund	Balanced Fund
1986	-2.01%	-17.54%	-8.13%	-3.93%
1987	14.51	20.45	23.47	15.53
1988	22.96	37.60	28.07	17.05
1989	-7.62	-14.68	-14.03	0.90
1990	33.10	53.06	49.40	22.07
1991	9.78	8.05	6.22	11.27
1992	14.75	32.80	27.53	19.40
1993	3.72	-6.20	1.20	-5.36
1994	26.27	9.01	20.53	21.68
1995	23.98	26.01	17.89	12.87
1996	32.00	33.93	26.78	17.84
1997	21.92	-5.61	-15.14	13.48
1998	25.66	57.51	30.65	0.32
1999	6.21	9.06	31.07	8.71
2000	-25.00	-24.95	-21.40	12.01
2001	-15.16	9.15	-0.37	2.10
2002	20.63	52.26	25.41	8.72
2003	9.25	2.08	12.48	8.84
2004	8.60	18.59	16.58	4.80
2005	16.18	8.34	16.70	10.86
2006	14.43	10.82	8.38	8.41
2007	-36.13	-52.90	-46.22	-14.25
2008	9.86	38.93	15.41	17.53
2009	16.39	25.75	19.98	13.50
2010	7.91	-8.96	4.52	8.15
2011	15.05	9.46	10.67	11.72
2012	26.97	33.37	34.93	7.98
2013	17.07	10.97	17.12	8.55
2014	5.07	-0.26	6.79	3.26
2015	3.30	9.53	-2.00	5.89

For example, -2.01% represents the rate of return on the Large-Cap Fund from November 1, 1986 to October 31, 1987.

Table 5 This table illustrates annual Sharpe ratios for each fund for the switching strategy, November 1, 1986 to October 31, 2016

	Large-Cap Fund	Small-Cap Fund	Mid-Cap Fund	Balanced Fund
1986	0.29	0.96	0.45	-0.62
1987	-0.03	1.20	1.01	0.02
1988	0.23	1.29	0.45	-0.27
1989	-1.52	-1.13	-0.50	-2.03
1990	2.14	2.13	0.78	1.50
1991	0.37	0.21	0.14	0.11
1992	1.27	0.55	0.65	1.26
1993	-0.78	-0.48	-0.22	-1.00
1994	0.74	-0.52	-0.06	0.58
1995	1.73	2.79	0.30	-0.16
1996	0.77	0.05	-0.39	-0.06
1997	2.29	0.81	0.35	0.47
1998	1.93	1.99	1.23	-0.07
1999	0.17	0.03	0.73	-0.42
2000	-1.04	-0.35	-0.16	0.97
2001	0.10	1.28	1.24	0.25
2002	0.26	0.67	0.04	0.58
2003	0.88	0.32	0.99	0.89
2004	0.09	0.34	0.09	0.24
2005	1.23	0.36	1.14	-0.08
2006	0.79	0.62	1.01	0.22
2007	-1.18	-1.43	-1.24	-0.61
2008	-0.42	0.12	-0.19	0.11
2009	1.76	3.11	2.12	1.83
2010	2.22	1.94	2.97	1.39
2011	1.93	1.40	1.32	1.85
2012	2.24	2.21	3.02	1.30
2013	1.28	0.73	0.87	1.07
2014	0.56	0.13	0.99	0.59
2015	-0.14	0.14	-0.26	0.44
Mean	0.67	0.72	0.63	0.35

For example, 0.29 represents the Sharpe ratio for the Large-Cap Fund from November 1, 1986 to October 31, 1987, with the switch into three-month U.S. Treasury Bills occurring from May 1, 1987 to October 31, 1987. All successive years follow this pattern. Annual U.S. Treasury Bill rates of return measure the risk-free rates of return and annual standard deviations of the fund returns measure the risks.

Funds, the results suggest no difference in the results from using the switching strategy or holding the funds for the entire 12 months.

#### 4.1.2. Switching and buy-and-hold strategies: Risk-adjusted returns

As Table 2 shows, however, the higher returns come at the price of higher risk. As a result, Table 5 and Table 6 illustrate annual Sharpe ratios for the switching strategy and the buy-and-hold approach, respectively.

The smallest Sharpe ratios are in the recession years of the first decade of the 21st century, as low as -1.87 for the Large-Cap Fund, with the largest ratios in the post-financial crisis period, especially in 2012, with a high of 3.21 for the Small-Cap Fund. Between the two tables, the means are higher for the Large-Cap and Balanced Funds but smaller for the Small-Cap and Mid-Cap Funds. The difference in the means of the Balanced Fund between the two strategies is

relatively large, 0.84 versus 0.35. To test for the differences between the two tables, the “Z” and “p-value” statistics, according to the Wilcoxon Signed-Rank Test, are as follows:

Tests of Sharpe Ratio differences: Switching strategy vs. buy-and-hold approach

Large-Cap:	Z = -1.22; p = 0.11
Small-Cap:	Z = -0.44; p = 0.33
Mid-Cap:	Z = -0.03; p = 0.49
Balanced:	Z = -3.47; p = 0.00

At the 5% level, only the Balanced Fund registers a statistically significant difference, and one that favors the buy-and-hold approach. For perspective with the Large-Cap Fund, in a series of simulations with the standard deviation of the switching strategy returns held

Table 6 This table illustrates annual Sharpe ratios for each fund for the buy-and-hold strategy, November 1, 1986 to October 31, 2016

	Large-Cap Fund	Small-Cap Fund	Mid-Cap Fund	Balanced Fund
1986	-0.25	-0.70	-0.32	-0.80
1987	0.54	0.89	0.92	0.81
1988	0.97	1.97	0.95	1.01
1989	-0.97	-1.37	-0.98	-0.73
1990	2.17	2.81	1.37	2.15
1991	0.50	0.32	0.16	1.03
1992	1.92	2.67	1.58	2.63
1993	-0.02	-0.70	-0.10	-0.81
1994	2.52	0.26	1.05	1.92
1995	2.19	1.55	0.34	1.03
1996	1.50	1.73	1.12	0.97
1997	0.83	-0.31	-0.54	0.76
1998	1.54	1.67	1.32	-0.40
1999	0.03	0.18	0.59	0.23
2000	-1.52	-0.96	-0.33	1.24
2001	-0.80	0.24	-0.09	0.04
2002	1.32	2.45	1.64	1.08
2003	1.14	0.06	1.11	1.89
2004	0.69	1.06	1.11	0.44
2005	1.71	0.14	0.96	0.92
2006	1.21	0.27	0.43	0.51
2007	-1.87	-1.60	-1.67	-1.69
2008	0.42	1.02	0.64	1.63
2009	0.87	1.14	1.07	2.00
2010	0.45	-0.37	0.26	1.10
2011	1.46	0.69	0.77	2.48
2012	2.84	3.21	3.09	1.10
2013	2.14	0.80	1.61	1.41
2014	0.34	-0.02	0.50	0.40
2015	0.29	0.57	-0.21	0.80
Mean	0.81	0.66	0.61	0.84

For example, -0.25 represents the Sharpe ratio for the Large-Cap Fund from November 1, 1986 to October 31, 1987. All successive years follow this pattern. Annual three-month U.S. Treasury Bill rates of return measure the risk-free rates of return and annual standard deviations of the fund returns measure the risks.

constant at 9.08%, as taken from Table 2, the mean value of the Sharpe ratios has to increase to at least 1.04 and have Sharpe ratios that exceed those of the buy-and-hold approach in at least 22 of the 30 years to outperform statistically the buy-and-hold approach. This is a large increase from the mean of 0.67, indicating the difficulty of outperforming a broad market index. Although the evidence indicates that the switching strategy does not outperform the buy-and-hold approach of the Large-Cap, Small-Cap, and Mid-Cap Funds, it also indicates that the buy-and-hold approach for each of these funds does not offer superior performance. As a result, investors who have been drawn to the switching strategy have probably not realized significant risk-adjusted return underperformance with respect to these three funds. It is conceivable that other small-cap and mid-cap funds, including ETFs, offer superior switching strategy effectiveness. Finding these funds, however, given the body of evidence supporting market efficiency, is unlikely to be easy.

The Balanced Fund's results signal that investors drawn to the switching strategy would be served well to combine this fund with the buy-and-hold approach. It is the only fund that appears to compensate for the additional risk of not switching into U.S. Treasury Bills.

So far, the results indicate that while the buy-and-hold strategy falls short of compensating investors for the additional risk incurred from May 1 to October 31, the switching strategy does not outperform it. They lead to the conclusion not to reject the hypothesis under test; namely, that the switching strategy does not outperform the buy-and-hold strategy, as drawn from *The Stock Trader's Almanac* (2016). The evidence is in contrast to the results in previous studies, such as in Andrade et al., (2013), Borowski (2015), and Bouman and Jacobsen (2002). Overall, the findings here align with those of, for example, Dichtl and Drobetz (2015), Lucey and Zhao (2008), and Jones and Lundstrum (2009). Their results lead them to question the effectiveness of following the "sell in May" observation. Collectively, they conclude that the results supporting it use time-specific data that do not fully align with the publication dates of the observation, and that U.S. markets have largely adjusted to it.

#### 4.2. *Second perspective: Bear-bull analysis*

For the second perspective, there are two bear markets and two bull markets from December 1999 through October 2016. In all four instances, price changes exceed 20%. While 20% is somewhat arbitrary, it is the standard benchmark (thestreet.com, 2018). Given the small number of observations in each case, only descriptive statistics are reported. Moreover, given the uniqueness in bear and bull markets, caution is in order when making generalizations. The first bear market is from March 2000 through October 2002. Within this span, there are three switching opportunities: November 1999 to April 2000, followed by the May–October switch; November 2000 to April 2001, followed by the May–October switch; and November 2001 to April 2002, followed by the May–October switch. The analysis for the first bear market is provided in Table 7.

For the Large-Cap Fund, the switching strategy shows a return of 7.82% from November 1999 to October 2000, outperforming the buy-and-hold approach by 161 basis points. (Although not shown in the table, the Large-Cap Fund registers a decline of over 6% in the first quarter of 1999, followed by a rise of over 10% by the third quarter of 2000 before continuing its descent into the fourth quarter and into 2002.) Given the returns of –11.84%

Table 7 This table provides the results for each of the four funds during the first bear market of the 21st century, or from March 2000 through October 2002

	Large-Cap Fund	Small-Cap Fund	Mid-Cap Fund	Balanced Fund
Nov. 1999 to Apr. 2000				
May 2000 to Oct. 2000				
Total return (switching)	7.82%	6.23%	28.90%	0.37%
Total return (buy-and-hold)	6.21	9.06	31.07	8.71
Nov. 2000 to Apr. 2001				
May 2001 to Oct. 2001				
Total return (switching)	-11.84	-3.92	-7.73	8.83
Total return (buy-and-hold)	-25.00	-24.95	-21.40	12.01
Nov. 2001 to Apr. 2002				
May 2002 to Oct. 2002				
Total return (switching)	2.39	28.97	19.20	2.59
Total return (buy-and-hold)	-15.16	9.15	-0.37	2.10

Three switching periods occur during this time.

and 2.39% in the following periods, compared with -25.00% and -15.16% for the buy-and hold approach—a mean difference of over 1000 basis points across the three switching periods—the switching strategy was an effective hedge during this bear market.

A similar impact occurs with the Small-Cap and Mid-Cap Funds. In fact, they display double-digit gains during the period November 2001–October 2002 with the switching strategy. The Balanced Fund posts gains throughout the bear market, with the buy-and-hold approach registering increases that are greater overall than those of the switching strategy. All told, the switching strategy helped to limit losses during this period, at least with respect to the four funds, compared with the buy-and-hold method, expectedly so given the “risk-free” attributes of U.S. Treasury Bills.

Table 8 represents the rates of return on the four funds in the second bear market. It records two switching strategies. Each fund posts losses during the switching period, with the Small-Cap Fund registering the largest, at -52.90%, and the Balanced Fund displaying the smallest, at -1.13%. The difference in losses between the switching and buy-and-hold strategies is striking at over 7,800 basis points during the first switching strategy, with the Mid-Cap Fund registering the largest difference at over 3,400 basis points. When combined

Table 8 This table provides the results for each of the four funds during the second bear market of the 21st century, or from October 2007 through March 2009

	Large-Cap Fund	Small-Cap Fund	Mid-Cap Fund	Balanced Fund
Nov. 2007 to Apr. 2008				
May 2008 to Oct. 2008				
Total return (switching)	-9.56%	-23.85%	-11.93%	-1.13%
Total return (buy-and-hold)	-11.23	-52.90	-46.22	-14.25
Nov. 2008 to Apr. 2009				
May 2009 to Oct. 2009				
Total return (switching)	-8.50	3.53	-3.83	0.99
Total return (buy-and-hold)	9.86	38.93	15.41	17.53

Two switching periods occur during this time.

Table 9 This table provides the results of the four funds during the first bull market of the 21st century, or from November 2003 through October 2007

	Large-Cap Fund	Small-Cap Fund	Mid-Cap Fund	Balanced Fund
Nov. 2003 to Apr. 2004				
May 2004 to Oct. 2004				
Total return (switching)	6.32%	4.03%	7.25%	4.19%
Total return (buy-and-hold)	9.25	2.08	12.48	8.84
Nov. 2004 to Apr. 2005				
May 2005 to Oct. 2005				
Total return (switching)	3.54	6.63	3.84	3.85
Total return (buy-and-hold)	8.60	18.59	16.58	4.80
Nov. 2005 to Apr. 2006				
May 2006 to Oct. 2006				
Total return (switching)	10.05	12.73	14.68	4.15
Total return (buy-and-hold)	16.18	8.34	16.70	10.86
Nov. 2006 to Apr. 2007				
May 2007 to Oct. 2007				
Total return (switching)	8.95	17.17	11.56	6.09
Total return (buy-and-hold)	14.43	10.82	8.38	8.41

Four switching periods occur during this time.

with the results in Table 7, the switching strategy helped to limit losses during this period and may serve as a guide in future bear markets.

Table 9 displays the results from the first bull market of the 21st century, with four switching strategies occurring. All returns are positive. The buy-and-hold strategy records higher returns in 12 of the 16 comparisons, displaying double-digit returns in eight instances compared with the five for the switching strategy. For the Small-Cap and Mid-Cap Funds, the buy-and-hold approach registers impressive double-digit gains in the second switching period, or 18.59% and 16.58%, respectively, with the Mid-Cap Fund recording a higher gain by 1,274 basis points. Both the buy-and-hold Large-Cap and Balanced Funds show higher returns in all four switching periods.

Table 10 illustrates the returns across the four funds during the second bull market, or from March 2009 through October 2016. Across all 32 returns, the buy-and-hold outperforms the switching strategy 23 times. The Small-Cap Fund shows a jump of 38.93% in the immediate post-financial crisis period, followed by a return of 25.75% in the next period. Together, they help to offset most (but not all) of the loss of 52.90% during the bear market of 2007–2009.

Although it does not post the highest returns, the steadiest performer during this period is the Balanced Fund, registering double-digit gains on three occasions, with the highest at 17.53%. However, the degree of risk tolerance of the investor comes into play, considering the higher risk of the buy-and-hold approach.

These results suggest that the switching strategy can be a worthy alternative to the buy-and-hold approach during risk-off periods, at least with respect to the four mutual funds, tempering somewhat the failure to reject the hypothesis under test. Because the strategy calls for a move into U.S. Treasury Bills during the flat-to-down months of the year, it shows the increase in portfolio performance through risk reduction. As a result, individual investors may want to “buy and hold”

Table 10 The table provides the results across the four funds during the second bull market of the 21st century, or from March 2009 through October 2016

	Large-Cap Fund	Small-Cap Fund	Mid-Cap Fund	Balanced Fund
Nov. 2008 to Apr. 2009				
May 2009 to Oct. 2009				
Total return (switching)	-8.50%	3.53%	-3.83%	0.99%
Total return (buy-and-hold)	9.86	38.93	15.41	17.53
Nov. 2009 to Apr. 2010				
May 2010 to Oct. 2010				
Total return (switching)	15.64	27.78	21.21	7.67
Total return (buy-and-hold)	16.39	25.75	19.98	13.50
Nov. 2010 to Apr. 2011				
May 2011 to Oct. 2011				
Total return (switching)	16.28	16.87	20.81	5.98
Total return (buy-and-hold)	7.91	-8.96	4.52	8.15
Nov. 2011 to Apr. 2012				
May 2012 to Oct. 2012				
Total return (switching)	12.71	13.30	11.06	6.72
Total return (buy-and-hold)	15.05	9.46	10.67	11.72
Nov. 2012 to Apr. 2013				
May 2013 to Oct. 2013				
Total return (switching)	14.33	18.77	21.15	6.55
Total return (buy-and-hold)	26.97	33.37	34.93	7.98
Nov. 2013 to Apr. 2014				
May 2014 to Oct. 2014				
Total return (switching)	8.26	6.09	7.08	5.51
Total return (buy-and-hold)	17.07	10.97	17.12	8.55
Nov. 2014 to Apr. 2015				
May 2015 to Oct. 2015				
Total return (switching)	4.35	3.16	7.55	2.96
Total return (buy-and-hold)	5.07	-0.26	6.79	3.26
Nov. 2015 to Apr. 2016				
May 2016 to Oct. 2016				
Total return (switching)	-0.65	2.62	-2.15	3.24
Total return (buy-and-hold)	3.30	9.53	-2.00	5.89

Eight switching periods occur during this time.

during bullish periods and use the switching strategy during bearish periods. However, this comes with the caveat that some market timing is in order, a difficult practice for individual investors, as Barber and Odean (2000) and Barber et al. (2001) demonstrate.

#### 4.3. Third perspective: tax considerations

For the third perspective, investors need to be circumspect of the impact of taxes on their returns. While this consideration is obvious, Barber and Odean (2004) find that investors trading activities undercut their after-tax returns, leading to subpar after-tax performance. By realizing gains faster than losses, it seems they do not capitalize fully on tax-avoidance strategies in their quest to earn high returns, often failing to defer the realization of capital gains to lower rates in the United States. As insight into this issue, Table 3, which provides the annual returns for the switching strategy for each of the four funds, becomes the focus.

The maximum marginal income tax rate is applied on short-term capital gains to each of the positive returns, with changes noted in the maximum rate, beginning with 38.5% in 1987 (that is the tax rate applied to gains from November 1, 1986 through October 31, 1987). There is a drop to 31% between 1988 and 1991 before an increase to 39.6% from 1993 to 2000. A drop to 35% follows from 2003 to 2012 before the rate increases back to 39.6% through 2016. (For ease of calculation, the Medicare tax surcharge, the phase-out of partial itemized deductions, carryover losses, and state and local income taxes are set aside.) Because the tax rates lower the returns in Table 3, and because the statistical evidence favors the buy-and-hold approach (that can apply for many years) with Large-Cap and Balanced Funds, the switching strategy should not be expected to outperform its alternative, at least on a return basis. The Wilcoxon Signed-Rank Test relative to the returns on the buy-and-hold results listed in Table 4 leads to the following results:

Tests of after-tax return differences: Switching strategy vs. buy-and-hold approach

Large-Cap:	$Z = -2.62; p = 0.00$
Small-Cap:	$Z = -1.63; p = 0.05$
Mid-Cap:	$Z = -1.94; p = 0.03$
Balanced:	$Z = -3.96; p = 0.00$

The statistics indicate outperformance by the buy-and-hold approach. The implication is that, particularly in bull markets, investors should use the switching strategy in a tax-sheltered account if it is to be a satisfactory alternative to the buy-and-hold method. It aligns more closely with the preferential treatment given to long-term capital gains in the United States than a non-sheltered tax account.

## 5. Conclusion

With the focus on individual investors, this study offers three perspectives on the quote “sell in May and go away.” The data apply from November 1, 1986, the publication year of the quote, to October 31, 2016, as drawn from *The Stock Trader’s Almanac* (2016), centered on four mutual funds. They represent large-cap equity (Vanguard 500 Index), small-cap equity (ClearBridge), mid-cap equity, (Dreyfus), and balanced equity-fixed income (Vanguard Wellesley Income). First, each of the four funds is held from November 1 through April 30, followed by a switch to U.S. Treasury Bills for the remaining months. The performance on a return basis and on a risk-adjusted return basis is compared with the performance of the buy-and-hold approach. Although the results suggest that the buy-and-hold approach does not fully compensate investors for the increase in risk incurred from May 1 through October 31, statistical tests do not lead to the rejection of the hypothesis under test; namely, that the switching strategy does not outperform the buy-and-hold strategy. This finding aligns with the body of literature that questions the effectiveness of the statement “sell in May and go away” as a market-beating method. As recent research demonstrates,

evidence favoring the strategy in prior studies may not only be time-specific, but it also may no longer hold, as U.S. markets have largely adjusted to it.

The findings from the balanced fund may be a draw for individual investors. The buy-and-hold approach, given the fund's composition of equities and fixed-income securities, registers statistically superior performance, both on a return basis and on a risk-adjusted return basis, compared with that of the switching strategy.

Second, this study examines the performances of the two bear markets and the two bull markets that occurred from 2000 through 2016 to test the switching strategy during each period. With caution about making generalizations given the uniqueness of each bear and bull market, the switching strategy registers superior return performance over the buy-and-hold approach during these bear markets, while the buy-and-hold approach offers superior return performance during bullish periods. Although the results from the bear markets are not strong enough to reject the null hypothesis under test, they signal that individual investors might want to consider switching to U.S. Treasury Bills during flat-to-bearish times but move to the buy-and-hold approach during bullish periods. This requires, however, accurate market timing of turning points, a difficult task.

Third, this study provides some concise statistical evidence that the application of the switching strategy should be in a tax-sheltered account if the switching strategy is to at least keep pace with the buy-and-hold method. This is because the gains from the switching strategy are short-term, which are taxed currently at ordinary income rates in the U.S. Preferential tax treatment is given to long-term gains earned from assets held for over one year, which aligns more closely with the buy-and-hold approach than with a short-term trading strategy.

## Notes

- 1 We are grateful to an anonymous referee for these clarifications.
- 2 We are grateful to an anonymous referee for these clarifications.

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