Solving the Halloween Indictor Puzzle: Market Efficiency Still Reigns

By

Edwin D. Maberly
Professor of Finance
University of Canterbury
Christchurch, New Zealand
edwin.maberly@canterbury.ac.nz

and

Raylene M. Pierce
Senior Lecturer
Lincoln University
Canterbury, New Zealand
raylene.pierce@lincoln.ac.nz

Abstract

Solving the Halloween Indictor Puzzle: Market Efficiency Still Reigns

Prior research by Bouman and Jacobsen (2002) document unusually high monthly returns over the period November-April for both United States (U.S.) and foreign stock markets and label this phenomenon the Halloween effect. The implication is that the Halloween effect represents an exploitable anomaly, which has negative implications for stock market efficiency. We extend this research to the S&P 500 futures contract and find no evidence of an exploitable Halloween effect over the period April 1982 through April 2003. Re-examining Bouman and Jacobsen's empirical results for the U.S., we find that two outliers drive their results. These two outliers are associated with the "Crash" in October 1987 and collapse of the hedge fund Long-Term Capital Management in August 1998. After inserting a dummy variable to account for the impact of the two identified outliers, the Halloween effect disappears.

Solving the Halloween Indictor Puzzle:
Market Efficiency Still Reigns

I. Introduction

Over the past twenty years, financial economists document numerous stock return patterns related to calendar time. The list includes patterns related to the month-of-the year (January effect), day-of-the-week (Monday effect), day-of-the-month (turn-of-the-month effect), and market closures due to exchange holidays (the holiday effect) to name just a few. This research is cited as evidence of market inefficiencies.[1] As a counter argument, Jensen (1978) highlights the importance of trading profitability when assessing market efficiency. If a trading rule is not strong enough to outperform a buy and hold strategy on a risk-adjusted basis, then it is not economically significant.

In a *Wall Street Journal* commentary, Malkiel (2000) argues that, "these attacks on the efficient market theory are far from convincing." In the same commentary, Professor Richard Roll (principal of the portfolio management firm, Roll and Ross Asset Management) argues that if calendar time anomalies represent evidence of market inefficiencies, then they ought to represent an exploitable opportunity. "I have personally tried to invest money, my client's and my own money, in every single anomaly and predictive result that academics have dreamed up. And I have yet to make a nickel on any of these supposed market inefficiencies. Real money investment strategies don't produce the results that academic papers say they should. If calendar time anomalies are evidence of market inefficiency, then there ought to be an exploitable opportunity."

In a recent issue of the *American Economic Review*, Bouman and Jacobsen (2002), henceforth B&J, document yet another calendar time anomaly in stock prices that "many Americans tend to be unfamiliar with." They label this anomaly the Halloween effect, as October 31 marks the end of the "scary" period for investors.[2] In particular, B&J conclude that stock returns are significantly lower during the period May-October versus the period November-April and propose a

trading strategy to exploit this market inefficiency. The Halloween strategy is to invest in the value-weighted S&P 500 index during the period November-April and in a risk-free investment like Treasury bills otherwise. Based on an analysis of monthly return data over the period January 1970 through August 1998 for both United States (U.S.) and foreign equity markets, B&J conclude that the Halloween strategy is robust over time and across international equity markets.

If the Halloween strategy is economically significant in the cash market, then the Halloween effect should carry over to the market for index futures, in particular to the S&P 500 futures contract. Since transaction costs are lower for index futures versus cash market transactions of similar size, the S&P 500 futures contract constitutes fertile ground for testing the trading rule "Sell in May and Go Away" versus the Buy and Hold strategy—a benchmark for market efficiency. The primary objective of the current paper is to examine the S&P 500 futures contract for evidence of a Halloween effect and to compare the Halloween strategy with the Buy and Hold strategy. A second objective is to re-examine the evidence presented by B&J (2002) documenting a Halloween effect for the U.S. stock market.

The S&P 500 futures contract debuted April 1982 on the Chicago Mercantile Exchange (CME), and we examine the time period April 1982 through April 2003. We conclude that there is no exploitable opportunity in the S&P 500 futures market associated with the Halloween effect. In particular, the Halloween strategy of Sell in May and Go Away performs poorly against the Buy and Hold strategy for most of the period examined. Re-examining B&J's findings of a significant Halloween effect for the U.S. stock market, we find two outliers driving their results. The first outlier, October 1987, is associated with the 1987 "Crash." The second outlier, August 1998, is associated with collapse of the hedge fund Long-Term Capital Management. A third potential outlier is the August 1990 invasion of Iraq by Saddam Hussein.

On closer inspection, the evidence supporting a significant Halloween effect in U.S. equity

returns is seriously questioned. Possible explanations for apparent discrepancies between the results presented in the current study and those of the B&J are model misspecification and data snooping. According to Fama (1998), empirical studies documenting long-term return anomalies are sensitive to methodology. Most long-term return anomalies tend to disappear with reasonable changes in technique, and the results of this paper support Fama's argument.

The rest of this paper is organized as follows. Section II reviews and re-examines the evidence of a Halloween effect in the U.S. stock market. In particular, we examine the robustness of B&J's results to alternative model specifications. Section III describes our data set and index futures trading rules as suggested by the Halloween strategy. Section IV presents the empirical results followed by a summary in Section V.

II. Review of Halloween Effect Evidence

B&J (2002) investigate monthly returns across world stock markets for the period January 1970 through August 1998 and report that monthly returns are unusually large over the period November-April. According to B&J, the "evidence shows that while during the period November-April returns are large in most countries, average returns in the period May-October are not significantly different from zero and are often even negative." Furthermore, B&J conclude that the Halloween strategy outperforms the Buy and Hold strategy in all countries except Hong Kong and South Africa, and the standard deviation of the Halloween strategy is substantially lower than the standard deviation of the Buy and Hold strategy in all countries. At first glance, B&J's results appear to be at odds with the efficient market hypothesis.

A. Halloween Strategy: Previously Known by Wall Street Professionals

A widely known practitioner oriented investment book is Hirsch's *Stock Trader's Almanac*, an annual publication since 1968. In the 1986 edition and thereafter, Hirsch makes reference to a Six-Month Switching strategy that is identical to B&J's Halloween strategy. In particular, in the

1997 edition and on page 54, Hirsch presents a spreadsheet of annual returns for the Six-Month Switching strategy over the 1950 through 1996 period. Results are reported for both the S&P 500 index and Dow Jones Industrial Average (DJIA). Hirsch shows that a $10,000 investment in the DJIA beginning in 1950 grew to $206,762 conditional on the proceeds being invested exclusively over the period November-April. In contrast, by investing the proceeds exclusively over the period May-October, the investment grew to only $17,272. The difference in the two investment strategies is striking, and in response Hirsch remarks, "Don't tell the big boys about this! Let's keep this one to ourselves." Hirsch's Six-Month Switching strategy, also known as the Halloween strategy, has been in the public domain since the late 1980s. We argue that B&J's (2002, p. 1618) comment that "many Americans tend to be unfamiliar with it," it being the Halloween strategy, does not apply to Wall Street professionals and astute individual investors. Note that Hirsch's results exclude the impact of dividends.

B. Halloween Strategy: Robustness to Alternative Model Specifications

To test for the existence of a Halloween effect, B&J (2002) apply the usual dummy regression technique, which is equivalent to a simple means test—are monthly mean returns over the period November-April significantly different from the period May-October? This is represented as:

$$R_t = \alpha + \beta_1 S_t + \varepsilon_t \qquad (1)$$

To maintain consistency with B&J, the dependent variable R_t represents continuously compounded monthly index returns for a value-weighted index. Thus, R_t is defined as the natural logarithm of the price relative.

The dummy variable S_t takes on the value 1 if month t falls within the period November-April and 0 otherwise. The constant term α represents the monthly mean return over the period

May-October while $\gamma_0 + \gamma_1$ represents the monthly mean return over the period November-April. A positive and significant γ_1 indicates that monthly mean returns are larger over the period November-April, and B&J (2002) take this as evidence of a significant Halloween effect.

As confirmation of B&J's (2002) results for the U.S stock market, we estimate equation (1) coefficients over the period January 1970 through August 1998 based on value-weighted Center for Research in Security Prices (CRSP) index returns with dividends.[3] As reported in Panel A, Table 1, our results are virtually identical to B&J's results. In particular, the monthly mean return over the period May-October ($\gamma_0 = 0.5438$) is not significantly different from zero at a meaningful level. However, the coefficient of interest is γ_1, positive at 1.0137 and significantly different from zero at the 0.05 level. A significant and positive γ_1 is confirming evidence of a Halloween effect in the U.S. stock market.

1. Impact of outliers on results

The Crash of 1987 was a worldwide phenomenon impacting all world stock markets. In particular, in October 1987 U.S. stocks fell on average by over 20 percent. As noted previously, B&J (2002) document unusually low U.S. monthly returns over the period May-October, but their finding is potentially driven by the fact that the Crash of 1987 occurs in October. Irrefutably, the October 1987 crash is an outlier, and this is verified by a within sample z-score of -6.234 and corresponding p-value of $0.3*10^{-9}$. From time series estimation procedures, it is well known that estimation of equation (1) coefficients and their significance via ordinary least squares is highly sensitive to outliers.

B&J's (2000) data set contains 344 monthly returns with the most recent month being August 1998. On August 17, 1998, the Russian government unexpectedly announced a moratorium on debt repayment, and this event threw world financial markets into a tailspin. This event and

others led to the collapse of the hedge fund Long-Term Capital Management in August 1998, a month in which U.S. stocks fell on average by over 15 percent. Thus, August 1998 is a potential outlier, and this is verified by a within sample z-score of –4.270 and corresponding p-value of $0.9*10^{-5}$. The decision by B&J to include August 1998 in their sample period increases the probability of rejecting the null hypothesis, and this could be interpreted as data snooping. Thus, we have identified two months that are potentially driving the findings of a significant Halloween effect over the period January 1970 through August 1998.

To control for the impact of outliers, we modify equation (1) by inserting a second dummy variable D_t, which is set equal to 1 for October 1987, 1 for August 1998 and 0 otherwise:

$$R_t = ?? + ?_1 S_t + ?_2 D_t + ?_t. \qquad (2)$$

The estimated coefficients for equation (2) are reported in Panel B, Table 1, but the results are reversed from those reported for equation (1). In particular, the Halloween effect is represented by $?_1 = 0.7784$, but given a p-value of 0.092, this coefficient is no longer significant at a meaningful level. Furthermore, monthly returns over the period May-October are represented by $?? = 0.6800$ and this coefficient is now significantly different from zero at a p-value of 0.038. The impact of the two outliers is represented by $?_2$, which is negative in sign and highly significant. It appears that documentation of a significant Halloween effect in the U.S. stock market over the period January 1970 through August 1998 is being driven by the large negative returns observed during the months of October 1987 and August 1998.

2. Impact of January returns on results

Studies by Haugen and Lakonishok (1988) and others suggest that stock returns are unusually large in January and label this phenomenon the January effect. The unusually large monthly returns documented by B&J (2002) over the period November-April could be a

manifestation of the January effect. To test for this possibility, equation (1) is modified by inserting a third dummy variable J_t, which is set equal to 1 whenever month t is January and 0 otherwise:

$$R_t = ?? + ?_1 S_t + ?_2 D_t + ?_3 J_t + ?_t. \quad (3)$$

The estimated coefficients for equation (3) are reported in Panel C, Table 1 and are similar to those reported for equation (2). As before, the Halloween effect is represented by $?_1 = 0.6205$, but given a p-value of 0.200, the Halloween effect is not significant at a meaningful level. We conclude that the Halloween effect as documented by B&J for U.S. stock returns disappears after adjusting for the impact of outliers—October 1987 and August 1998—and the January effect.

III. Index Futures and the Halloween Trading Strategy

A. Description of Data Set

On the CME, S&P 500 futures trade in four contract months—March, June, September and December—with the last trading day the Thursday preceding the third Friday of the contract month. In April 1982, the contract multiplier was set at $500, but after the close of business on October 31, 1997, the multiplier was halved to $250. Our data set consists of daily S&P 500 futures settlement prices over the period April 30, 1982 through April 30, 2003. Observations are selected from the contract closest to maturity with one minor modification related to contract expiration. On the last business day of the month prior to the contract month, observations are switched to the next most distant contract. For example, in January, observations correspond to the March contract, but then on the last business day of February, observations are switch to the June contract and so forth for the other contract months.

B. The Halloween Effect: S&P 500 Futures

To maintain consistency with the return metric used in equation (1) through equation (3) for spot prices, monthly S&P 500 futures returns are defined as the natural logarithm of the price relative. Monthly returns are calculated for each S&P 500 futures contract over the period April 1982 through April 2003 based on the switching rule established earlier. The usual dummy regression technique is applied to test for the existence of a Halloween effect in the market for index futures. Equation (3) is replicated, but the dependent variable FR_t now represents monthly S&P 500 futures returns. This is represented as:

$$FR_t = ?? + ?_1 S_t + ?_2 D_t + ?_3 J_t + ?_t. \qquad (4)$$

As before, the dummy variable S_t takes on the value 1 if month t falls within the period November-April and 0 otherwise. The previous section examines monthly returns to the value-weighted CRSP index with dividends, and October 1987 and August 1998 are identified as outliers. After adjusting for the impact of these two outliers, the Halloween effect disappears. October 1987 and August 1998 are identified as outliers for S&P 500 futures returns over the period April 1982 through April 2003. Therefore, the dummy variable D_t in equation (4) is inserted to adjust for the impact of these two outliers. D_t takes on the value 1 for October 1987, 1 for August 1998 and 0 otherwise. In equation (4), the dummy variable J_t, which is set equal to 1 whenever month t is January and 0 otherwise, is an adjustment for the January effect.

IV. Presentation of Empirical Results: S&P 500 Futures

Equation (4) coefficients are first estimated for the subperiod April 1982 through April 2000, and these results are presented in Panel A, Table 2. April 2000 is identified as the end of an 18-year bull market that began in August 1982. The period after April 2000 marks the beginning of a major bear market in the United States. The results do not support the existence of a Halloween

effect for S&P 500 futures, and are virtually identical to those presented in Panel C, Table 1 for spot returns. In particular, the Halloween effect is represented by $?_1 = 0.3737$, but this coefficient is insignificant with a p-value of 0.508. Excluding the two identified outliers, monthly S&P 500 futures returns over the period May-October are positive (? = 0.7928) and significantly different from zero at a p-value of 0.039.

In Panel B, Table 2, equation (4) coefficients are estimated for the period April 1982 through April 2003, which includes the three-year bear market that commenced in April 2000. All of the coefficients are insignificant at a meaningful level except $?_2$, which reflects the impact of the two identified outliers.

Based on the evidence presented in Table 2, we reject the hypothesis that there exists a significant Halloween effect for the S&P 500 futures contract. The lack of supporting evidence for a Halloween effect for S&P 500 futures is not dependent on inclusion of the outlier dummy in equation (4). The Halloween effect coefficient $?_1$ remains insignificant at a meaningful level even after removing the outlier dummy from equation (4), and these results are presented in panels C and D, Table 2.

A. The Halloween Effect: S&P 500 Futures Trading Strategies

Two S&P 500 futures trading strategies referred to as Strategy-I and Strategy-II are identified to exploit the Halloween effect, and both of these strategies are compared against the Buy and Hold strategy. These three trading strategies are defined as follows: (1) The Buy and Hold strategy—Long one S&P 500 futures contract over the investment horizon April 30, 1982 through April 30, 2003; (2) Strategy-I—Long one S&P 500 futures contract over the period November through April. Short one S&P 500 futures contact over the period May through October; (3) Strategy-II—Long one S&P 500 futures over the period November-April. No S&P 500 futures

position over the period May through October.

Profits (losses) for each S&P 500 futures trading strategy is calculated as $500 times the change in index points with all realized profits (losses) invested in Treasury bills. As noted previously, the S&P 500 futures contract multiplier was split in half after October 1997, and thus the number of contracts identified with each strategy increases from 1 to 2 after this date. Treasury bill rates are taken from Ibbotson & Associates (2003) *Valuation Edition*.

The accumulated dollar profits from each of the three strategies over the period April 1982 through April 2003 are depicted in Figure 1. The Buy and Hold strategy initially outperforms the other two strategies but loses ground momentarily around the October 1987 Crash. This observation is not unexpected, as both Strategy-I and Strategy-II benefited from either being short S&P 500 futures or out of the market in October of 1987. Thereafter, the Buy and Hold strategy outperforms the other two strategies by a wide margin through April 2000, which marks the beginning of a major bear market in the United States. For example, over the period April through October 1997, the accumulated dollar profits to the Buy and Hold strategy equals $411,370 versus $83,733 for Strategy-I and $258,778 for Strategy-II.

A bear market commenced in April 2000 and thereafter the Buy and Hold strategy performs poorly relative to the other two strategies.[4] This observation is not unexpected, as both Strategy-I and Strategy-II are either short S&P 500 futures or out of the market entirely over the period May-October. Mark Hulbert (2003) financial journalists and editor of *Financial Digest* recently stated, "In bull markets, timers rarely beat their nemesis—a buy-and-hold. It's only in bear markets that they stand a chance of coming out ahead." [5] Hulbert conjectures that market-timing strategies like the Halloween strategy outperform the Buy-and-Hold strategy only during bear market years, and this paper reports similar results. An interesting casual observation is that in bear-market years like 2000, 2001 and 2002, most of the decline occurs over the period May-October.[6] In summary, we

find no evidence that the Halloween effect presents an exploitable market phenomenon for the S&P 500 futures contract.

V. Summary

Prior research by B&P (2002) document unusually high monthly returns over the period November-April for both U.S. and foreign equity markets. Their data set covers the period January 1970 through August 1998. The Halloween effect is considered an exploitable anomaly, which is taken as another example of market inefficiency. The rule is to sell stocks at the end of April and buy stocks at the end of October. It is ironic that in the May-October 2003 period, returns to the S&P 500 index are unusually large at 13.28 percent, at least through October 9, 2003.

In this paper, we re-examine B&P's (2002) results for the U.S. stock market and extend the analysis to S&P 500 futures. Our futures data set covers the period April 1982 through April 2003. On a closer re-examination, the documentation of a Halloween effect in the U.S. equity market disappears after an adjustment is made for the impact of outliers, in particular the large monthly declines for October 1987 and August 1998 associated with the Crash and collapse of the hedge fund Long-Term Capital Management, respectively. We find no evidence that the Halloween effect represents an exploitable anomaly in the market for index futures. However, in bear market years, we present some anecdotal evidence that most of the negative declines occurs over the period May-October.

Footnotes

[1]For example, see Shleifer's (2000) *Inefficient Markets* and *Wall Street Journal* commentary, "Are Markets Efficient?" (December 28, 2000).

[2]Halloween is celebrated every October 31. Over a century ago, the American humorist Mark Twain (1894) remarked, "October, this is one of the peculiarly dangerous months to speculate in stocks." But then Twain knew that other dangerous months "are July, January, September, April, November, May, March, June, December, August and February."

[3]B&J (2002) examine value-weighted indices with dividends reinvested. To be consistent with their results, we examine a similar index for U.S. equity prices.

[4]There is no precise definition for a bear market, but intuitively it represents a year when equity prices decline or a decline from peak to trough by more than 20 percent.

[5]Hulbert's comments appeared in his July 23, 2003 column at www.MarketWatch.com.

[6]For example, a $100,000 investment in the value-weighted CRSP index with dividends on December 31, 1999 declines to $62,250 by December 31, 2002. However, 70% of the decline in value or $26,376 is attributable to the period May-October.

References

Bouman, Sven and Jacobsen, Ben. "The Halloween Indicator, 'Sell in May and Go Away': Another Puzzle." *American Economic Review*, December 2002, 92(5), pp. 1618-1635.

Fama, Eugene F. "Market Efficiency, Long-term Return, and Behavioral Finance." Journal of Financial Economics, September 1998, 49(3), pp. 238-306.

Haugen, Robert A. and Lakonishok, Josef. *The Incredible January Effect: The Stock Markets Unsolved Mystery*. Dow-Jones Irwin, Homewood, IL, 1988.

Hirsch, Yale. *Stock Traders Almanac.* The Hirsch Organization, Old Tappen, NJ, 1997.

Ibbotson & Associates. *Valuation Edition*. Ibboston & Associates, Chicago, IL, 2003.

Jensen, Michael C. "Some Anomalous Evidence Regarding Market Efficiency." *Journal of Financial Economics*, June/September 1978, 6(2/3), pp. 95-101.

Malkiel, Burton G. "Are Markets Efficient?." *The Wall Street Journal*, December 28, 2000.

Shleifer, Andrei. *Inefficient Markets.* Oxford University Press, London, 2000.

Scleifer, Andrei. "Are Markets Efficient?." *The Wall Street Journal*, December 28, 2000.

Twain, Mark. *The Tragedy of Pudd'nhead Wilson*. The American Publishing Company, Hartford CT, 1894.

Table 1

The Halloween Effect: Review of Evidence for U.S. Equity Prices
January 1970 through August 1998

$$R_t = ? + ?_1 S_t + ?_2 D_t + ?_3 J_t + ?_t$$

Panel A	Coefficient	t-value	p-value	Panel B	Coefficient	t-value	p-value	Panel C	Coefficient	t-value	p-value
?	0.4235	1.21	0.226	?	0.6800	2.08	0.038	?	0.6800	2.08	0.038
$?_?$	1.0349	2.10	0.037	$?_?$	0.7784	1.69	0.092	$?_?$	0.6205	1.28	0.200
$?_?$	N/A	N/A	N/A	$?_?$	-22.0560	-7.27	0.000	$?_?$	-22.0560	-7.27	0.000
$?_?$	N/A	N/A	N/A	$?_?$	N/A	N/A	N/A	$?_?$	0.9363	1.08	0.282

R_t represents monthly returns for the value-weighted Center for Research in Security Prices index with dividends. The constant term m represents the monthly mean return over the period May-October. The monthly mean return over the period November-April is represented by $? + ?_1$. The impact of the two identified outliers October 1987 and August 1998 is represented by $?_2$. The impact of January returns is represented by $?_3$. Panel A corresponds to Equation (1); Panel B corresponds to Equation (2); and Panel C corresponds to Equation (3).

Table 2

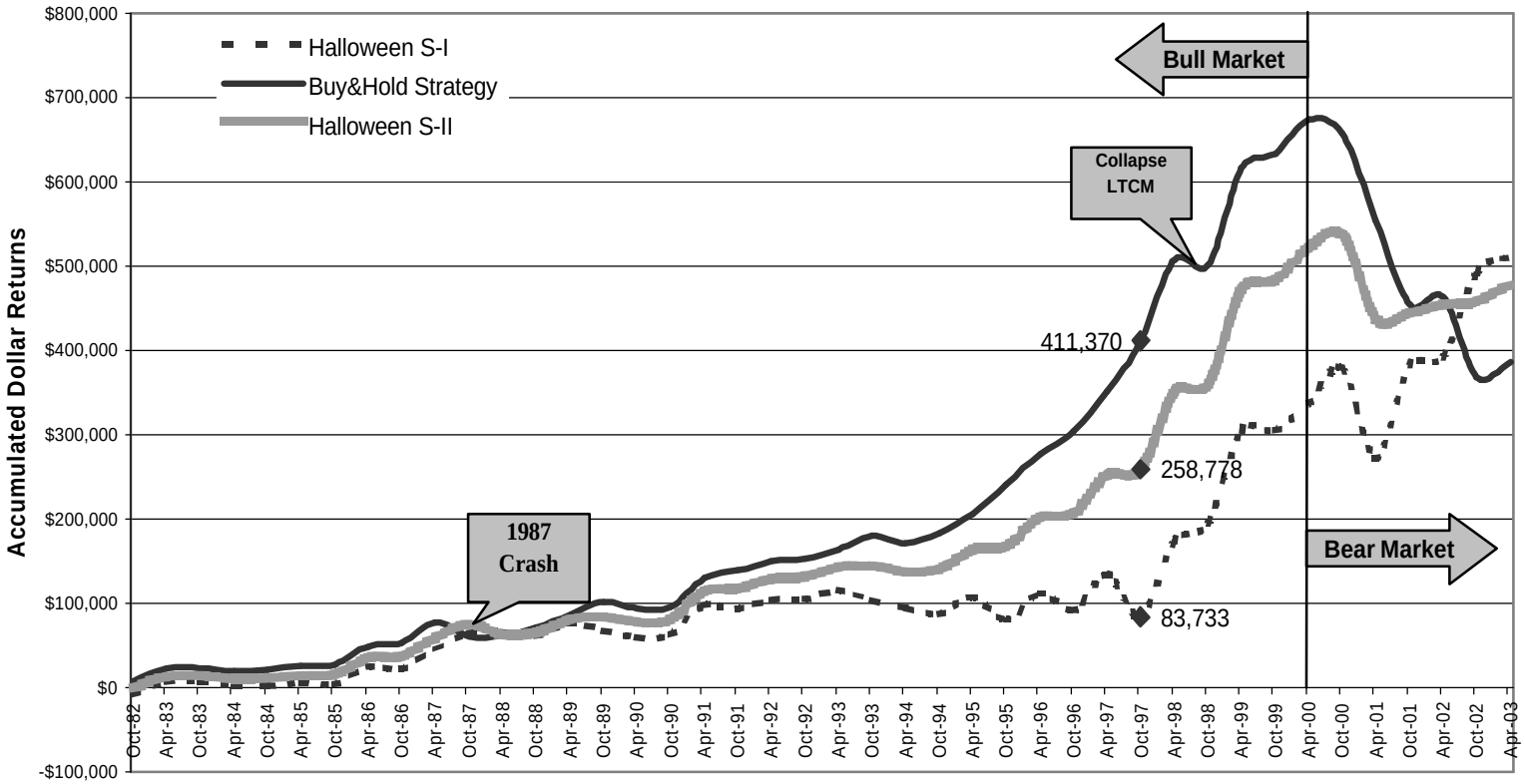
The Halloween Effect: Review of Evidence for S&P 500 Futures
April 1982 through April 2003

$$FR_t = ? + ?_1 S_t + ?_2 D_t + ?_3 J_t + ?_t$$

	April 1982-April 2000				April 1982-April 2003				April 1982-April 2000				April 1982-April 2003		
Panel A	Coefficient	t-value	p-value	Panel B	Coefficient	t-value	p-value	Panel C	Coefficient	t-value	p-value	Panel D	Coefficient	t-value	p-value
?	0.7928	2.07	0.039	?	0.3369	0.88	0.378	?	0.3042	0.7	0.486	?	0.0209	0.05	0.959
??	0.3737	0.66	0.508	??	0.5687	1.01	0.314	??	0.7171	1.10	0.275	??	0.8847	1.46	0.147
??	-20.3610	-2.80	0.000	??	-19.9050	-3.02	0.000	??	N/A	N/A	N/A	??	N/A	N/A	N/A
??	0.9540	0.94	0.349	??	0.8340	0.82	0.413	??	1.5470	1.29	0.197	??	1.8340	0.76	0.449

FR_t represents monthly returns for the S&P 500 futures contract. The constant term m represents the monthly mean return over the period May-October. The monthly mean return over the period November-April is represented by $? + ?_1$. The impact of the two identified outliers October 1987 and August 1998 is represented by $?_2$. The impact of January returns is represented by $?_3$. Panel A and Panel B correspond to Equation (4); Panel C and Panel D correspond to Equation (4) eliminating $?_2 D_t$.

Figure 1
Exploiting the Halloween Effect via S&P 500 Futures
Buy and Hold vs. Halloween Effect Trading Strategies
April 1982 through April 2003



Strategy-I: Long one futures contract November-April and short one futures contract May-October.
Strategy-II: Long one futures contract November-April and long T-Bills May-October.
Crash of 1987 occurred in October. Collapse of Long-Term Capital Management (LTCM) occurred in August 1998.