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THE HALLOWEEN EFFECT IN EUROPEAN SECTORS

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Abstract

We present economically and statistically empirical evidence that the Halloween effect is significant. A trading strategy based on this anomaly works persistently and outperforms the buy and hold strategy in 8 out of 10 indices in our sample.

We present evidence that the Halloween strategy works two out of every three calendar years and if an investor followed it “blindly”, it would yield an annual average excess of return of approximately 2.4%, compared to the buy and hold strategy and further ensure a significant reduction in risk in all indices (around 7.5% on an annual basis).

We have considered several possible explanations for the anomaly, however, none was able to fully justify the seasonal effect. We suggest that a possible explanation may be related to negative average returns during the May–October period, rather than superior performance during the November–April period.

Key Words: Halloween effect, market efficiency, anomaly, returns.

JEL Classification Code: G10, G14

1. Introduction

Calendar effects on stock market returns have confused financial economists for over 50 years. The evidence of equity market anomalies contradicts the prediction of the Fama (1970) Efficient Market Hypothesis (hereafter EMH), at least in its weak form, because the predictable movements in asset prices provide investors with opportunities to generate abnormal returns. In addition, stock market anomalies may result from an inefficient flow of information in financial markets, which contradicts an underlying assumption of the EMH.

This theory was widely accepted until the 1990s, when empirical analyses consistently found anomalies that undermined the EMH. One of those anomalies is the Halloween effect, which was firstly presented by Bouman and Jacobsen (2002).

Their study follows an old saying, “Sell in May and go away”. The message under this saying is that stock returns should be lower from May to October than during the rest of the year. Although no one knows exactly how old this saying is, research by Jacobsen and Zhang (2010) found a written reference in the *Financial Times* from 1935. After this, the phenomenon was studied by a variety of different authors.

In spite of other pioneering studies, Bouman and Jacobsen (2002) was the first study to take such research further. They analyzed the stock market monthly returns of 37 countries between January, 1970, and August, 1998 in both developed and emerging markets. For 36 of the 37 countries, average monthly returns were lower during the May-October period than those between November and April. The authors reported statistically significant differences at the 1 percent level for 10 countries and at the 10 percent level for 20 countries.

Moreover, they presented sample evidence that this seasonal pattern has been noticeable for a very long time in different countries. In particular, for the U.K. stock market, they found evidence of a “Sell in May” effect as far back as 1694. The authors also argued that the Halloween strategy outperforms the buy and hold strategy, on a risk-adjusted basis, for most of markets examined, casting doubt on the validity of the efficient market paradigm.

In order to find an explanation for the anomaly, Bouman and Jacobsen (2002) examined different reasons, such as risk, cross correlation between markets, the January effect, data mining, shifts in interest rates, as well as shifts in trading volume, the possibility of the effect being sector specific and also the existence of a seasonal factor in news provision. However, according to the authors, none of these seemed to provide an explanation.

In their efforts to explain the anomaly, they found only that the relative strength of the effect in different countries appeared to be related to the timing and length of summer vacations. This suggests that vacations imply changes in risk aversion. However, in their subgroup of southern-hemisphere countries, where summer vacations occur at a different time to those in the northern-hemisphere, they also find higher returns in the November–April period. Eventually, they left the seasonal anomaly unexplained.

Later, Kamstra *et al.* (2003) suggested an explanation for the Halloween effect that resulted in a controversial debate. They related the seasonal nature of stock market returns to the effect of Seasonal Affective Disorder (SAD). They remarked that SAD – which is a medical condition whereby the shortness of the days leads to depression for many people – increases risk aversion¹, leading to seasonal stock market returns that depend on the daylight length. Based on this, they argued that stock returns during the fall should be lower, then become relatively higher during the

¹ More specifically, they argued that the medical and psychology literature have clinically established a positive relationship between the length of night and depression through the seasons, as well as a positive relationship between depression and risk aversion.

winter months, when days start to get longer. Low returns occur before the winter solstice² and abnormally high returns after it. In short, their study argues that weather affects stock returns through the changes of investors' moods. They also added that, according to medical evidence relating to SAD, this seasonality relates to the length of the day, not to changes in the length of the day. Price seasonality and its relationship with the Halloween effect has been also documented in commodities. For example, Baur (2013) analyzes how recurring annual events potentially produces a seasonality effect on gold prices, concluding that September and November are the only months with positive and statistically significant changes in gold prices. This anomaly can be explained with hedging demand by investors anticipating the "Halloween effect" in the stock market, wedding season gold jewelry demand in India and negative investor sentiment due to shorter daylight time.

Maberly and Pierce (2004) re-examined the Halloween effect for the U.S. stock market between April 1982 to April 2003. They contended that Bouman and Jacobsen (2002) documentation of a significant Halloween effect for the U.S. equity returns appears to be driven by two outliers – the "crash" in world equity prices in October 1987 and the collapse of the Long-Term Capital Management hedge fund in August 1998 – and found that the effect disappeared after an adjustment for outliers.

Maberly and Pierce's study was specifically criticized by Witte (2010), who reported that, in their study, the authors identified the two outliers without formalizing criteria and dealt with them in an unsatisfactory way. He found that the four biggest outliers, aside from October 1987 and August 1998, all work against finding a Halloween effect, concluding that these outliers would augment the Halloween effect. In addition, he suggested that outliers do not drive Bouman and Jacobsen (2002) results, after using three robust regression methods (more appropriate to outliers, according to the author) to estimate the Halloween effect within the same time frame.

Doeswijk (2008) provided sample evidence that the abnormal returns from the Halloween strategy are, indeed, economically significant. He also suggested that the seasonal pattern could be a result of an optimism cycle. The optimism cycle hypothesis assumes that investors think in calendar years rather than 12-month rolling periods, and that the perceived outlook for the economy and earnings varies during the year. In the last quarter of the year, investors start looking forward to the next calendar year. Initially, they are usually too optimistic about the economic outlook. As the year proceeds, this reverses around the time of the summer break in the stock market and investors become less optimistic. So, from November to April, investors should overweight equities, and from May through October, they should underweight them.

Daily seasonality has been also detected in several equity markets. For example, Lucey (2006) examines the extent and determinants of daily seasonality on the Dublin stock exchange. Although he finds a daily seasonal effect, this pattern is unusual in that it is midweek, contrary to previous research. The source of this mid-week seasonality seems to differ between financial and other firms. Financial firms appear to react to macroeconomic news and non-financial to firm specific news, albeit weakly. There is no support for microstructural hypotheses of daily seasonality.

Extending prior research, this paper examines the existence of the Halloween effect on the European stock market at the levels of industry and supersector indices. This study expects to contribute in several ways to the existing literature. First, to the best of our knowledge, it is the first study of the Halloween effect that uses European stock market sector indices. Second, our results provide new insight regarding the effect of dividends on the Halloween effect. Third, we

² Winter solstice occurs every year on December 21st or 22nd in the Northern Hemisphere, and on June 20th or 21st in the Southern Hemisphere, on the shortest day and longest night of the year. Winter solstice marks the beginning of the winter season and, after it, days start to get longer. The SAD effect means the Southern Hemisphere is six months out of syncs, as are the seasons.

show that the January effect does not explain the anomaly, as the impact of the January returns is to obscure rather than to drive the Halloween effect. Finally, we suggest that a possible explanation for the anomaly may be related to the negative average returns during the May–October period, rather than superior performance during the winter months

This paper is organized as follows: Section 2 presents the data and explains the methodology we have used; Section 3 documents the existence of the Halloween effect; Section 4 discusses possible explanations for the anomaly and presents robustness checks and Section 5 offers conclusions.

2. Methodology and Data

In this section we discuss the methodology used to test the Halloween Effect and we present the data that supports our empirical study.

2.1. Methodology

To test the existence of the Halloween effect, simple and multiple linear regression models are used. To maintain consistency with Bouman and Jacobsen (2002), a seasonal dummy variable³ was incorporated in the usual regression model that takes the value 1 if month t falls in the November to April period and 0 otherwise.

$$r_t = \mu + \alpha_1 S_t + \varepsilon_t; \quad \varepsilon_t \sim N(0, \sigma_\varepsilon^2) \quad (1)$$

The dependent variable r_t represents continuously-compounded monthly index returns. The constant term μ represents the monthly mean return over the May–October periods, while $\mu + \alpha_1$ represents the monthly mean return over the November–April periods. A positive and significant estimate for α_1 indicates that monthly mean returns are larger over the November–April periods, and is taken as evidence of a significant Halloween effect. In absence of significance for the estimated coefficient of S_t , then the difference in the average rates of return of the two periods is not statistically different from zero. ε_t is the usual error term.

To estimate μ and α_1 , we use the Ordinary Least Squares (OLS) method. In order to deal with the violation of the errors' Gauss-Markov assumptions, we apply the OLS coefficients standard errors corrections. White (1980) procedure is applied to deal with error heteroskedasticity and Newey-West's (1987) procedure was used to deal with both heteroskedasticity and autocorrelation or with autocorrelation only.

2.2. Data Base

The data set used in this paper consists of monthly returns of European stock market sector indices (Euro currency), from October 1992⁴ to October 2010. However, the time horizon differs between indices according to when it was established or available data, varying between 119 and 216 observations. The indices used assume different classifications according to the Industry Classification Benchmark (ICB), as well as, industry and supersector. In addition to this, European stock market benchmark and blue-chip indices were also employed, which will be used for the purposes of out-of-sample tests, as they provide a benchmark of sector performance that is frequently used by practitioners.

The indices used are Dow Jones STOXX and the returns were computed based on two different calculation methodologies, which are the Total Return Methodology⁵ and the Price Return Methodology⁶. There are 37 Total Return Indices and 37 Price Return Indices.

³ The regression equation (1) is equivalent to a simple means t test, to test if the monthly mean returns over the November–April periods are significantly different from the monthly mean returns over the May–October periods.

⁴ Some indices have been established since December 1991, however, only the returns after October 1992 (included) were used, in order to assure the same number of observations in the November–April period and in the May–October period.

⁵ The Total Return Indices consider all price changes, including all dividend payments. Dividend payments are included in the appropriate indices as net dividends: Net Dividend is equal to the declared dividend, less withholding tax.

⁶ The Price Return Indices only consider the price changes of the assets. It could also include cash dividends, where the distribution is outside the scope of the regular dividend policy or where the company declares such distribution to be extraordinary or special, as well as, special dividends from non-operating income.

The indices may represent two regions, the Nordic or Eurozone region. The source of information is the Reuters 3000 Xtra. The indices will be denominated IS Indices (Industry and Supersector) and, in the absence of specification, the text refers to the IS Indices.

There are four main reasons for using this data set. First, looking at the investigation/research produced over recent years, and compared to their American counterparts, European researchers and traders are relatively unfamiliar with the Halloween effect. Second, as pointed out by Sullivan et. al. (2001) and Schwert (2003), the European stock data constitutes a reasonably independent data set that presents an out-of-sample test⁷ for the previous studies on this anomaly, alongside U.S. stock data, which is extremely well mined. Third, the use of European sectorial data to analyse the Halloween effect offers a new perspective, which, to the best of our knowledge, was never considered before. Fourth, it is intended to perceive the role of dividends in the anomaly (i.e. see if the results obtained are sensitive to the methodology used), since Bouman and Jacobsen (2002) argued that excluding dividends would bias the results in favor of the Halloween effect.

3. Empirical Study about the Existence of the Halloween Effect

Since the results tend to be similar, the focus will be on Total Return Indices. We only discuss results from the analysis of the Price Return Indices if they provide additional insights⁸.

The puzzle will be approached as follows. First, we study whether economic differences in the returns of the two half-year periods exist and if they are attributable to risk. Second, we test if the economic differences are statistically significant. Third, we examine if the Halloween strategy (investing in the equity market - in equities - from October 31st to April 30th and to be long in cash for the rest of the year) constitutes an exploitable opportunity, by analyzing its robustness, distribution of returns and risk by the different months, as well as comparing the Halloween strategy to the buy and hold strategy (B&H, hereafter).

3.1. Economic Significance

According to the popular market saying “Sell in May and go away”, stock market returns should be higher in the November–April period (also known as winter months) than those in the May–October period (also known as summer months). To examine the seasonal effect, it is necessary to break down the annual returns of equity markets into the two fractions of a year. Results are reported in Table 1, from which we can draw two main conclusions. First, from October 1992 to October 2010, the Halloween effect is present in all the indices, as they show higher average rates of return during winter. Second, monthly average returns are always positive and unusually large during the winter months. In the summer months they are often negative (more than half of the indices demonstrate negative average returns during summer⁹) or close to zero. More specifically, the monthly average excess of return during the winter months is approximately 1.8% compared to the summer months. The bulk of the annualised return is concentrated in the November–April period. As such, the effect is very pronounced as illustrated in Figure 1.

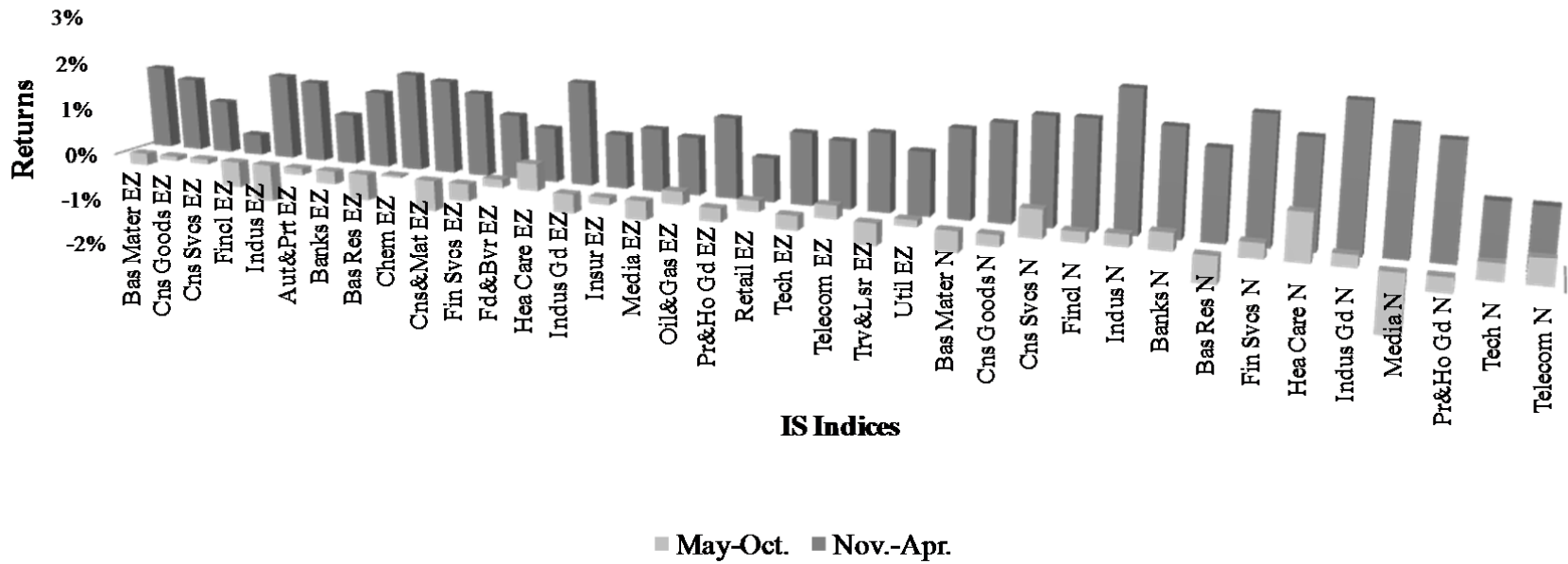
⁷ European stock data constitute an out-of-sample test to U.S. stock data; benchmark and blue-chip indices constitute an out-of-sample test for the remaining European indices.

⁸ All the results are separate and available on request from the corresponding author.

⁹ During our research, we found this curious statement: “*I am not aware of a paper that claims to find strong evidence that excess stock returns have been predictably negative*” (Schwert, 2003: 950). This shows how important and interesting the Halloween effect is, as average returns during summer months are often negative.

Figure 1

Average rates of return from October 1992 to October 2010.



Note: This figure reports the average monthly returns in the May–October and November–April periods based on 37 European stock indices from October 1992 to October 2010.

We suggest that a possible explanation for the anomaly may be related to the negative average rates of return during the May–October period, rather than superior performance during the winter months. Sample evidence supports this, since the effect is mainly present in the indices with negative average returns during the summer months, and is insignificant in the indices with positive average returns during the summer months.

Curiously, the Nordic region is a better option in terms of return.

Table 1
Economic Significance of the Halloween Effect

	Eurozone (23 Indices)		Nordic (14 Indices)		IS (37 Indices)	
	Nov.- Apr.	May- Oct.	Nov.- Apr.	May- Oct.	Nov.- Apr.	May- Oct.
Average monthly returns	1.5%	-0.2%	2.2%	0.2%	1.7%	-0.1%

Note: This table shows the average monthly returns in the May–October and November–April periods, based on 37 European stock indices, industry and supersectors, from October 1992 to October 2010.

The empirical evidence supports the economically exploitable opportunity associated with the Halloween effect. For the more sceptical, an example of the differences in return between the two six-month periods from October 1992 to October 2010 is presented, based on the Media Supersector Nordic Index. A €100 investment in this Index, beginning in 1992, grew to €2,264, provided the proceeds were re-invested exclusively over the November–April periods. In contrast, by re-investing the proceeds exclusively over the May–October periods, the initial amount of €100 drops to only €26. The difference is striking.

Risk-Return Trade-off

A natural question is whether these results are related to risk. Are higher returns during the winter months a compensation for higher risk in that period? The answer is likely to be no.

Table 2 and Table 3 show interesting empirical insights regarding risk during the winter and summer months. First, in 65% of the indices the standard deviation is lower in winter than in summer. These indices show a reduction of around 0.3% on the average standard deviation during winter. The results contradicts the hypothesis that the “Sell in May” effect is a result of higher risk during the winter months. Second, curiously the Nordic region seems to be riskier in winter months than the Eurozone region.

In addition, we also analyzed if the dot-com bubble bursting created changes in the level of risk of the different indices. Bubbles cause misallocations of capital and the subsequent correction causes severe structural difficulties in the economy, which is why we computed the Chow Test¹⁰, in order to check for the presence of a structural break in the risk that could lead to the existence of the Halloween Effect. The conclusion is that only 5 indices have changed their risk structure at the 1 percent significance level. However, this does not seem to affect the conclusions about the Halloween effect.

¹⁰ The Chow test is a statistical test of whether the coefficients in two linear regressions on different data sets are equal. The Chow test was proposed by the economist Gregory Chow in 1960.

Table 2

Halloween Effect: Percentage of indices with less risk during the winter months

IS (37 Indices)	65%
Eurozone (23 Indices)	83%
Nordic region (14 Indices)	36%

Note: This table shows the percentage of indices, in the sample of 37 European stock indices, industry and supersector, which exhibit lower risk (measured by standard deviation of the monthly returns) during the winter months in comparison to the summer months.

Table 3

Halloween Effect: Average risk during the winter and summer months

	Eurozone (23 Indices)		Nordic (14 Indices)		IS (37 Indices)	
	Nov.- Apr.	May- Oct.	Nov.- Apr.	May- Oct.	Nov.- Apr.	May- Oct.
Average monthly standard deviation.	4.5%	4.9%	5.8%	5.8%	5.0%	5.2%

Note: This table shows the monthly average standard deviation during the summer period (May–October) and winter period (November–April), based on 37 European stock indices, industry and supersector, from October 1992 to October 2010.

Furthermore, the reward-to-risk ratio, defined as the average return per unit of risk, was computed for the two half-year periods. Such ratio show us which half of the year rewards risk better. To analyze if the return compensates the risk, we assume investor’s risk neutrality.

The results show that all indices indicate a reward-to-risk ratio that is superior during the November–April period. The monthly average reward-to-risk ratio of the two six-month periods shows that winter rewards risk 0.4% more than summer.

To sum up, on average, stocks deliver close to zero or negative returns in the six-month period from May through October, only rewarding the investors from November to April. Moreover, the effect cannot be accounted for by a seasonal incidence of risk, as the winter months offer less risk than the summer months. So, following a Halloween strategy seems to be, on average, a “win-win” scenario (in return and risk).

3.2. Statistical Significance

Even though the Halloween effect is economically significant, it is important to discover whether it is also statistically significant.

From October 1992 to October 2010, 23 out of 37 indices show statistically significant differences in summer and winter average returns, all with the expected sign at the 10 percent level. The effect is highly significant at the 1 percent level for 4 indices in the sample. Statistical significance results are summarized in Table 4.

Curiously, we found that the majority of indices with a statistically significant Halloween effect exhibit negative average returns during the summer months. If we consider only indices with positive average returns during the summer months, the Halloween effect is residual. As such, the Halloween effect may not be the result of higher than the usual returns in the November–April periods, but due to the lower than the usual (and sometimes negative) returns in the May–October periods.

Table 4

Global results of the Halloween Effect statistical significance

Estimated results for the regression (1): $r_t = \mu + \alpha_1 S_t + \varepsilon_t$ with $\varepsilon_t \sim N(0, \sigma_\varepsilon^2)$

Level of Significance	Halloween effect - α_1		
	1%	5%	10%
No. of Significant Indices	4	16	23
% of Significant Indices	11	43	62
No. of negative coefficients	-	-	-

Note: This table shows global results of the statistical significance of the Halloween effect based on 37 European stock indices, industry and supersector, from October 1992 to October 2010. The percentage of statistical significant indices is the ratio between the number of significant indices and the total number of indices. The number of negative estimated coefficients is also exhibited. The t significance tests are based on White heteroskedasticity consistent standard errors or Newey-West heteroskedasticity and autocorrelation consistent standard errors.

Indeed, we document a strong seasonal effect on stock returns, as described by the Halloween effect and proved the effect to be statistically significant in the majority of indices in our sample.

3.3. Halloween Effect: A persistent and an exploitable opportunity?

Finally, it is important to realize if the Halloween effect is persistent and constitutes an exploitable opportunity.

3.3.1. Robustness of the Halloween Effect

A trading rule is only helpful for an investor if it is persistently reliable. The Halloween effect may be a consequence of an extraordinary performance for a couple of years.

To actually allow for the possibility of the abnormal return being achieved by mere chance, the percentage of years that the November–April period achieved higher returns than the May–October period was computed.

Empirical results show that the Halloween strategy, based on the “Sell in May and go away” effect, is a reliable trading strategy, since it works every two out of three calendar years and can be applied in more than 95% of the indices in our sample.

Popular media refer to this market wisdom (“Sell in May and go away”) in the month of May, claiming that in the following six months things will be different and the pattern will not occur. However, as the effect has been strongly and persistently present in the majority of the European stock market sector indices, these claims often proved to be wrong, demonstrating that a strategy based on “Sell in May and go away” saying, works persistently.

3.3.2. Monthly Returns and Risk

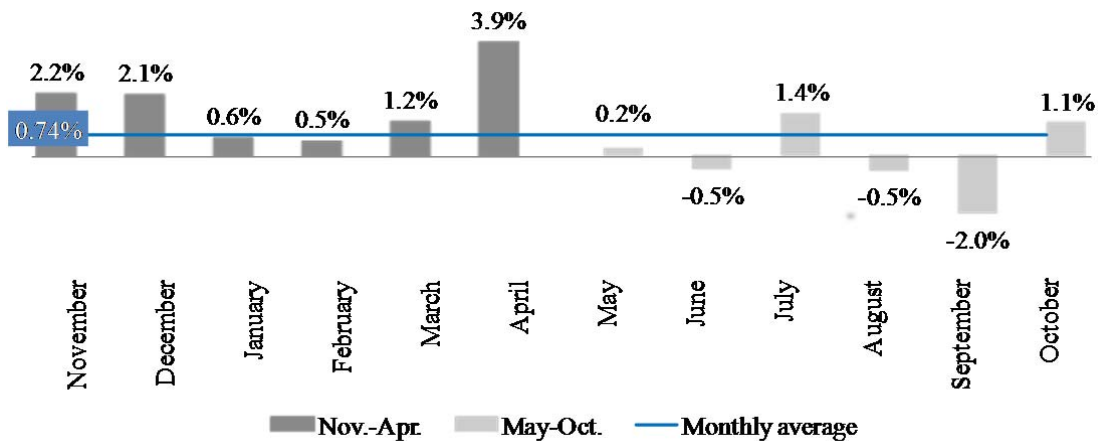
An interesting question is whether the returns are more or less evenly spread over the months in all indices, or whether they can be attributable to specific months. Is the abnormal performance of the winter months a consequence of an extraordinary performance of one specific month? Is the lower performance of the summer months a result of a bad performance of one particular month?

To answer these questions, we computed the monthly average returns, as reported in Figure 2.

The results indicate that the Halloween effect is clearly not a result of abnormal returns in one specific month. In addition, we observe higher monthly average rates of return during winter and low (and sometimes negative) average rates of return during summer.

According to the results obtained, in order to have a long position in the market for a period of six-months, the best strategy is to invest in the months of October, November, December, March, April and July. By making such an investment, an investor would benefit from the return of the best six months of the year. The main pitfall of this investment strategy is the transaction costs, which would be 3 times higher than the ones from the Halloween strategy.

Figure 2
Average Monthly Returns



Note: This figure reports the average monthly returns per month based on 37 European stock indices, industry and supersector, from October 1992 to October 2010.

To verify that the better performance of the winter months is not a consequence of more risk during that period, we also analyzed the average standard deviation of the monthly returns. According to the EMH, a higher return cannot be expected without additional risk. Table 5 contains the risk for each month. We would also like to highlight the fact that September and October are the worst months in terms of return and risk, respectively, and both of them are in the summer months.

Of the winter months, only two – February and April – are in the 6 riskier months, which are actually months with good returns. As such, it is important to cross-check the information between return and risk, which is why the reward-to-risk ratio of every month was analyzed.

By looking at the reward-to-risk ratio of each month, we can see that, during the winter months, only January and February do not appear in the six best places, as a result, it seems unlikely that risk would justify the difference in returns between November–April and May–October periods.

Table 5
Ranking of months according to the standard deviation of the returns

Rank	Month	Std. dev.
1	June	4.11%
2	December	4.42%
3	July	4.52%
4	March	4.64%
5	January	4.92%
6	November	5.05%
7	February	5.10%
8	May	5.12%
9	August	5.14%
10	September	5.61%
11	April	5.74%
12	October	6.87%

Note: This table exhibits the months in ascending order of risk (measured by the average standard deviation of the monthly returns) based on 37 European stock indices, industry and supersector, from October 1992 to October 2010. In addition, the related monthly average standard deviation is reported on the right side of each month.

In conclusion, the Halloween effect is not a result of higher or lower-than-usual returns in one particular month. In addition, the superior returns in the November–April period are not justified by higher levels of risk (as previously concluded).

3.3.3. Trading Strategies

In the literature, there is an ongoing discussion regarding whether the Halloween strategy offers a significantly higher returns than a B&H strategy throughout the whole year.

Here, we compare annual returns of the Halloween strategy with a B&H strategy. Halloween strategy is defined as one where the investor buys a market portfolio at the end of October and sells this portfolio at the end of April. This investor will then invest in a risk-free asset from the end of April to the end of October. In the buy and hold strategy, the investor holds the stock market portfolio throughout the year.

Three scenarios must be distinguished as part of this comparison. Table 6 shows the percentage of indices in each scenario.

- Scenario 1: The Halloween strategy outperforms the B&H strategy, even without taking into account risk-free investment;
- Scenario 2: The Halloween strategy outperforms the B&H strategy;
- Scenario 3: The B&H strategy outperforms the Halloween strategy. We measured annualized continuously-compounded returns from October 1992 to October 2010.

The results show that more than half of the indices are in scenario 1, where the Halloween strategy outperforms the B&H strategy, even ignoring investment in a risk-free asset over the May–October periods. This happens because the indices often demonstrate negative average returns during the summer months, therefore any strategy that suggests being out of the market during this period yields superior returns.

For the indices which are not in scenario 1, the annual continuously-compounded break-even rates of return required from the risk-free asset to equal the returns from the Halloween strategy and the B&H strategy¹¹ were computed.

The indices in which the annual continuously-compounded break-even rate is below 3.95% (which corresponds to the continuously-compounded European Interbank Offered Rate¹² from October 1992 to October 2010, and a benchmark for the risk-free rate), the Halloween strategy was assumed to outperform the B&H strategy (scenario 2), conditional on the proceeds being invested exclusively over the November–April periods in the stock market and then applied to the risk-free asset during the summer months (for instance, since it is better to hold bonds than invest in the stock market during the summer months). In the remaining indices, the B&H strategy offers a better trading strategy solution (scenario 3).

In more than 75% of the indices, the Halloween strategy outperforms the B&H strategy. Additionally, a strategy based on “Sell in May and go away” saying is less risky (risk measured by standard deviation of monthly returns) in all the indices, compared to B&H. This contradicts those financial principles in which, according to the risk-return tradeoff, invested money can render higher profits if, and only if, it is subject to higher levels of risk. Finally, only 24% of the indices are in scenario 3, where the Halloween strategy does not outperform the B&H strategy.

Table 6
Halloween Strategy vs. the Buy and Hold Strategy

	Scenario 1	Scenario 2	Scenario 3
Total	57%	76%	24%
Eurozone	70%	96%	4%
Nordic region	36%	43%	57%

Note: This table exhibits three scenarios based on 37 European stock indices, industry and supersector, from October 1992 to October 2010. Scenario 1 represents the percentage of indices in which the winter months alone outperformed the B&H strategy. Scenario 2 shows the percentage of indices in which the Halloween strategy outperformed the B&H strategy. Scenario 3 represents the percentage of indices in which the B&H strategy outperformed the Halloween strategy.

The Halloween strategy is undeniably an exploitable opportunity. Other evidence can be found in the superior returns this strategy offers in Table 7.

From October 1992 to October 2010, all the indices in our sample indicate, on average, an annualized continuously-compounded rate of return for the B&H strategy of 10.0%. However, if an investor followed a Halloween investment strategy “blindly” in all indices, it would yield, on average, a return of 12.4%. In fact, the annual average excess of return is approximately 2.4%, with a significant reduction in risk in all the indices (on average, on an annual basis and considering all indices, the Halloween strategy allows a decrease of about 7.5% on standard deviation), for which the investor is grateful¹³. If we only consider the indices in which the Halloween strategy outperforms the B&H strategy (scenario 2), the annual excess of return rises to 3.6%.

¹¹ Without accounting for the transaction costs.

¹² In detail it corresponds to the Libor ECU from October 1992 to December 1998 and to the Euribor from January 1999 to October 2010. We achieve a similar rate by using Libor ECU from October 1992 to October 2010. All rates with 6-month period and extracted from Bloomberg.

¹³ The reward-to-risk ratio of the blind Halloween strategy is almost twice the one from the buy and hold strategy, since, on an annual basis, it benefits from a reduction in risk of approximately 7.5% and an increase in return of about 2.4%.

Table 7
Halloween strategy: An exploitable opportunity

	Average annual return	Difference against the benchmark
Buy and Hold Strategy (All indices)	10.0%	-
Halloween Strategy (All indices)	12.4%	2.4%
Buy and Hold Strategy (Indices in Scenario 2)	8.2%	-
Halloween Strategy (Indices in Scenario 2)	11.8%	3.6%

Note: This table show average annual continuously-compounded rates of return considering all the indices in our sample. Results are based on 37 European stock indices, industry and supersector, from October 1992 to October 2010. Column three compares the return of the strategies with the return of the respective benchmark (B&H strategy).

In conclusion, the Halloween strategy yields superior returns and beats the B&H strategy by a wide margin. In addition to this, this strategy is less risky. As a result, the Halloween strategy is proved to outperform the B&H strategy on a risk-adjusted basis.

From October 1992 to October 2010, we concluded that all the indices exhibit larger than the average returns during the winter months. Then, we showed that the differences in returns between the two six-month periods are statistically significant for the majority of the indices in our sample. We questioned ourselves about the persistence and reliability of this anomaly, so that the implementation of the Halloween strategy constitutes an exploitable opportunity. This strategy proved to work persistently. Another thought crossed our minds. Is the Halloween effect a result of higher or lower than the usual returns in one particular month or are the returns evenly spread? We documented that, with the exception of April and September, all the average monthly returns are within a reasonable range, although we found higher average returns during the winter months and lower or negative average returns during the summer months. A natural explanation for higher-than-average returns during the winter months would be the greater risk associated with that period; however, this is not the case. Finally, the Halloween effect was submitted to its ultimate test. We analyzed if the Halloween strategy outperformed the B&H strategy, a benchmark for market efficiency. The results are conclusive and impressive. In more than 75% of the indices, the Halloween strategy outperforms the B&H strategy with an annual average excess of return of 2.4%, and with a significant reduction in risk in all the indices (around 7.5% on an annual basis considering all indices). Considering all of this, we conclude that the Halloween effect exists.

4. Results Discussion

Since the Halloween effect constitutes an anomaly that contradicts the EMH, it is important to discover the reasons for such an anomaly.

Jacobsen and Marquering (2009) concluded that this seasonal effect on stock returns is consistent with many alternative explanations. They demonstrated that any variable with a strong summer/winter pattern “explains” the stock market’s seasonality, in particular, they proved that the Halloween effect was related to ice cream consumption and airline travel.

Here, we test the veracity of certain explanations previously presented, and, others that we would like to suggest.

4.1. Economic Significance

From October 1992 to October 2010, the Halloween effect is economically significant¹⁴ in all the indices and exhibits an average excess of return during the winter months of around 1.8% compared to the summer months.

Moreover, the Halloween strategy outperforms the B&H strategy in more than 75% of the indices in our sample. Another finding was that an investor would yield an annual average excess of return of about 2.4%, compared to the B&H strategy if they followed the Halloween strategy “blindly” in all the indices. If one assumes reasonable trading costs, the Halloween strategy constitutes an exploitable opportunity. For a practical implementation of trading regarding this effect, it would be more appropriate to use index futures since the transactions costs would be much lower. For instance, Solnik (1993) estimates round-trip transactions costs of 0.1% on futures contracts.

4.2. Data Mining

Another problem is determining if the anomaly is unique to the specific sample where it was tested. First, Bouman and Jacobsen (2002: 1619) state that “(...) *the data snooping argument does not apply. (...) The effect is based on an inherited market saying (and the number of rules induced by market sayings seems limited).*”

Second, Schwert (2003) states that the obvious solution to the data mining problem is to test the anomaly on an independent sample, i.e., see if the anomaly exists in an out-of-sample test over different time periods and comparable markets. Bearing this in mind, we conducted the analysis of the anomaly before and after September 2001 to accommodate the significance of the dot-com bubble bursting (over different time periods) and tested the anomaly on Benchmark and Blue-chip Indices for the Europe Continent (over comparable markets).

The results are conclusive, as they present economically and statistically evidence that the Halloween effect exists.

4.3. Risk

Risk (measured as standard deviation of monthly returns) does not seem to explain the differences in terms of return over the two six-month periods.

¹⁴ “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.” (Maberly and Pierce, 2004: 30).

First, the majority of the indices demonstrate lower risk during the winter months. Second, risk in the winter months is more greatly rewarded in all the indices. Third, the Halloween strategy offers less risk than the B&H strategy in all the indices (on average, on an annual basis and considering all indices, the Halloween strategy allows a decrease of about 7.5% on standard deviation).

4.4. Is the Halloween Effect a Sector-Specific Effect?

Bouman and Jacobsen (2002) investigated whether the Halloween effect exists in particular sectors (in the case of seasonality sensitive industries) within an economy or in all sectors of the economy. In their study, they found that the effect was not related to specific sectors and suggested that the effect was mostly country specific. However, in light of the present results, the effect may be related to certain sectors¹⁵. However, the question remains: Is the Halloween effect specific to a particular sector? Whether by chance or due to fundamentals, time will tell.

4.5. Halloween Effect Controlled for the January Effect

Maberly and Pierce (2004) suggested that a possible solution for the “Sell in May and go away” puzzle could be the January effect. However, in our sample, January is not even one of the best six months to hold a long position in the market. As a result, January does not offer an explanation for this puzzle. Nevertheless, in order to establish a comparison with Bouman and Jacobsen (2002) and Maberly and Pierce (2004) results, the January effect was controlled by inserting a second dummy variable J_t , which is set equal to 1 whenever month t is January and 0 otherwise and, the “Sell in May” dummy is adjusted by giving the value 1 in the period November to April, except in January. Therefore, equation (1) is modified to:

$$r_t = \mu + \alpha_1 S_t^{adj} + \alpha_2 J_t + \varepsilon_t \quad \text{with } \varepsilon_t \sim N(0, \sigma_\varepsilon^2) \quad (2)$$

The estimation results from this equation are both very interesting and somewhat curious. First, the statistical significance of the Halloween effect is higher when controlled for the January effect. In total, 27 out of 37 indices are statistically significant at the 10 percent level (there were 23 without controlling for the January effect). Second, these results contradict those obtained by Bouman and Jacobsen (2002) and Maberly and Pierce (2004), since it seems that the January effect does not drive the Halloween effect in any way. Finally, in several indices, the estimated coefficient for the January effect is negative, which contradicts the belief that markets exhibit a January effect. Furthermore, only a reduced number of indices indicate a statistical significant January effect.

In conclusion, the January effect does not explain the Halloween effect and the impact of January returns obscures rather than drives the anomaly.

4.6. Halloween Effect Controlled for the April Effect

Contrary to January, April is the month with the highest average rate of return within the indices in our sample. Therefore, the abnormal returns in April could be a possible explanation for the anomaly. If the estimations of the Halloween effect controlled for the April returns became statistically insignificant, it would be enough to state that the Halloween effect was nothing more than a manifestation of the higher than the usual returns from April and, if so, any period which contains that month would outperform.

¹⁵ While Bouman and Jacobsen (2002) do not find large differences between sectors, their results are subjected to small number of sectors, and here, it is used a much finer partition.

To test for the possibility of the Halloween effect being driven by April returns, an additional regression was considered. The “Sell in May” dummy now takes the value 1 in the period November to March. In addition, an April dummy was included in which A_t takes the value 1 when returns fall in April and 0 otherwise, resulting in equation:

$$r_t = \mu + \alpha_1 S_t^{adj} + \alpha_3 A_t + \varepsilon_t \quad \text{with } \varepsilon_t \sim N(0, \sigma_\varepsilon^2) \quad (3)$$

The results from equation (3) are interesting for several reasons. First, the statistical significance of the Halloween effect is noticeably lower when controlled for the April returns. In 11¹⁶ out of the 37 indices there is a statistically significant “Sell in May” effect at the 10 percent level (there were 23 indices without controlling for April returns). The effect is highly significant (at the 1 percent level) in only 1 index (there were 4 without controlling for April returns). Second, a high number of indices indicate a statistically significant April effect. Third, only the supersectors “media” and “personal & household goods” remained statistically significant, both to Eurozone and Nordic regions, with and without dividends, after controlling the Halloween effect for April returns. Consequently, the Halloween effect may be related with specific sectors, although this is not completely clear for now.

In conclusion, it seems that the statistical significance of the Halloween effect is, in part, driven by the large returns observed during the months of April. However, the anomaly controlled for the April effect remains and is not completely explained, therefore, the puzzle is not solved yet.

4.7. Halloween Effect after Bouman and Jacobsen (2002) Publication

Since Bouman and Jacobsen (2002) documented the Halloween effect, a discussion arose in the academic literature of whether or not the anomaly really exists.

Therefore, it is necessary to understand whether the Halloween effect still exists in the period after the publication of the Bouman and Jacobsen (2002) paper, or if it suffers from Murphy’s Law¹⁷.

Therefore, we tested the Halloween effect after Bouman and Jacobsen (2002) publication, and the anomaly proved statistically insignificant (since the coefficient of interest, α_1 , became statistically insignificant).

As the Halloween effect is statistically insignificant in the years after the publication of Bouman and Jacobsen (2002), we analyzed the returns, risk and reward-to-risk ratio over the two six-month periods after 2002. The results suggest that the effect is economically significant in the majority of the indices in the sample (86%).

However, some interesting features must be highlighted:

1. Surprisingly, after 2002, the majority of the indices demonstrate positive average rates of return during the summer months, something unusual from October 1992 to October

¹⁶ It is important to notice, that by estimating regression (3), it is accepted that all excess returns in April (above the average returns in May through October months) are entirely due to an April effect and not caused by a “Sell in May” effect. Note that this might exaggerate the size of the April effect and might in addition understate the “true” size of the “Sell in May” effect. For instance, in indices without a significant April effect but with a strong “Sell in May” effect, one might now find a significant April effect.

To be precise, with regression (3) a statistically significant April effect can be found in 26 indices (at the 10 percent level). However, with only a dummy for the April effect, we find a statistically significant April effect in 24 indices. Moreover, by estimating regression (3) with an unadjusted “Sell in May” dummy, we find a statistically significant April effect in 15 indices.

¹⁷ Murphy’s Law, as documented by Dimson and Marsh (1999), is the tendency for anomalies to disappear or reverse after they are discovered and published.

2010. Therefore, the increase in return during the summer months may have led to a reduction in the significance of the Halloween effect.

2. The monthly average excess of return during the winter months is about 0.7% compared to the summer months (which compares with 1.8% in the October 1992–October 2010 period).
3. 46% of the indices exhibit lower risk during the winter months compared to the summer months (which compares with 65% in the October 1992–October 2010 period), which indicates that the risk is becoming more equal between the winter and summer months.
4. The indices indicate a reduction of around 0.2% in the average standard deviation (vs. 0.3% in the period October 1992–October 2010), during the winter months.
5. In 87% of the indices, risk is more rewarded during the winter months (on average winter months offer 0.2% greater reward than summer months).

In conclusion, the Halloween effect became statistically insignificant after the Bouman and Jacobsen (2002) publication, but remained economically significant. Based on the results, we can conclude that the Halloween effect did not disappear completely after 2002.

Will the Halloween effect disappear completely? Is market efficiency working? We will probably have to wait and see; however, it seems that both risk and return are converging to the same values during winter and summer months, which is something we would expect assuming market efficiency.

5. Conclusions

“Sell in May and go away” is an old saying that poses a serious challenge to the market efficiency hypothesis. It refers to a belief that during the months of November to April monthly returns are unusually larger than those during the months of May to October.

Extending prior research, this paper examines the existence of the Halloween effect for the European stock market at the levels of industries and supersectors indices. This study expects to contribute in several ways to the existing literature.

First, we document the existence of a strong seasonal effect on stock returns, as described by the Halloween effect, and we prove the effect to be economically significant in all the indices in our sample, from October 1992 to October 2010. Winter months boast a monthly average excess of return of 1.8% compared to summer months.

Second, the effect cannot be accounted for by a seasonal incidence of risk, as the winter months offer less risk and reward it better than the summer months.

Third, on average, stocks deliver returns close to zero and often negative returns in the six-month period from May to October, only rewarding investors from November to April. This pattern is inconsistent with the EMH and difficult to explain with any equilibrium asset pricing model and the assumption that investors are risk averse. In comparison, the monthly average returns are almost always positive and unusually large during the winter months. Stock market returns should not be predictably lower than the short-term interest rate (risk-free rate) nor predictably negative. Specifically, more than half of the indices have negative average returns during summer.

Fourth, the differences in returns between the two six-month periods are indeed statistically significant, as 23 out of 37 indices show statistically significant differences between the winter and summer average returns, all with the expected sign, at the 10 percent level. The effect is highly significant (at the 1 percent level) for 4 indices in our sample.

Fifth, the Halloween strategy (described as investing in the stock market from November through April and in a risk-free asset for the other half of the year) produces results persistently, working two out of every three calendar years. Moreover, the Halloween strategy outperforms the B&H strategy – a benchmark for market efficiency – in 75% of the indices, constituting an exploitable opportunity. By following the Halloween strategy “blindly”, in all the indices in our sample, an investor would yield an annual average excess of return of approximately 2.4% compared to the B&H strategy and further assure a significant reduction in risk in all the indices (around 7.5% on an annual basis). If we assume reasonable trading costs, the Halloween strategy constitutes an exploitable opportunity. To optimize the Halloween strategy (which, by its nature, is specially suited for those investors without liquidity problems), an investor should use future contracts to reduce the implementation costs of the strategy, which is especially attractive given the low number of transactions required.

Sixth, having concluded that the Halloween effect exists and because the Halloween strategy has proved to outperform the B&H strategy on a risk-adjusted basis, we have examined and discussed a number of possible explanations for this market anomaly. We found no evidence that the effect can be explained by factors like risk, data mining or the January effect. There are some clues which indicate that the effect may only exist or may be more concentrated in some sectors, however, the answer is not completely clear for now. We found that part of the Halloween effect’s statistical significance is driven by the large returns observed during the months of April. However, the anomaly controlled for the April effect still exists, as it

remains economically and statistically significant, therefore, the puzzle is not solved yet. Another finding was that the Halloween effect became statistically insignificant after the Bouman and Jacobsen (2002) publication. That said, it has remained economically significant and still represents an exploitable opportunity. Interestingly, it can be observed that, after 2002, both risk and return from winter and summer months are converging and the disparities seem to be disappearing. Is this due to market efficiency?

Seventh, we suggest that a possible explanation for the anomaly may be related with the negative average returns during the May–October period, rather than with a superior performance during the winter months, since the effect is found mainly in the indices with negative average returns during the summer months. In addition, Bouman and Jacobsen (2002) concluded that, both in the southern and northern hemispheres, returns were superior in the November–April period. However, seasons differ by six months between the hemispheres. We think that the explanation for the Halloween effect, instead of being related to human behavior due to weather, SAD (Seasonal Affective Disorder), vacations or an optimism cycle, as suggested by other authors, may be related with economic and/or financial events (like flows from mutual funds or others) that lead prices to be persistently negative during the summer months.

We have made some breakthroughs regarding the study of the Halloween effect and we have indicated some avenues that may lead (we hope) to the true rationales for this anomaly. We are sure that further research is needed to reconcile this seasonal pattern with rational human behavior. Future research may be able to answer the question of whether it is indeed the negative returns of the summer months the reason behind this anomaly.

6. References

- Bachelier, L., 1900, Theory of Speculation, in Dimson, E. and M. Mussavian, 1998, A brief history of market efficiency, *European Financial Management* 4(1), 91-193.
- Baur, Dirk G., 2013, The autumn effect of gold, *Research in International Business and Finance*, Volume 27, Issue 1, January 2013, Pages 1-11.
- Bouman, S. and B. Jacobsen, 2002, The Halloween Indicator, “Sell in May and Go Away”: Another Puzzle, *American Economic Review* 92(5), 1618-1635.
- Chow, G., 1960, Tests of Equality Between Sets of Coefficients in Two Linear Regressions, *Econometrica* 28(3), 591-605.
- Ciccone, S. and A. Etebari, 2008, A month-by-month examination of long-term stock returns, *Investment Management and Financial Innovations* 5(3), 8-18.
- Cootner, P., 1964, *The Random Character of Stock Market Prices*. Cambridge: M.I.T. Press.
- Cowles, A. 3rd, 1933, Can Stock Market Forecasters Forecast?, *Econometrica* 1, 309-324.
- Cowles, A. 3rd, 1944, Stock Market Forecasting, *Econometrica* 12, 206-214.
- Cowles, A. 3rd and H. Jones, 1937, Some A Posteriori Probabilities in Stock Market Action, *Econometrica* 5, 280-294.
- Dimson, E. and M. Mussavian, 1998, A brief history of market efficiency, *European Financial Management* 4(1), 91-193.
- Dimson, E. and P. Marsh, 1999, Murphy's Law and Market Anomalies, *Journal of Portfolio Management* 25(2), 53-69.
- Doeswijk, R.Q., 2008, The Optimism Cycle: Sell in May, *De Economist* 156(2), 175-200.
- Doeswijk, R.Q., 2009, The Halloween Effect in US Sectors: Comment, *Working Paper*, Robeco. Available at SSRN: <http://ssrn.com/abstract=1456357>.
- Fama, E., 1965, The Behavior of Stock-Market Prices, *Journal of Business* 38(1), 34-105.
- Fama, E., 1970, Efficient Capital Markets: A Review of Theory and Empirical Work, *Journal of Finance* 25(2), 383-417.
- Fama, E., 1991, Efficient Capital Markets: II, *Journal of Finance* 46(5), 1575-1617.
- Goetzmann, W. and N. Zhu, 2005, Rain or Shine: Where is the Weather Effect?, *European Financial Management* 11(5), 559-578.
- Grimbacher, S., L. Swinkels and P. Vliet, 2010, An Anatomy of Calendar Effects, *Working Paper*, Robeco. Available at SSRN: <http://ssrn.com/abstract=1593770>.
- Guenster, N., E. Kole and B. Jacobsen, 2009, Riding Bubbles, *Working Paper*, Finance International Meeting AFFI-EUROFIDAI Paper. Available at SSRN: <http://ssrn.com/abstract=1071670>.
- Haggard, K. and H. Witte, 2010, The Halloween Effect: Trick or Treat?, *International Review of Financial Analysis* 19(5), 379-387.
- Hirsch, Y., 1986, *Don't Sell Stocks on Monday*. New York: Facts on File Publications.
- Jacobsen, B. and C. Zhang, 2010, Are Monthly Seasonals Real? A Three Century Perspective, *Working Paper*, Massey University. Available at SSRN: <http://ssrn.com/abstract=1697861>.

- Jacobsen, B. and N. Visaltanachoti, 2009, The Halloween Effect in US Sectors, *The Financial Review* 44(3), 437-459.
- Jacobsen, B. and W. Marquering, 2008, Is it the weather?, *Journal of Banking and Finance* 32(4), 526-540.
- Jacobsen, B. and W. Marquering, 2009, Is it the Weather? Response, *Journal of Banking and Finance* 33(3), 583-587.
- Jacobsen, B., A. Mamun and N. Visaltanachoti, 2005, Seasonal, Size and Value Anomalies, *Working Paper*, Massey University. Available at SSRN: <http://ssrn.com/abstract=784186>.
- Jacobsen, B., J. Stangl and N. Visaltanachoti, 2009, Sector Rotation across the Business Cycle, *Working Paper*, Massey University. Available at SSRN: <http://ssrn.com/abstract=1467457>.
- Jensen, M., 1967, The Performance of Mutual Funds in the Period 1945-1964, *Journal of Finance* 23(2), 389-416.
- Kamstra, M., L. Kramer and M. Levi, 2003, Winter Blues: A SAD Stock Market Cycle, *American Economic Review* 93(1), 324-343.
- Kamstra, M., L. Kramer and M. Levi, 2009, Is it the Weather? Comment, *Journal of Banking and Finance* 33(3), 578-582.
- Kelly, P. and F. Meschke, 2010, Sentiment and stock returns: The SAD anomaly revisited, *Journal of Banking and Finance* 34(6), 1308-1326.
- Kendall, M., 1953, The Analysis of Economic Time-Series-Part I: Prices, *Journal of the Royal Statistical Society. Series A (General)* 116(1), 11-34.
- Levis, M., 1985, Are small firms big performers?, *Investment analyst* 76, 21-27.
- Lucey, B. and S. Whelan, 2002, A Promising Timing Strategy in Equity Markets, *Journal of the Statistical and Social Inquiry Society of Ireland* 31, 74-110.
- Lucey, Brian M., 2006, Investigating the determinants of the Wednesday seasonal in Irish Equities, *Research in International Business and Finance*, Volume 20, Issue 1, March 2006, Pages 62-76.
- Lucey, B. and S. Zhao, 2008, Halloween or January? Yet Another Puzzle, *International Review of Financial Analysis* 17(5), 1055-1069.
- Maberly, E. and R. Pierce, 2004, Stock Market Efficiency Withstands another Challenge: Solving the "Sell in May/Buy after Halloween" Puzzle, *Econ Journal Watch* 1(1), 29-46.
- Maberly, E. and R. Pierce, 2005, The Halloween Effect and Japanese Equity Prices: Myth or Exploitable Anomaly, *Asia-Pacific Financial Markets* 10(4), 319-334.
- Moskalenko, E. and P. Reichling, 2008, "Sell in May and Go Away" on the Russian Stock Market, *Transformation in der Ökonomie*, 257-267.
- Newey, W.K. and K.D. West, 1987, A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix, *Econometrica* 55(3), 703-708.
- O'Higgins, M. and J. Downs, 1990, *Beating the Dow, A High-Return-Low-Risk method investing in Industrial Stocks with as little as \$5000*. New York: Harper Collins.
- Osborne, M.F.M., 1959, Brownian Motion in the Stock Market, *Operations Research* 7, 145-173.
- Pearson, K., 1905, The Problem of the Random Walk, *Nature* 72(1867), 342.

- Roberts, H., 1959, Stock-Market “Patterns” and Financial Analysis: Methodological Suggestions, *Journal of Finance* 14(1), 1-10.
- Samuelson, P., 1965, Proof That Properly Anticipated Prices Fluctuate Randomly, *Industrial Management Review* 6(2), 41-49.
- Schwert, G.W., 2003, *Handbook of the Economics of Finance*. Amsterdam: Elsevier Science B.V.
- Sharpe, W. F., 1966, Mutual Fund Performance, *Journal of Business* 39(1), 119-138.
- Sullivan, R., A. Timmermann and H. White, 2001, Dangers of data mining: The case of calendar effects in stock returns, *Journal of Econometrics* 105, 249-286.
- Whelan, S., 2002, Beating the Market, *The Actuary* January/February, 39-40.
- White, H., 1980, A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity, *Econometrica* 48(4), 817-838.
- Witte, D., 2010, Outliers and the Halloween Effect: Comment on Maberly and Pierce, *Econ Journal Watch* 7(1), 91-98.