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THE HALLOWEEN EFFECT IN EUROPEAN SECTORS

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 every two out of three calendar years and if an investor followed it "blindly", would yield an annual average excess of return of about 2,3% compared to the Buy and Hold strategy and further assure a significant reduction in risk in all the Indices (around 7,5% on an annual basis). We have considered several possible explanations for the anomaly, but none was able to completely justify the seasonal effect. We suggest that a possible explanation may be related with the negative average returns during the May–October period, rather than with a superior performance during the November–April period.*

Key Words: *Halloween Effect, Market Efficiency, Anomaly, Returns.*

JEL Classification Code: G10, G14

1. Introduction

Calendar effects in 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 is the violation of an underlying assumption of the EMH.

This theory was widely accepted until the 1990s when empirical analyses have consistently found anomalies that undermines the EMH. One of those anomalies is the Halloween effect which is 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 during May through October than during the rest of the year. Even if no one knows exactly how old the saying is, research by Jacobsen and Zhang (2010) found a written reference in the Financial Times from the year of 1935. After this, the phenomenon was studied by a sort of different authors.

In spite other pioneering studies, Bouman and Jacobsen (2002) was the first study that took this investigation point into a further stage. They analyzed the stock markets monthly returns of 37 countries from January 1970 through August 1998, and their sample includes both developed and emerging markets. For 36 of the 37 countries, average monthly returns were lower over the period May-October than over the period November-April. The authors reported differences statistically significant 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.

Bouman and Jacobsen (2002) in order to find an explanation for the anomaly have tried different reasons like 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 the provision of news, but according to the authors, none of these seemed to provide an explanation.

In their efforts to explain the anomaly, they have just found 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 are at a different time relatively to those in the northern-hemisphere, they also find higher returns in the November–April period. At the end, they left the seasonal anomaly unexplained.

After this, Kamstra *et. al.* (2003) suggested an explanation for the Halloween effect, originating a controversial discussion around it. They related the seasonal nature of stock market returns to the Seasonal Affective Disorder (SAD) effect. They remarked that SAD – which is a medical condition whereby the shortness of the days leads to depression for many people – causes a higher level of risk aversion[1], leading to seasonal stock market

[1] More specifically, they argued that the medical and psychology literature have clinically established a positive relationship between the length of night and

returns depending on the length of the day. Based on this, they argued that stock returns during the fall should become lower and, then, become relatively higher during the winter months when days start to get longer. Low returns occur before winter solstice[2] and abnormally high returns following winter solstice. In short, their study argues that weather affects stock returns through mood changes of investors. They also added that according to the medical evidence on the incidence of SAD, this seasonality relates to the length of the day, not to changes in the length of the day.

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

The study of Maberly and Pierce (2004) has been specifically criticized by Witte (2010) who reported that the authors in their study identified the two outliers without formalizing criteria and, dealt with them in an unsatisfactory way, as 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 the Bouman and Jacobsen (2002) results, after using three robust regression methods (more appropriate to outliers, according to the author) to estimate the Halloween effect in the same time frame.

Doeswijk (2008) provided sample evidence that the abnormal returns from the Halloween strategy are indeed economically significant and he also suggested that the seasonal pattern could be a result from an optimism cycle. The optimism cycle hypothesis assumes that investors think in calendar years instead of twelve-month rolling forward 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. At first, 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 more pessimistic (or less optimistic if one prefers). So, from November through April investors should overweight equities and from May through October they should be underweight.

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, to the best of our knowledge, it is the first study

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depression through the seasons, as well as a positive relationship between depression and risk aversion.

[2] Winter solstice occurs each year in December 21 or 22 in the Northern Hemisphere and in June 20 or 21 in the Southern Hemisphere, on the shortest day and longest night of the year. Winter solstice marks the beginning of winter season and after it, days start to get longer. The SAD effect results in the Southern Hemisphere are six months out of phase, as are the seasons.

wich regards the Halloween effect using European Stock Market Sector Indices. Second, our results provide some new insights regarding the effect of dividends in the Halloween effect. Third we 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 to 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

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 some possible explanations for the anomaly and presents some robusteness checks and Section 5 concludes.

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 keep consistency with Bouman and Jacobsen (2002), it was incorporated a seasonal dummy variable[3], in the usual regression model that takes the value 1 if month t falls on the period November through April and 0 otherwise.

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

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 assumptions we apply the OLS coefficients standard errors corrections. White (1980) procedure is applied to deal with errors' heteroskedasticity and Newey-West (1987) procedure was used to deal with both heteroskedasticity and autocorrelation or with autocorrelation only.

[3] The regression equation 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. In the absence of the dummy variable the equation is reduced to the random walk model with drift for the log of the stock prices.

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 1992[4] to October 2010. However, the time horizon differs between indices according to its establishment date 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, it were also used Benchmark and Blue-Chip Indices relative to the European Stock Market, which will be used for out-of-sample tests purposes, as they provide a benchmark of sector performance, 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 Methodology[5] and the Price Return Methodology[6]. There exist 37 Total Return Indices and 37 Price Return Indices.

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

There are four mainly reasons for the use of this data set. First, European researchers and traders are relatively unfamiliar with the Halloween effect compared to American researchers, looking at the investigation/research produced over the last years. Second, the European stock data constitutes a reasonably independent data set that presents an out-of-sample test[7], as pointed out by Sullivan *et. al.* (2001) and Schwert (2003), for the previous studies on this anomaly, with U.S. stock data, which is extremely well mined. Third, the use of European Sectorial data in the study of the Halloween effect brings 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.

[4] Some Indices are 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 considers all price changes and include 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 considers 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.

[7] European stock data will constitute an out-of-sample test to U.S. stock data; Benchmark and Blue-Chip Indices will constitute an out-of-sample test for the remaining European Indices.

3. Empirical Study about the existence of the Halloween Effect

Since the results tend to be similar, the focus will be on the Total Return Indices. We discuss results from the analysis of the Price Return Indices only if they provide additional insights[8].

The puzzle will be approached as follows. First, it will be studied whether exists economic differences in the returns of the two half-year periods and if they are attributable to risk. Second, it will be tested if the economic differences are statistically significant. Third, it is intended to perceive if the Halloween strategy (which points to invest in the stock market - in equities - from October 31 through April 30 and to be out of the market - in cash - for the rest of the year) constitutes an exploitable opportunity, for which will be analyzed its robustness, the distribution of returns and risk by the different months and the Halloween strategy will be compared with the Buy and Hold strategy.

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 periods (also known as winter months) than those in the May–October periods (also known as summer months). To examine the seasonal effect we just need to break down the annual returns of equity markets into the two fractions of a year.

Results are reported in Table 1 and Table A1, from what we can withdraw 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 present negative average returns during summer[9]) or close to zero. More specifically, the monthly average excess of return during the winter months is about 1,8% compared to the summer months. The bulk part of the annualised return is concentrated in the November–April period. The effect is, therefore, very pronounced as it is illustrated in Figure A1.

We suggest, that a possible explanation to the anomaly may be related with the negative average rates of return during the May–October period, rather than with a superior performance during the winter months. Sample evidence support 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.

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

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

[9] During our research, we found this curiously 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 relevant and interesting it is the Halloween effect, as the average returns during summer months are often negative.

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.**
Avg. monthly returns	1,5%	-0,2%	2,2%	0,2%	1,7%	-0,1%

This table shows the average monthly returns in the period May–October and in the period November–April based on 37 European Stock Indices from October 1992 to October 2010.

The empirical evidence supports the economically exploitable opportunity associated with the Halloween effect. For those more skeptics, it is presented an example based on the Media Supersector Nordic Index, of the differences in return between the two six-month periods from October 1992 to October 2010. A €100 investment in this Index, beginning in 1992 grew to €2.264 conditional on the proceeds being invested exclusively over the November–April periods. In contrast, by investing the proceeds exclusively over the May–October periods, the investment reduces to €26. The difference is striking.

Risk-Return Trade-off

A natural question is whether these results are related with 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 some interesting empirical insights about the 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 present a reduction of around 0,3% in the average standard deviation during winter. The results allow to reject the hypothesis that the "Sell in May" effect is a result of higher risk during the winter months. Second, as curiosity the Nordic region seems to be more risky in winter months than the Eurozone region.

In addition, we also analyzed if the burst of the dot-com bubble 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, reason of why, we computed the Chow Test[10] to check for the presence of a structural break in the risk that in somehow could lead to the existence of the Halloween Effect. The conclusion is that only 5 Indices have changed its 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	65%
Eurozone	83%
Nordic region	36%

Table 2 shows the percentage of Indices, in the sample of 37 European Stock Indices, which exhibit lower risk (measured by standard deviation of the monthly returns) during the winter months than during 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.**
Avg. monthly std. dev.	4,5%	4,9%	5,8%	5,8%	5,0%	5,2%

Table 3 shows the monthly average standard deviation during the summer period (May–October) and during the winter period (November–April) based on 37 European Stock Indices from October 1992 to October 2010.

Furthermore, it was computed the reward-to-risk ratio, defined as the average return per unit of risk, for the two half-year periods. Such ratio allow us perceive in which half of the year the risk is being more rewarded. To analyze if the return compensates the risk, we assume investor's risk neutrality.

The results show that all Indices present 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 the risk 0,4% more than the summer.

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

3.2. Statistical Significance

Even though the Halloween effect is economically significant, it is important to notice that the relevant question is whether it is also statistically significant.

In Table A2 we report some summary statistics and some basic estimations results from equation (1).

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 the Indices with a statistical significant Halloween effect, exhibit negative average returns during the summer months. If we consider only the Indices with positive average returns during the summer months, the Halloween effect is residual. Hence, the Halloween effect may not be resultant to higher than the usual returns in the November–April periods, but due to the lower (and sometimes negative) than the usual returns in the May–October periods.

Table 4 – Global results of the Halloween Effect statistical significance
Estimations results for the regression (1):

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

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

Table 4 shows global results of the Halloween effect statistical significance based on 37 European Stock Indices 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. It is also exhibited the number of negative estimated coefficients. The *t* significance tests are based on White heteroskedasticity consistent standard errors or Newey-West heteroskedasticity and autocorrelation consistent standard errors.

Indeed, we document the existence of a strong seasonal effect in stock returns, as the one it is described by the Halloween effect and, we proved the effect to be statistically significant in the majority of the 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 only is helpful for an investor if it is reliable on its persistence. The Halloween effect could perhaps be a consequence of an extraordinary performance in a couple of years.
To actually control for the possibility of the abnormal return could be achieved by mere chance it was computed the percentage of years that the

November–Aril period achieved higher returns than the May–October period.
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 that it 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 six months to come things will be different and the pattern will not show. 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. Concluding, a strategy based on the “Sell in May and go away” saying, works persistently.

3.3.2. Monthly Returns and Monthly Risk

An interesting question is whether the returns are more or less evenly spread over the months in all the 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 1.
The results point out 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.
The best strategy to follow, according to the results obtained, in order to have a long position in the market for a period of six-months, is to be invested in the months of October, November, December, March, April and July. By doing such an investment, an investor would benefit from the return of the best six months of the year (at least, in average from October 1992 to October 2010, since past returns do not meant future ones). The main pitfall of this investment strategy is the transaction costs which would be 3 times higher than the ones from the Halloween strategy.

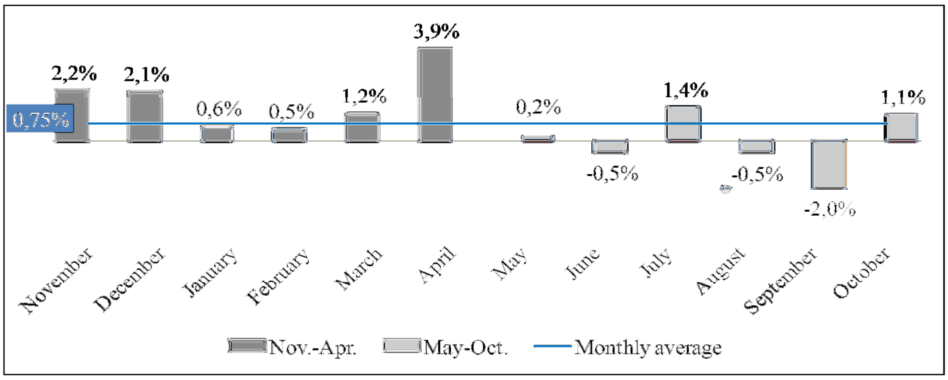

Figure 1 – Average Monthly Returns
Figure 1 reports the average monthly returns per Month based on 37 European Stock Indices from October 1992 to October 2010.

To guarantee that the higher 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 bearing additional risk. Results are reported in Table 5 that contains the risk for each month. As a curiosity, we would like to highlight that September and October are the worst months in terms of return and risk, respectively, and both of them are in the summer months.

Within the winter months, only 2 – February and April – are in the 6 riskier months, which by chance, are months with good performances in terms of return. Thus, it is important to cross the information between return and risk, reason of why it was analyzed the reward-to-risk ratio of every month.

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 sixth 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 the 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%

Table 5 exhibits the months sorted in ascending order of risk (measured by the average standard deviation of the monthly returns) based on 37 European Stock Indices from October 1992 to October 2010. In addition, it is reported the related monthly average standard deviation on the right side of each month.

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

3.3.3. Trading Strategies

In the literature there is an ongoing discussion if the Halloween strategy offers a significantly higher profit than a Buy and Hold strategy throughout the whole year.

Here we compare annual returns of the Halloween strategy with a Buy and Hold strategy. Halloween strategy is defined as a strategy 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 through the end of October. In the Buy and Hold strategy the investor holds the stock market portfolio all over the year.

Within this comparison three scenarios must be distinguished. Table 6 shows the percentage of Indices in each Scenario.

- Scenario 1: The Halloween strategy outperforms the Buy and Hold strategy even without taking into account the risk-free investment;
- Scenario 2: The Halloween strategy outperforms the Buy and Hold strategy;
- Scenario 3: The Buy and Hold 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 Buy and Hold strategy even if one does not consider investing in a risk-free asset over the May–October periods. This happens, because the Indices often present negative average returns during the summer months, therefore any strategy that suggest to be out of the market during this period yields superior returns. Table A3 exhibits annualized average returns during all the year and during the winter months.

For the Indices which are not in Scenario 1, it were computed 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 Buy and Hold strategy[11].

The Indices in which the annual continuously-compounded break-even rate is below 3,95% (which corresponds to the continuously-compounded European Interbank Offered Rate[12] from October 1992 to October 2010, and a benchmark for the risk-free rate), the Halloween strategy was assumed to outperform the Buy and Hold strategy (Scenario 2) conditional on the proceeds being invested exclusively over the November–April periods in the stock market and then applied in the risk-free asset during the summer months (since it is better to hold for instance bonds than invest in the stock market during the summer months). In the remaining Indices, the Buy and Hold strategy presents a better trading strategy solution (Scenario 3).

[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 months period and extracted from Bloomberg.

In more than 75% of the Indices the Halloween strategy outperforms the Buy and Hold strategy. Additionally, a strategy based on the “Sell in May and go away” saying is less risky (risk measured by standard deviation of the monthly returns) in ALL the Indices, compared to the Buy and Hold strategy. This contradicts the 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 Buy and Hold 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%

Table 6 exhibits three scenarios based on 37 European Stock Indices from October 1992 to October 2010. Scenario 1 represents the percentage of Indexes in which the winter months by itself outperformed the Buy and Hold strategy. Scenario 2 shows the percentage of Indexes in which the Halloween strategy outperformed the Buy and Hold strategy. Scenario 3 represents the percentage of Indexes in which the Buy and Hold strategy outperformed the Halloween strategy.

The Halloween strategy is undeniably an exploitable opportunity. If in need of more convincing, we present the superior returns presented by this strategy in Table 7. The detailed results are reported in Table A4.

Table 7 – Halloween strategy: An exploitable opportunity

	Average annual return	Difference against the Benchmark
Buy and Hold Strategy	10,0%	-
Halloween Strategy	12,4%	2,3%
Buy and Hold Strategy (Indices in Scenario 2)	8,2%	-
Halloween Strategy (Indices in Scenario 2)	11,8%	3,5%

Table 7 show average annual continuously-compounded rates of return considering all the Indices in our sample. Results are based on 37 European Stock Indices from October 1992 to October 2010. Column three compares the return of the strategies with the return of the respective Benchmark (Buy and Hold strategy).

From October 1992 to October 2010, all the Indices in our sample, present in average, an annualized continuously-compounded rate of return for the Buy and Hold strategy of 10,0%. However, if an investor followed a Halloween investment strategy "blindly" in all Indices, he would yield on average a return of 12,4%. In fact, the annual average excess of return is about 2,3% 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) and the investor is thankful for that[13]. If we consider only the Indices in which the Halloween strategy outperforms the Buy and Hold strategy (Scenario 2) the annual excess of return rises to 3,5%.

Concluding, the Halloween strategy yields superior returns and beats by a wide margin the Buy and Hold strategy. Additionally, this strategy is less risky. As a result, the Halloween strategy proved to outperform the Buy and Hold strategy on a risk-adjusted basis.

From October 1992 to October 2010, we have concluded that ALL the Indices exhibit larger than the average returns during the winter months. After that, we have showed that the differences in returns between the two six-month periods are indeed statistically significant for the majority of the Indices in our sample. In front of this, we have 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 cross our mind. 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 the existence of higher than the average returns during the winter months, would be the existence of more risk associated with that period, however, this is not the case. Finally, the Halloween effect was submitted to its ultimate test. It was analyzed if the Halloween strategy outperformed the Buy and Hold strategy, a benchmark for market efficiency. The results are conclusive and impressive. In more than 75% of the Indices, the Halloween strategy outperforms the Buy and Hold strategy with an annual average excess of return of 2,3%, 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 about the existence of the Halloween effect.

[13] The reward-to-risk ratio of the blind Halloween strategy is almost twice the one from the Buy and Hold strategy, since it benefits, in an annual basis, from a reduction in risk of about 7,5% and an increase in return of about 2,3%.

4. Results Discussion

Since the Halloween effect constitutes an anomaly which contradicts the EMH one would ask the reasons of such anomaly.

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

Here, we test whether there is some truth at all in some explanations presented before, and, others that we would like to suggest.

4.1. Economic Significance

From October 1992 to October 2010 the Halloween effect is economically significant[14] in ALL the Indices and exhibits an average excess of return during the winter months around 1,8% compared to the summer months.

Moreover, the Halloween strategy outperforms the Buy and Hold strategy in more than 75% of the Indices in our sample. Another finding result, was that an investor, by following "blindly" the Halloween strategy in all the Indices, would yield an annual average excess of return of about 2,3%, compared to the Buy and Hold strategy . If one assumes reasonable trading costs, the Halloween strategy constitutes an exploitable opportunity. For a practical implementation of trading on this effect, it would be more appropriate to use index futures since the transactions costs would be much lower. For instance, Solnik (1993) estimates the round-trip transactions costs of 0.1% on futures contracts.

4.2. Data Mining

Another problem is to determine 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. Therefore we conducted the analysis on the anomaly before and after September 2001, to deal with the significant event of the burst of the dot-com bubble (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 of the existence of the Halloween effect.

[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).

4.3. Risk

The risk (measured as standard deviation of monthly returns) do not seems to explain the differences in terms of return over the two six-month periods. First, the majority of the Indices have lower risk during the winter months. Second, the risk in the winter months is being more rewarded in ALL the Indices. Third, the Halloween strategy presents less risk than the Buy and Hold 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 would be present in particular sectors (could be the case of seasonality sensitive industries) within an economy or, if it manifests itself in all sectors of the economy. In their study, they found that the effect was not related to specific sectors and, suggested the effect to be mostly country specific. However, in light of the present results, the effect might be related to some sectors[15]. At the end 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 present an explanation for the 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:

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

The estimation results from this equation are very interesting and somewhat curious and are reported in Table A5. First, the statistical significance of the Halloween effect is higher when it is 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 do not drive in any way the Halloween effect. Finaly, in several Indices the estimated coefficient for the January effect is negative which contradicts the believing that the markets exhibit a January effect. Furthermore, only a reduced number of Indices present a statistical significant January effect.

[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, much finer partition.

Concluding, the January effect does not explain the Halloween effect and the impact of the January returns is to obscure, rather than to drive, 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 the April month could be a possible explanation for the anomaly. If the estimations of the Halloween effect controlled for the April returns became statistically insignificant, would be enough to state that the Halloween effect was nothing else than a manifestation of the higher than the usual returns from April and, if so, any period which contains that month would outperform.

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

$$r_t = \mu + \alpha_1 S_t^{adj2} + \alpha_3 A_t + \varepsilon_t \quad with\ \varepsilon_t \sim N\left(0, \sigma_\varepsilon^2\right) \qquad (3)$$

The results from equation (3) are interesting due to several reasons and are reported in Table A6. First, the statistical significance of the Halloween effect is noticeably lower when it is controlled for the April returns. In 11[16] 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 the April returns). The effect is highly significant (at the 1 percent level) in only 1 Index (there were 4 without controlling for the April returns). Second, a high number of Indices present a statistical 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 the April returns. Consequently, the Halloween effect may be related with specific Sectors, but, that is not completely clear for now.

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

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

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

Since Bouman and Jacobsen (2002) documented the Halloween effect, in the academic literature arose a discussion of whether or not the anomaly really exists, reason why, it is required to understand if the Halloween effect still exists in the period after the publication of the Bouman and Jacobsen (2002) paper or if it suffers from the Murphy Law[17].

Therefore, we tested the Halloween effect after Bouman and Jacobsen (2002) publication, and the anomaly proved to become statistically insignificant (since the coefficient of interest, α_1, became statistically insignificant), as it is shown in Table A7.

Since the Halloween effect in the years after the publication of the Bouman and Jacobsen (2002) is statistically insignificant, 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%), as it is shown in Table A8.

However, some interesting features must be highlighted:

1. Surprisingly, it can be noticed that after 2002, the majority of the Indices present positive average rates of return during the summer months, something unusual from October 1992 to October 2010. Therefore, the increase in return during the summer months may have lead 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 period October 1992–October 2010).
3. 46% of the Indices exhibit lower risk during the winter months compared to the summer months (which compares with 65% in the period October 1992–October 2010), so, also the risk is getting equal between the winter and summer months.
4. The Indices present 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, the risk is being more rewarded during the winter months (winter months reward on average 0,2% more than the summer months)..

Concluding, the Halloween effect became statistically insignificant after the Bouman and Jacobsen (2002) publication, but it remained economically significant. By looking at the results, we can conclude that the Halloween effect did not disappear completely after 2002.

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

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

5. Conclusions

The "Sell in May and go away" is an old saying that, poses a serious challenge to the market efficiency hypothesis. The saying refers to a believing 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 in stock returns, as the one it is 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 exhibit a monthly average excess of return of 1,8% compared to the summer months.

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

Third, on average, stocks deliver returns close to zero and often negative in the six-month period from May through October, only rewarding the investors from November through April. This pattern is inconsistent with the EMH and it is difficult to explain, with any equilibrium asset pricing model and the assumption that the 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), and moreover, should not be 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 shown 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, as it works every two out of three calendar years. Moreover, the Halloween strategy outperforms the Buy and Hold strategy – a benchmark for market efficiency – in 75% of the Indices, constituting therefore an exploitable opportunity. By following "blindly" the Halloween strategy, in all the Indices in our sample, an investor would yield an annual average excess of return of about 2,3% compared to the Buy and Hold strategy and further assure a significant reduction in risk in all the Indices (around 7,5% on an annual basis). If one assumes reasonable trading costs, the Halloween strategy constitutes an exploitable opportunity. To optimize the Halloween strategy (which by nature is specially suited for those investors which do not face 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, as we have concluded about the existence of the Halloween effect and since the Halloween strategy proved to outperform the Buy and Hold strategy on a risk-adjusted basis, we have examined and discussed a number of possible explanations for this market anomaly. We do not found evidence that the effect can be explained by factors like risk, data mining or the January effect. There are some clues which point that the effect may be only present or more concentrated in some sectors, but, the answer is not completely clear for now. We found that part of the Halloween effect statistical significance is being 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 result, was that the Halloween effect became statistically insignificant after the Bouman and Jacobsen (2002) publication, but, it remained economically significant and still representing 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 the market efficiency working?

Seventh, we suggest, that a possible explanation to 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 mainly present in the Indices with negative average returns during the summer months. In addition, Bouman and Jacobsen (2002) concluded that both in the southern-hemisphere and in the northern-hemisphere, returns were superior in the November–April period. However, seasons are six months out of phase between the hemispheres. We think that the Halloween effect explanation, instead of be related with human behavior due to the weather, SAD (Seasonal Affective Disorder), vacations or a optimism cycle, like suggested by other authors, might be related with economic and/or financial events (like flows from mutual funds or others) which conducts prices to be persistently negative during the summer months.

We have made some breakthroughs on the study of the Halloween effect and we have pointed some directions that may lead (we hope) for the true rationales of this anomaly. We know for sure, that further research is needed to reconcile the existence of this stock seasonal pattern with rational human behavior. Future research might be able to answer the question whether it is indeed the negative returns during the summer months the reason behind this anomaly.

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Data Appendix

Table A1 – Risk, Return and Reward-to-Risk Ratio

Table A1 shows risk and return in the period May–October and in the period November–April measured by standard deviation of the monthly returns and monthly continuously-compounded average returns, respectively. In addition, it reports the reward-to-risk ratio. All results are based on 37 European Stock Indices from October 1992 to October 2010.

	May-Oct.		Nov.-Apr.		Reward-to-risk ratio	
	Mean	Std. Dev.	Mean	Std. Dev.	May-Oct.	Nov.-Apr.
Bas Mater EZ	-0,18%	7,15%	1,68%	6,41%	-0,02%	0,26%
Cns Goods EZ	-0,12%	5,71%	1,48%	5,22%	-0,02%	0,28%
Cns Svcs EZ	-0,21%	5,53%	1,17%	5,37%	-0,04%	0,22%
Fincl EZ	-0,70%	8,13%	0,43%	7,16%	-0,09%	0,06%
Indus EZ	-0,90%	6,72%	1,79%	6,30%	-0,13%	0,28%
Aut&Prt EZ	-0,10%	7,78%	1,53%	8,10%	-0,01%	0,19%
Banks EZ	-0,23%	7,93%	1,29%	6,67%	-0,03%	0,19%
Bas Res EZ	-0,31%	8,96%	1,77%	7,14%	-0,03%	0,25%
Chem EZ	0,09%	6,45%	1,98%	5,55%	0,01%	0,36%
Cns&Mat EZ	-0,58%	6,34%	1,90%	5,55%	-0,09%	0,34%
Fin Svcs EZ	-0,38%	6,73%	1,73%	5,57%	-0,06%	0,31%
Fd&Bvr EZ	0,08%	4,78%	1,27%	4,12%	0,02%	0,31%
Hea Care EZ	0,53%	4,54%	0,98%	4,77%	0,12%	0,20%
Indus Gd EZ	-0,42%	6,90%	2,22%	6,10%	-0,06%	0,36%
Insur EZ	-0,33%	8,62%	1,09%	7,46%	-0,04%	0,15%
Media EZ	-0,61%	6,19%	1,37%	7,55%	-0,10%	0,18%
Oil&Gas EZ	0,33%	5,52%	1,23%	5,03%	0,06%	0,24%
Pr&Ho Gd EZ	-0,32%	6,44%	1,67%	5,66%	-0,05%	0,30%
Retail EZ	0,19%	5,56%	0,99%	5,52%	0,03%	0,18%
Tech EZ	-0,47%	9,54%	1,53%	8,71%	-0,05%	0,18%
Telecom EZ	0,27%	7,23%	1,79%	7,89%	0,04%	0,23%
Trv&Lsr EZ	-0,45%	7,84%	1,54%	5,69%	-0,06%	0,27%
Util EZ	0,18%	5,16%	1,52%	4,96%	0,03%	0,31%
Bas Mater N	-0,22%	7,69%	1,81%	7,56%	-0,03%	0,24%
Cns Goods N	-0,21%	5,95%	1,92%	5,73%	-0,04%	0,34%
Cns Svcs N	0,53%	6,06%	2,51%	7,90%	0,09%	0,32%
Fincl N	0,26%	7,31%	2,11%	7,52%	0,04%	0,28%
Indus N	0,54%	7,95%	2,82%	7,06%	0,07%	0,40%
Banks N	0,45%	7,81%	2,07%	7,94%	0,06%	0,26%
Bas Res N	-0,30%	7,94%	1,79%	8,45%	-0,04%	0,21%
Fin Svcs N	0,48%	7,37%	2,43%	6,92%	0,06%	0,35%
Hea Care N	1,07%	5,37%	1,89%	5,62%	0,20%	0,34%
Indus Gd N	0,60%	8,07%	2,86%	7,15%	0,07%	0,40%
Media N	-1,24%	8,70%	2,89%	14,22%	-0,14%	0,20%
Pr&Ho Gd N	-0,37%	6,85%	2,33%	7,41%	-0,05%	0,31%
Tech N	0,41%	10,96%	1,36%	12,39%	0,04%	0,11%
Telecom N	0,42%	8,33%	1,42%	10,17%	0,05%	0,14%

Table A2 – Estimation results for the regression (1) by Index

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

Table A2 shows summary results on 37 European Stock Indices from October 1992 to October 2010. α_1 refers to the parameter of regression (1). In addition, we report related p-values based on White heteroskedasticity consistent standard errors or Newey-West heteroskedasticity and autocorrelation consistent standard errors. Column seven contains comments on the OLS coefficients standard errors corrections used and when the estimated coefficient is negative. WP – White procedures were applied; NWP – Newey-West procedures were applied.

Indices	Number of Obs.	Mean	Std. Dev.	α_1	*p*-value	Notes:
Bas Mater EZ	141	0,73%	6,84%	0,02	0,108	
Cns Goods EZ	216	0,68%	5,52%	0,02	0,032	
Cns Svcs EZ	216	0,48%	5,48%	0,01	0,065	
Fincl EZ	141	-0,15%	7,67%	0,01	0,383	
Indus EZ	141	0,41%	6,63%	0,03	0,016	
Aut&Prt EZ	216	0,72%	7,97%	0,02	0,133	
Banks EZ	216	0,53%	7,35%	0,02	0,114	NWP
Bas Res EZ	216	0,73%	8,15%	0,02	0,067	NWP
Chem EZ	216	1,04%	6,07%	0,02	0,022	
Cns&Mat EZ	216	0,66%	6,07%	0,02	0,003	
Fin Svcs EZ	216	0,68%	6,25%	0,02	0,023	NWP
Fd&Bvr EZ	216	0,68%	4,49%	0,01	0,052	
Hea Care EZ	216	0,75%	4,65%	0,00	0,481	
Indus Gd EZ	216	0,90%	6,63%	0,03	0,003	
Insur EZ	216	0,38%	8,08%	0,01	0,198	
Media EZ	216	0,38%	6,96%	0,02	0,036	
Oil&Gas EZ	216	0,78%	5,29%	0,01	0,212	
Pr&Ho Gd EZ	216	0,68%	6,13%	0,02	0,017	
Retail EZ	216	0,59%	5,54%	0,01	0,292	
Tech EZ	216	0,53%	9,17%	0,02	0,109	
Telecom EZ	216	1,03%	7,59%	0,02	0,142	
Trv&Lsr EZ	216	0,54%	6,91%	0,02	0,034	WP
Util EZ	216	0,85%	5,09%	0,01	0,052	
Bas Mater N	216	0,80%	7,68%	0,02	0,052	
Cns Goods N	216	0,85%	5,93%	0,02	0,008	
Cns Svcs N	216	1,52%	7,09%	0,02	0,040	WP
Fincl N	216	1,19%	7,46%	0,02	0,076	NWP
Indus N	216	1,68%	7,59%	0,02	0,037	NWP
Banks N	216	1,26%	7,90%	0,02	0,137	NWP
Bas Res N	216	0,74%	8,25%	0,02	0,062	
Fin Svcs N	216	1,46%	7,20%	0,02	0,046	
Hea Care N	216	1,48%	5,50%	0,01	0,272	
Indus Gd N	216	1,73%	7,69%	0,02	0,039	NWP
Media N	216	0,82%	11,94%	0,04	0,011	
Pr&Ho Gd N	216	0,98%	7,25%	0,03	0,006	
Tech N	216	0,88%	11,68%	0,01	0,552	
Telecom N	195	0,91%	9,27%	0,01	0,475	NWP

Table A3 – Risk and return during the entire year and during the winter months

Table A3 shows risk and return for the complete year (Buy and Hold strategy) and during the winter months measured by annualized standard deviation and mean continuously-compounded average returns, respectively. The results would assume an investor that had been in the stock market during the 12 months (columns 2 and 3) or during the 6 winter months (columns 4 and 5). Results are based on 37 European Stock Indices from October 1992 to October 2010.

	All year (Buy and Hold Strategy)		Winter months	
	Mean	Std. Deviation	Mean	Std. Deviation
Bas Mater EZ	8,76%	23,68%	10,06%	15,71%
Cns Goods EZ	8,14%	19,13%	8,89%	12,80%
Cns Svcs EZ	5,80%	18,98%	7,03%	13,15%
Fincl EZ	-1,77%	26,55%	2,58%	17,53%
Indus EZ	4,97%	22,98%	10,73%	15,43%
Aut&Prt EZ	8,62%	27,60%	9,20%	19,84%
Banks EZ	6,36%	25,46%	7,75%	16,34%
Bas Res EZ	8,73%	28,22%	10,61%	17,49%
Chem EZ	12,46%	21,04%	11,90%	13,58%
Cns&Mat EZ	7,88%	21,04%	11,37%	13,60%
Fin Svcs EZ	8,11%	21,66%	10,37%	13,65%
Fd&Bvr EZ	8,14%	15,56%	7,64%	10,09%
Hea Care EZ	9,02%	16,10%	5,85%	11,68%
Indus Gd EZ	10,77%	22,97%	13,30%	14,95%
Insur EZ	4,53%	27,98%	6,51%	18,28%
Media EZ	4,54%	24,10%	8,22%	18,49%
Oil&Gas EZ	9,35%	18,31%	7,37%	12,31%
Pr&Ho Gd EZ	8,14%	21,24%	10,03%	13,87%
Retail EZ	7,09%	19,20%	5,93%	13,52%
Tech EZ	6,35%	31,75%	9,17%	21,33%
Telecom EZ	12,37%	26,29%	10,73%	19,33%
Trv&Lsr EZ	6,52%	23,94%	9,24%	13,95%
Util EZ	10,22%	17,64%	9,14%	12,14%
Bas Mater N	9,55%	26,59%	10,85%	18,52%
Cns Goods N	10,25%	20,53%	11,53%	14,05%
Cns Svcs N	18,24%	24,57%	15,05% *	19,34%
Fincl N	14,26%	25,84%	12,68%	18,43%
Indus N	20,18%	26,28%	16,91%	17,29%
Banks N	15,12%	27,36%	12,40%	19,44%
Bas Res N	8,94%	28,57%	10,76%	20,69%
Fin Svcs N	17,47%	24,94%	14,60%	16,94%
Hea Care N	17,78%	19,05%	11,36%	13,76%
Indus Gd N	20,76%	26,64%	17,19%	17,52%
Media N	9,86%	41,37%	17,33%	34,84%
Pr&Ho Gd N	11,76%	25,11%	13,98%	18,16%
Tech N	10,59%	40,47%	8,14%	30,35%
Telecom N	10,96%	32,13%	8,51%	24,92%

Table A4 – Buy and Hold Strategy Versus Halloween Strategy

Table A4 show annual continuously-compounded rates of return that an investor would have achieve if he had followed the respective strategy. Results are based on 37 European Stock Indices from October 1992 to October 2010. Column two contains the annual return of the Buy and Hold strategy in the period. Column three contains the annual return of the Halloween strategy.

Indices	Buy and Hold Strategy: Annual return	Halloween Strategy: Annual return
Bas Mater EZ	8,76%	11,86%
Cns Goods EZ	8,14%	10,86%
Cns Svcs EZ	5,80%	9,01%
Fincl EZ	-1,77%	4,54%
Indus EZ	4,97%	12,52%
Aut&Prt EZ	8,62%	11,18%
Banks EZ	6,36%	9,73%
Bas Res EZ	8,73%	12,58%
Chem EZ	12,46%	13,88%
Cns&Mat EZ	7,88%	13,35%
Fin Svcs EZ	8,11%	12,35%
Fd&Bvr EZ	8,14%	9,61%
Hea Care EZ	9,02%	7,83%
Indus Gd EZ	10,77%	15,28%
Insur EZ	4,53%	8,49%
Media EZ	4,54%	10,20%
Oil&Gas EZ	9,35%	9,35%
Pr&Ho Gd EZ	8,14%	12,00%
Retail EZ	7,09%	7,91%
Tech EZ	6,35%	11,15%
Telecom EZ	12,37%	12,71%
Trv&Lsr EZ	6,52%	11,22%
Util EZ	10,22%	11,12%
Bas Mater N	9,55%	12,83%
Cns Goods N	10,25%	13,51%
Cns Svcs N	18,24%	17,02%
Fincl N	14,26%	14,66%
Indus N	20,18%	18,88%
Banks N	15,12%	14,38%
Bas Res N	8,94%	12,73%
Fin Svcs N	17,47%	16,58%
Hea Care N	17,78%	13,34%
Indus Gd N	20,76%	19,16%
Media N	9,86%	19,31%
Pr&Ho Gd N	11,76%	15,96%
Tech N	10,59%	10,12%
Telecom N	10,96%	10,38%

Table A5 – Estimation results for the regression (2) by Index

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

Table A5 shows summary results on 37 European Stock Indices from October 1992 to October 2010. α_1 and α_2 refers to the parameters of regression (2) regarding the Halloween effect and the January effect, respectively. In addition, we report related p-values based on White heteroskedasticity consistent standard errors or Newey-West heteroskedasticity and autocorrelation consistent standard errors. Column seven contains comments on the OLS coefficients standard errors corrections used and when the Halloween effect estimated coefficient (α_1) is negative. WP – White procedures were applied; NWP – Newey-West procedures were applied.

Indices	Number of Obs.	α_1	p-value	α_2	p-value	Notes:
Bas Mater EZ	141	0,03	0,016	-0,03	0,107	
Cns Goods EZ	216	0,02	0,014	0,00	0,999	
Cns Svcs EZ	216	0,02	0,040	0,00	0,874	
Fincl EZ	141	0,02	0,162	-0,03	0,250	
Indus EZ	141	0,03	0,005	0,00	0,868	
Aut&Prt EZ	216	0,02	0,123	0,01	0,623	
Banks EZ	216	0,02	0,042	-0,01	0,737	NWP
Bas Res EZ	216	0,02	0,035	0,00	0,805	NWP
Chem EZ	216	0,03	0,002	-0,02	0,174	
Cns&Mat EZ	216	0,03	0,002	0,01	0,415	
Fin Svcs EZ	216	0,03	0,004	0,00	0,954	NWP
Fd&Bvr EZ	216	0,02	0,007	-0,01	0,427	WP
Hea Care EZ	216	0,01	0,349	0,00	0,713	
Indus Gd EZ	216	0,03	0,003	0,02	0,324	
Insur EZ	216	0,02	0,075	-0,02	0,398	
Media EZ	216	0,02	0,044	0,02	0,281	
Oil&Gas EZ	216	0,01	0,053	-0,02	0,164	
Pr&Ho Gd EZ	216	0,02	0,005	0,00	0,887	
Retail EZ	216	0,01	0,149	-0,01	0,506	
Tech EZ	216	0,02	0,141	0,02	0,317	
Telecom EZ	216	0,01	0,302	0,04	0,069	
Trv&Lsr EZ	216	0,02	0,015	0,00	0,870	WP
Util EZ	216	0,01	0,041	0,01	0,618	
Bas Mater N	216	0,02	0,025	0,00	0,953	
Cns Goods N	216	0,02	0,007	0,02	0,310	
Cns Svcs N	216	0,01	0,147	0,05	0,044	WP
Fincl N	216	0,02	0,068	0,01	0,678	NWP
Indus N	216	0,02	0,035	0,02	0,365	NWP
Banks N	216	0,02	0,077	0,00	0,910	NWP
Bas Res N	216	0,03	0,023	-0,01	0,711	
Fin Svcs N	216	0,02	0,035	0,01	0,637	
Hea Care N	216	0,01	0,337	0,01	0,410	
Indus Gd N	216	0,02	0,038	0,02	0,347	NWP
Media N	216	0,04	0,034	0,07	0,024	
Pr&Ho Gd N	216	0,03	0,003	0,02	0,506	WP
Tech N	216	0,01	0,631	0,02	0,575	
Telecom N	195	0,01	0,578	0,02	0,425	NWP

Table A6 – Estimation results for the regression (3) by Index

$$r_t = \mu + \alpha_1 S_t^{adj2} + \alpha_3 A_t + \varepsilon_t \quad with\ \varepsilon_t \sim N\left(0, \sigma_\varepsilon^2\right)$$

Table A6 shows summary results on 37 European Stock Indices from October 1992 to October 2010. α_1 and α_3 refers to the parameters of regression (3) regarding the Halloween effect and the April effect, respectively. In addition, we report related p-values based on White heteroskedasticity consistent standard errors or Newey-West heteroskedasticity and autocorrelation consistent standard errors. Column seven contains comments on the OLS coefficients standard errors corrections used and when the Halloween effect estimated coefficient (α_1) is negative. WP – White procedures were applied; NWP – Newey-West procedures were applied.

Indices	Number	α_1	p-value	α_3	p-value	Notes:
Bas Mater EZ	141	0,01	0,353	0,05	0,011	
Cns Goods EZ	216	0,01	0,108	0,03	0,017	
Cns Svcs EZ	216	0,01	0,113	0,02	0,137	
Fincl EZ	141	0,00	0,865	0,05	0,023	
Indus EZ	141	0,02	0,069	0,05	0,007	
Aut&Prt EZ	216	0,01	0,392	0,05	0,015	
Banks EZ	216	0,01	0,366	0,04	0,022	NWP
Bas Res EZ	216	0,02	0,187	0,04	0,036	NWP
Chem EZ	216	0,01	0,113	0,05	0,003	
Cns&Mat EZ	216	0,02	0,009	0,04	0,017	
Fin Svcs EZ	216	0,02	0,098	0,04	0,003	NWP
Fd&Bvr EZ	216	0,01	0,082	0,02	0,171	
Hea Care EZ	216	0,00	0,704	0,01	0,231	
Indus Gd EZ	216	0,02	0,012	0,04	0,017	
Insur EZ	216	0,01	0,436	0,04	0,051	
Media EZ	216	0,02	0,045	0,02	0,267	
Oil&Gas EZ	216	0,01	0,459	0,03	0,052	
Pr&Ho Gd EZ	216	0,02	0,040	0,03	0,058	
Retail EZ	216	0,01	0,463	0,02	0,187	
Tech EZ	216	0,02	0,186	0,03	0,154	
Telecom EZ	216	0,01	0,195	0,02	0,286	
Trv&Lsr EZ	216	0,02	0,055	0,03	0,095	WP
Util EZ	216	0,01	0,116	0,02	0,067	
Bas Mater N	216	0,01	0,346	0,07	0,000	
Cns Goods N	216	0,02	0,044	0,04	0,003	
Cns Svcs N	216	0,01	0,164	0,05	0,010	WP
Fincl N	216	0,01	0,335	0,06	0,003	NWP
Indus N	216	0,01	0,197	0,06	0,002	NWP
Banks N	216	0,01	0,548	0,06	0,003	NWP
Bas Res N	216	0,01	0,408	0,08	0,000	
Fin Svcs N	216	0,01	0,149	0,04	0,017	
Hea Care N	216	0,01	0,225	0,00	0,908	
Indus Gd N	216	0,01	0,212	0,06	0,001	NWP
Media N	216	0,03	0,026	0,10	0,119	WP
Pr&Ho Gd N	216	0,02	0,034	0,05	0,003	
Tech N	216	0,01	0,612	0,01	0,628	
Telecom N	195	0,01	0,540	0,01	0,662	NWP

Table A7 – Estimation results for regression (1) by Index, after Bouman and Jacobsen (2002)

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

Table A7 shows summary results on 37 European Stock Indices from January 2003 to October 2010. α_1 refers to the parameter of regression (1). In addition, we report related p-values based on White heteroskedasticity consistent standard errors or Newey-West heteroskedasticity and autocorrelation consistent standard errors. Column five contains comments on the OLS coefficients standard errors corrections used and when the estimated coefficient is negative. WP – White procedures were applied; NWP – Newey-West procedures were applied.

Indices	Number	α_1	p-value	Notes:
Bas Mater EZ	94	0,01	0,576	
Cns Goods EZ	94	0,00	0,675	Neg. α_1
Cns Svcs EZ	94	0,00	0,696	
Fincl EZ	94	0,00	0,889	NWP
Indus EZ	94	0,02	0,263	NWP
Aut&Prt EZ	94	-0,02	0,364	Neg. α_1
Banks EZ	94	0,00	0,955	NWP
Bas Res EZ	94	0,01	0,620	NWP
Chem EZ	94	0,01	0,572	
Cns&Mat EZ	94	0,02	0,143	NWP
Fin Svcs EZ	94	0,01	0,409	NWP
Fd&Bvr EZ	94	0,00	0,805	
Hea Care EZ	94	0,01	0,507	WP
Indus Gd EZ	94	0,01	0,352	
Insur EZ	94	0,00	0,856	
Media EZ	94	0,00	0,809	NWP
Oil&Gas EZ	94	0,00	0,933	Neg. α_1
Pr&Ho Gd EZ	94	0,01	0,650	
Retail EZ	94	0,00	0,800	
Tech EZ	94	0,00	0,850	
Telecom EZ	94	-0,01	0,091	Neg. α_1
Trv&Lsr EZ	94	0,01	0,400	
Util EZ	94	0,00	0,695	NWP
Bas Mater N	94	0,01	0,476	
Cns Goods N	94	0,02	0,213	NWP
Cns Svcs N	94	0,02	0,156	
Fincl N	94	0,01	0,402	NWP
Indus N	94	0,01	0,403	
Banks N	94	0,01	0,513	NWP
Bas Res N	94	0,01	0,584	
Fin Svcs N	94	0,02	0,210	
Hea Care N	94	0,01	0,493	WP
Indus Gd N	94	0,01	0,418	
Media N	94	0,00	0,816	NWP
Pr&Ho Gd N	94	0,02	0,185	
Tech N	94	0,01	0,553	
Telecom N	94	0,00	0,750	Neg. α_1+NWP

Table A8 – Risk, Return and Reward-to-Risk Ratio, after Bouman and Jacobsen publictation
Table A8 shows risk and return in the period May–October and in the period November–April measured by standard deviation of the monthly returns and monthly continuously-compounded average returns, respectively. In addition, it reports the reward-to-risk ratio. All results are based on 37 European Stock Indices from January 2003 to October 2010.

	May-Oct.		Nov.-Apr.		Reward-to-risk ratio	
	Mean	Std. Dev.	Mean	Std. Dev.	May-Oct.	Nov.-Apr.
Bas Mater EZ	0,71%	6,87%	1,47%	6,15%	0,10%	0,24%
Cns Goods EZ	1,00%	4,70%	0,55%	5,59%	0,21%	0,10%
Cns Svcs EZ	0,21%	4,66%	0,59%	4,92%	0,04%	0,12%
Fincl EZ	0,11%	7,48%	0,32%	7,93%	0,01%	0,04%
Indus EZ	0,01%	6,63%	1,61%	5,72%	0,00%	0,28%
Aut&Prt EZ	1,65%	6,60%	0,10%	9,59%	0,25%	0,01%
Banks EZ	0,12%	7,75%	0,21%	8,33%	0,02%	0,02%
Bas Res EZ	0,29%	10,01%	1,32%	8,28%	0,03%	0,16%
Chem EZ	0,82%	5,95%	1,52%	6,10%	0,14%	0,25%
Cns&Mat EZ	-0,46%	6,84%	1,77%	6,21%	-0,07%	0,29%
Fin Svcs EZ	0,00%	5,94%	1,16%	6,52%	0,00%	0,18%
Fd&Bvr EZ	0,55%	4,69%	0,77%	3,78%	0,12%	0,20%
Hea Care EZ	0,12%	3,56%	0,73%	5,12%	0,03%	0,14%
Indus Gd EZ	0,28%	6,91%	1,50%	5,68%	0,04%	0,26%
Insur EZ	0,02%	8,09%	0,34%	9,26%	0,00%	0,04%
Media EZ	0,17%	5,11%	0,41%	4,96%	0,03%	0,08%
Oil&Gas EZ	0,43%	5,25%	0,34%	5,09%	0,08%	0,07%
Pr&Ho Gd EZ	0,50%	5,71%	1,00%	5,04%	0,09%	0,20%
Retail EZ	0,33%	4,92%	0,61%	5,77%	0,07%	0,11%
Tech EZ	-0,11%	7,34%	0,18%	7,25%	-0,01%	0,02%
Telecom EZ	1,36%	3,87%	-0,10%	4,42%	0,35%	-0,02%
Trv&Lsr EZ	-0,03%	6,20%	1,04%	5,95%	0,00%	0,17%
Util EZ	0,64%	4,94%	1,08%	5,43%	0,13%	0,20%
Bas Mater N	-0,09%	8,08%	1,08%	7,76%	-0,01%	0,14%
Cns Goods N	0,04%	6,72%	1,73%	5,93%	0,01%	0,29%
Cns Svcs N	0,34%	4,98%	1,92%	5,72%	0,07%	0,34%
Fincl N	0,26%	7,38%	1,58%	7,44%	0,04%	0,21%
Indus N	0,78%	7,76%	2,06%	6,88%	0,10%	0,30%
Banks N	0,12%	8,47%	1,29%	8,78%	0,01%	0,15%
Bas Res N	-0,20%	7,81%	0,72%	8,28%	-0,03%	0,09%
Fin Svcs N	0,46%	6,86%	2,16%	6,10%	0,07%	0,35%
Hea Care N	1,16%	3,74%	1,81%	5,31%	0,31%	0,34%
Indus Gd N	0,84%	7,91%	2,10%	6,95%	0,11%	0,30%
Media N	0,71%	8,32%	1,13%	9,30%	0,09%	0,12%
Pr&Ho Gd N	-0,06%	5,74%	1,55%	5,99%	-0,01%	0,26%
Tech N	-0,60%	7,88%	0,42%	8,68%	-0,08%	0,05%
Telecom N	1,42%	7,40%	0,93%	5,52%	0,19%	0,17%

Figure A1 – Average rates of return from October 1992 to October 2010.

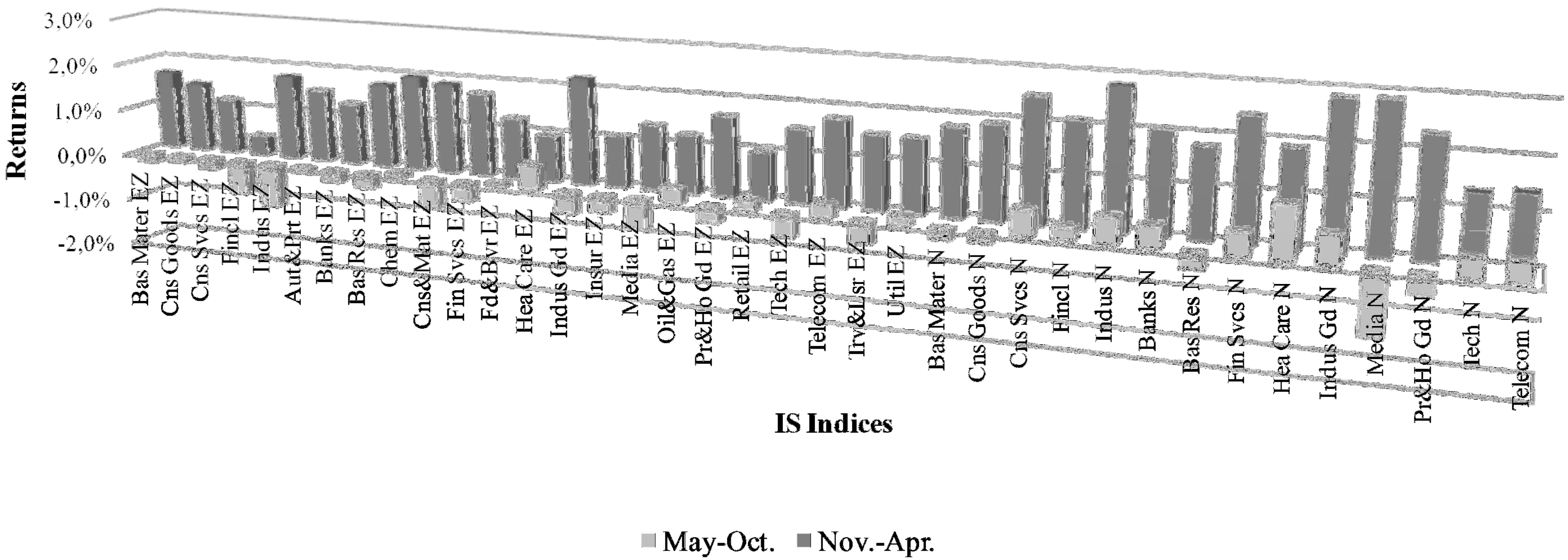

Figure A1 reports the average monthly returns in the May–October and November–April periods based on 37 European Stock Indices from October 1992 to October 2010.