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Calendar Anomalies on American Depository Receipts

Master in Finance

Master dissertation

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Biography

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In that same year, he decided to proceed with his studies at Faculdade de Economia do Porto by taking the Master in Finance course.

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Abstract

For my master's dissertation, I decided to focus my study on some of the well-known calendar anomalies i.e. the January, turn-of-the-month, holiday and weekend effect, and search for empirical evidence of them on the American Depositary Receipts market.

The subject of calendar anomalies has already been thoroughly studied in the U.S and other developed markets. However, when it comes to ADR, there is a big gap of research, and since this market represents a unique class of securities, I think it is worth to proceed with my investigation.

I follow the methodology of the paper developed by Bouges (2009), extending the range of the data and proceed with the study of other indexes of the ADR market.

The following research represents something of great importance for the academic community, not only because of it being one of the first studies on the area, but also for the fact the range of data being wider than the base-study and including a different index. My research is focused on three different markets: The S&P ADR, the S&P 500 and the BNY Mellon ADR from April 1999 to March 2014. The results show the presence of a TOTM effect on the BNY Mellon ADR, as well as a pre-holiday effect on the S&P ADR and the BNY Mellon ADR market. On the contrary, the other two calendar anomalies referred previously are not observed on this market.

These results contradict the weak form of the efficient market hypothesis, showing that the markets are not efficient in reflecting on the stock price the public available information.

Key-words: anomalies, behavioral, finance, ADR

Resumo

A minha dissertação de tese teve como principal foco algumas das mais estudadas anomalias de calendário, nomeadamente o efeito de janeiro, efeito passagem-do-mês, efeito feriado e efeito fim-de-semana, procurando evidências empíricas destes mesmos fenómenos no mercado das *American Depository receipts*.

Ao longo das ultimas décadas, estes efeitos foram já exaustivamente estudados tanto no mercado americano, como em outros mercados desenvolvidos. No entanto, no que toca às ADR, existe uma grande lacuna, e sendo estas ações pertencentes a um mercado singular, penso que se torna num assunto digno de investigação.

Decidi seguir a metodologia do estudo desenvolvido por Bouges (2009). No entanto, o mesmo será efetuado com um período maior e incidindo sobre um mercado adicional ADR.

A investigação levada a cabo representa algo relevante na comunidade académica, não só pelo facto de este representar um dos primeiros estudos na área, mas também pelo alargamento do período estudado relativamente ao anterior (Bouges (2009)) e por ainda incluir um índice diferente.

A minha investigação centrar-se-á em três diferentes mercados: o S&P 500, o S&P ADR e o BNY Mellon ADR desde Abril de 1999 até Março de 2017. Os Resultados apresentados demonstram evidência de um Efeito de passagem do mês no *BNY Mellon ADR*, Assim como um Efeito de Feriado no *S&P ADR* e no *BNY Mellon ADR*. No entanto, não conseguimos observar no nosso estudo qualquer uma das outras duas anomalias previamente referidas.

Palavras-chave: anomalias, Finanças comportamentais, ADR.

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1. Introduction

For my Master's dissertation, I decided to focus on some anomalies that have been detected on the financial markets over the last decades, more precisely, studying those anomalies on American depository receipts (ADR) in developed markets.

American depository receipts are a way for non-American companies to list their stocks in American stock markets without the big expense and hassle of going through the process of doing it. They represent securities that, although being of non-US companies, the banks trade them in U.S Dollars, with the underlying security being held by a U.S financial institution oversea.

Although the subject of calendar anomalies being already thoroughly studied in the US and other developed markets, when it comes to ADR's, there is a big gap, where the most relevant research was developed by Bouges (2009), in which the author analyses the S&P ADR from 1998 to 2004 and compares it with the S&P 500 to find evidence of the January effect, the day -of-the week effect, the TOTM effect and the holiday effect.

Being ADR a unique class of securities, and since 2004 was 12 years ago, where in the meantime the market suffered a strong financial crash, it makes sense to proceed with a new investigation on the same direction, extending it to other developed ADR markets and test the efficiency of it.

So, the main research question that my dissertation will try to answer is: "can we observe the January, the Turn-of-the month, the day of the week, or the pre-holiday effect on the American depository receipts market?".

Through DataStream, I retrieve the adjusted closing prices of some ADR markets and test the existence of the said anomalies on them. Then proceed to compare the S&P ADR to the S&P 500 as Bouges (2009) did and extend the research to the BNY Mellon ADR.

This master's dissertation may represent one of the "first" studies in some developed markets regarding the behavior of ADR's, where the results may be of great relevance for the academic community and bring their focus for the subject for the future.

The next sections will be structured as follow: section 2 consists of a Literature review of the 4 calendar anomalies previously stated, as well as the American depository receipts with a table at the end with a scheme of the main conclusions, chapter 3 is a critical analysis of the literature reviewed. section 4 addresses the research methodology, section 5 presents the results of said study and section 6 consists on the main summary and conclusions.

2. Literature review

American Depositary receipts have already been studied in some extent. Miller studied the stock price impact of international dual listing. The author concluded that listing a DR on the most important U.S stock exchanges generates abnormal returns for the firms. Ejara and Gosh (2004) studied the pricing and aftermarket performance of foreign IPO's issued in the U.S capital market in the form of ADR, arriving to the conclusion that ADR IPOs are heavily underpriced, even more than U.S IPO's.

Regarding the calendar anomalies, Bouges (2009) studied the Day-of-the-week, the January, the Turn-of-the-month (TOTM) and the pre-holiday effect on the S&P ADR index from 1998 to 2004 and compared it with the S&P 500. The author only found evidence of the TOTM effect on this index.

Let's now turn ourselves to the relevant research of the four previously stated calendar anomalies. We will present the main definitions defended by the authors and at the end it is presented a table with a scheme of the main conclusions stated.

2.1 The January effect

In 1976, Rozeff and Kinney found evidence of seasonality in monthly rates of return on the NYSE from 1904-1974. this was one of the first studies that found evidence that the Random walk model does not hold, and contradicting Granger and Mortensen (1970) who, by using spectral analysis, found no evidence of a seasonal peak (in 12 months), only small peaks that correspond to seasonal harmonics. In the parametric study of the authors, it seems that the tradeoff of return for risk demanded and received by the market in January is much greater than in other months of the year. However, they defend that these seasonal patterns will not allow the investor to earn abnormal returns due to: (1) the large amount of evidence consistent with market efficiency; (2) the tendency of high return months over 1941-1974 to be also high dispersion months; and (3) the anecdotal and other evidence which indicates that seasonal effects have not gone unnoticed by Wall Street's technical analysts.

Rozeff incentivized future research in order to understand possible reasons for these abnormal results.

Dyl (1977) and Branch (1977) found evidence that this may be due to tax loss realization at the end of the year by the investors. The idea behind this hypothesis is that investors want to realize capital losses in the current tax year, which creates pressure for the prices

of securities that have been showing negative returns until that point to go down. At the turn of the year, this pressure disappears, resulting in excess return. Contradicting evidence is found in Reinganum (1983), who examined the U.S stocks returns, finding evidence that small firms exhibit high returns after controlling for tax-loss-selling pressures. Reinganum (1983) concluded that the January abnormal returns for small firms were consistent with tax loss selling; however, tax-loss-selling cannot explain the entire seasonality effect. Kato and Schallheim (1985) studied the Japanese market and observed that the returns are abnormally high on January. The authors also found that small firms, on average, earn higher returns than large firms, (stating that the January effect may be a small firm effect). In addition, it was found evidence of a June effect. The author explained that it is a Japanese tradition to pay the bonuses not only in December, but also in June.

Another possible reason for the January effect is that investors may sell their loss-making shares and buy shares with high returns in that year in order to avoid showing their bad decisions at picking stocks and maintain their respectable positions. Haugen and Lakonishok (1988) called this the window-dressing hypothesis.

In this perspective, the institutional investors sell their loser shares and buy winning shares in December in order to avoid showing their loss-making shares in the reports and do not affect their image. This hypothesis is an alternative answer, but it does not seem an exclusive explanation for the January effect.

Bhabra *et. al* (1999) study the effect of the Tax reform act ¹of 1986 (TRA) on the January effect. The data consists on the monthly returns from January 1980 through December 1994 of the CRSP NYSE/AMEX, and then splitting it into pre-TRA and Post-TRA. The study concludes that this new reform act has made the January effect even stronger, probably due to the act's elimination of the preferential treatment for capital gains.

Asteriou and Kavetsos (2006) examine the January effect in eight economies, namely, in the stock returns of Czech Republic, Hungary, Lithuania, Poland, Romania, Russia, Slovakia and Slovenia from 1991 to 2003. the results show evidence of the January effect on Hungary, Poland, Romania, and Slovakia.

Recent studies show that these effect is mitigated on the international markets. Patel (2016) study the data taken from different indexes of the Russel indexes data website from 1996 to 2014, namely the Russell 3000 index, the Russell Developed stock index,

¹ Revision of the american tax code in 1986 in order to simplify it, broaden the taxbase and eliminate tax shelters. This revision was passed during the Reagan administration.

the Russell Asia-Pacific stock index, the Russell Europe stock index, the Russell Latin-America stock index, and the Russell Emerging stock index. The results indicate that the January effect does not exist during high as well as moderate volatility periods in each of the six stocks index examined in this study.

2.2 The day of the week effect

The process generating stock returns is an important issue that is discussed among the academic community. Does the process operate continuously or only in the active trading days? This is an important issue because, since most stocks are traded from Monday to Friday, and returns are generated continuously, the distribution of returns to Monday can't be the same for the other days of the week. This fact alone, makes Monday a special day for the stock market, representing three days.

The previous explained notion of calendar time, or the trading time (all the 5 days represent only one trading day) shapes the method of research for every financial investigator.

French (1980) analyzed both models and compared them with the returns of the S&P composite portfolio from 1953 to 1977, arriving to inconsistent results. But regardless of the method, the returns for Monday were persistently negative. The author suggested that an obvious explanation could be the information released by the firms tend to be unfavorable for the investors for them to have more time and try to minimize the "fear panic". This explanation is also supported by Damodaran (1989), adding that this effect is stronger in small firms since they take longer periods of time to adjust to the news. Harris (1986) found evidence of a firm size effect using the calendar time method where most of the negative returns happen between Friday close and Monday open for large firms and Friday close and Monday close for small firms. But even that does not explain consistent negative returns for Monday, in almost every week.

Rogalsky (1984) found evidence that over different time periods, most of the negative returns on the closing prices on Friday, to the closing prices on Monday, occurs while the market is closed.

Wang *et. al* (1997) also observed this phenomenon in the us market from 1962 to 1993 and added that it occurs primarily in the last two weeks of the month.

On the other hand, Jaffe et. al (1989) reported that the average returns on Friday are, not only positive, but also above the average returns for the rest of the week and that the returns on Friday highly influence the returns on Monday.

Chan *et. al* (2004) studied the relation between the Monday effect and the percentage of institutional holdings using all stocks traded on the NYSE, Amex and Nasdaq from 1981 to 1998. The authors observed that , not only the anomaly is stronger in stocks with low institutional holdings , but also that the significant increase in institutional holding in the USA in the post-1990 period resulted in a diminishing Monday effect on the market.

Lakonishok and Maberly (1990) also documented that the individual investors tend to increase their trading activity, especially their sell orders, on Monday. This indicates that the Monday effect could be related with the trading pattern of individual investors.

But, in contrast to the U.S market, Jaffe and Westerfield (1985) studied the U.K, Japanese, Canadian and Australian market and found no evidence that the Monday effect is related with settlement procedures on the first three markets and could be partially related with the fourth.

Lakonishok and Maberly (1990) argued that this behavior of the market may be due to individual investors behavior. Individual investors have a higher cost of information than institutional investors and during weekdays they are employed in other activities, having only weekends to study the market with more attention. This results that in Monday they will be more active, resulting in more activity on the market. This is especially important for selling orders, decisions in which they rely mainly on themselves. Therefore, the selling pressure exceeds the demand on Monday. They also found that in Japan and Australia there isn't a Monday effect, but a Tuesday effect. They also concluded that the time zone of the markets is not able to explain the Japanese seasonal effect, but may explain partially the Australian effect.

Mehdian and perry (2001) studied five major equity indexes through 1964 to 1998 (three with major large-cap (S&P500, NYSE, DJCOMP) and two dominated by small cap-stocks (NASDAQ AND RUSSEL), but focusing also on the change of this anomaly over time. The authors conclude that Monday effect is observed on the sub-sample between 1964-1987. But in the periods after the 1987 crash, the Monday returns are significantly positive for the three large cap indexes and are negative or insignificant for the predominantly small-cap indexes. Also, Monday returns are not significantly lower different from returns during the rest of the week for the DJCOMP, S&P500 and NYSE

but they are significantly lower for NASDAQ and the RUSSELL compared to returns during the rest of the week.

Yalcin and Yucel (2006) studied 20 emerging countries and found that only three of the countries (China, Malaysia and Poland) present abnormally low results on Monday at a 1% significance level, leading us to believe that the effect has been decreasing for the past few years, especially since the crash of 1987.

This statement is consistent with the findings of Chia *et al.* (2008) where the author studies the Taiwan, the Singapore, Hong Kong and South Korea markets. In this case, after adjusting for equity risks, only the Friday effect is observed in Taiwan, while all the other effects disappear completely.

2.3 The turn of the month effect

The first author to identify this effect was Ariel (1987), where he uses the CRSP value-weighted and equally weighted stock index returns from 1963 to 1981. He focused his study on the last trading day of the month and the three trading days afterwards, finding that changes in stock prices in these days are positive. He then proceeded to study the cumulative returns earned through the investment in stocks of the CRSP index over the sample period during only the first half of the trading months or during only the second half of the trading month. While the cumulative returns for an equally-weighted index on the first half of trading month is 255.2040% and 565.40% for the value weighted index, when it comes to the last half of the trading months, the cumulative returns are respectively -0.25% and -33.80%.

Lakonishok and Smidt (1988) confirmed this market anomaly by studying the U.S market from 1897 to 1986 and narrowing the range of days (from -1 to +4), confirming that the mean returns were significantly higher during the turn-of-the-month. However, the numbers that the authors arrived were not as radical as other authors, like Ariel (1987).

Agrawal and Tandon (1994) even showed that the cumulative returns during the short window of the turn-of-the month (interval of 5 days) could constitute 55 to above 70 percent (in six of the studied countries) of the monthly returns.

Jaffe and Westerfield (1989) observed in their study for foreign countries that the turn-of-the-month was significant at 1% level in Canada, Switzerland, and West Germany and at 5% level in UK and Australia. The authors studied the CRSP monthly stock from 1951

to 1962 and from 1963 to 1986. They divided in two subsamples in order to include AMEX firms, thereby substantially increasing the number of sample firm.

One of the reasons suggested was that this anomaly was related with the fact individual investors receive their payments during this period and reinvest a portion of it. On the other hand, corporate investors need cash to pay employees or for other business purposes like dividend or interest. Ogden (1990) added that the increase of liquidity at the TOTM could be responsible for the rise of the stock prices in that period.

Another reason may be, once more, due to the window dressing opportunity. Thaler (1987) argued that, at the end of the month, investors close their losing positions and at the turn of the month they buy again those stocks, pushing their prices up.

This anomaly is still present in the recent studies and not only in the U.S, but also in other markets, where Kunker *et. al* (2003) studied the TOTM effect in 18 countries from the day -1 to the day + 3 in each month and finding a TOTM effect in almost every country, except the United States and Japan and mixed results in Canada, Singapore and Mexico. Dzhavarov and Ziemba (2010) study the turn-of-the-month effect on the S&P 500 and the Russel 2000 index from 1993 to 2009 and then on a sub-period from 2004 to 2009. The authors found evidence that the TOTM effect still exists, but with a bit of anticipation. Instead of the usual (-1; +3) days, the abnormally high results are now observed on -5 to + 2 days for the S&P 500 and the RUSSEL 2000.

2.4 The pre-holiday effect

The pre-holiday effect is considered one of the oldest and most consistent seasonal irregularities of the market. The anomaly was first identified by Fields (1934), where he studied the Dow Jones industrial average from 1915 to 1930. The results lead the author to think that the returns on Saturday tended to be significantly higher than on Fridays and Mondays. It is important to know that the markets were open at Saturday at the time.

Lakonishok and Smidt (1988) also found evidence that, not only the rates of return rise before a weekend, but they also found evidence that in a pre-holiday trading day the rates of return are two to five times larger than a pre-weekend trading day. Also, the average rate of return after a holiday is negative for the total period.

Kim and Park (1994) went further and studied the three major stock markets of the USA (NYSE, AMEX and NASDAQ) for the period of 1963-1986 for the NYSE and AMEX and 1973-1986 to NASDAQ, finding evidence of the effect in three of them. They even

go further and test the relation between the anomaly and the firm size. Contradicting the previous studied effects, here the magnitude is bigger for larger firms. However, the author refers that the results may be contaminated since a great deal of holidays fall on Friday, so the results may be in line with the weekend effect and not the pre-holiday effect.

For the last part, the authors studied the holiday effect on the Japanese and U.K market, finding evidence that it exists, but that the U.S holidays are independent of the anomaly on those markets.

Agrawal and Tandon (1994) studied seventeen national markets, arriving to the conclusion that this effect was present in 65 percent of the sample markets.

Arguably, the most promising explanation for the holiday effect relies in investor psychology. However, the major problem relies in the fact that this hypothesis is really difficult to test directly.

Although much weaker, this anomaly on the market persists. According to Dzhaharov and Ziemba (2010) (who studied the futures market from 1993-to 2009 on the S&P 500 and RUSSEL 2000), this effect moved to a minus three days before the holiday effect. None of the holidays were significant for the S&P 500 and only the labor's day and the president's day was significant with a mean gain of 0.88% for the first weekend and a positive return on 82.4% of the time for the second one.

2.5 Main Conclusions of the authors on the subjects

On the next page, we can read the terms and most important conclusions by the authors referred previously on the text.

Subject	author(s) and year of release	Market analysed	Period	Main Conclusions
American depository receipts	Miller (1999)	181 firms from 35 countries	1985-1995	Listing a DR on the most important U.S stock exchanges generates abnormal returns for the firms
	Ejara and Gosh(2004)	US Market	1990-2001	ADR IPOs are heavily underpriced, even more than U.S IPO's.
	Bouges	S&P ADR Index	1998-2004	The author only found evidence of the TOTM effect on the index
The January Effect	Rozeff and Kinney (1976)	NYSE	1904-1974	The authors found evidence of Seasonality in monthly rates of return
	Dyl (1977)	100 Random stocks from CRSP file	1959-1970	the seasonality (specially on January) may be due to tax loss realization at the end of the year by the investors
	Kato and Schalleim (1985)	All stocks listed on the Tokyo stock exchange	1964-1981	The returns are abnormally high on the Tokyo market on January and June, specially on small firms
	Haugen and Lakonishok (1988)	NYSE	1979-1987	Studies show that investors may sell their loss meking shares and buy shares with high returns in that year in order to avoid showing their bad decisions at picking and maintain their well respected decisions . This is called the window-dressing hypothesis
the day-of-week effect	French (1980)	S&P composite portfolio	1953-1977	in all the calculations of the author, returns on Monday were persistently negative.
	Harris (1986)	NYSE	1981-1983	also found consistent negative returns and most of them happen happen between Friday close and Monday open for large firms and Friday close and Monday close for small firms

	Jaffe et. Al (1989)	S&P; nikkey dow; toronto stock exchange; statex actuaries index	six different samples from 1930 to 1983	the authors found evidence that the average returns on Friday are , not only positive, but also above the average returns for the rest of the week and that the returns on Friday highly influence the returns on Monday
	Lakonishok and Maberly (1990)	Dayly NYSE trading volume	1962-1986	the authors argued that this behaviour may be due to individual investors behaviour who only have time to place orders at weekends
The turn of the month effect	Ariel (1987)	CRSPvalue-weighted and equially weighted index	1963-1981	while the cumulative returns for an equally-weighted index on the first half of trading month is 2552040% and 565.40 for the value weighted index, when it comes to the last half of the trading months, the cumulative returns are respectively -0.25% and -33.80%.
	Agrawal and Tandon (1994)	daily stock index from 18 countries	1971-1987	authors found evidence that cumulative returns during the short window of the turn-of-the month (interval of 5 days) could constitute 55 to above 70 percent (in six of the studied countries) of the monthly returns.
	Jaffe and Westerfield (1989)	CRSP monthly stock	1951 1962 and 1963- 1986	One of the reasons suggested for this anomaly that this anomaly was related with the fact individual investors receive their payments during this period and reinvest a portion of it. On the other hand, corporate investors need cash to pay employees or for other business purposes like dividend or interest

	Ogden (1990)	CRSP value-weighted and equally- weighted index	1969-1989	Ogden (1990) added that the increase of liquidity at the TOTM could be responsible for the rise of the stock prices in that period.
The pre-holiday effect	Fields (1934)	DJIA	1915-930	The results lead the author to think that the returns on Saturday tended to be significantly higher than on Fridays and Mondays. It is important to know that the markets were open at Saturday at the time.
	Lakonishok and Smidt (1988)	DJIA	1897-1986	not only the rates of return rise before a weekend, but they also found evidence that in a pre-holiday trading day the rates of return are two to five times larger than a pre -weekend trading day.
	Kim and Park (1994)	NYSE, AMEX, NASDAQ	1963-1986; 1963-1986; 1973-1986	The authors found evidence of the pre-holiday effect on the three markets, found evidence that the magnitude is greater on the big firms,
	Agrawal and Tandon (1994)	daily stock index from 18 countries	1971-1987	The authors arrived to the conclusion that this effect is present in 6 percent of the sample markets.
	Dzhabarov and Ziemba (2010)	U.S futures market	1993-2009	although much weaker, the effect still persists in some holidays (labor's day and the president's day)

Table 1- literature review resume

3. Seasonal anomalies in ADR

Although the literature regarding these calendar anomalies being vast, the application of them to the ADR market is non-existent. The only one found belongs to Bouges (2009) in the year of 2009. The author studies the presence of these 4 calendar anomalies in the S&P ADR index. Then, he proceeds to analyze the S&P 500 and compare them. The methodology applied is based on the paper by Redman et. al 1997 to study calendar anomalies, where it is done a regression of the daily returns on the index from 1998 to 2004. Regarding the day-of-the-week effect, the average daily returns for Monday of the S&P ADR and S&P 500 are, respectively -0.03% and 0.03%, but neither of them are significantly different from 0 at a 10% significance level.

As for the January effect, the results are very similar, where the returns are either insignificant or slightly positive. But curiously, the coefficient for October is positive and significant at a 10% confidence level, being it the only one.

When it comes to the TOTM, it was used a dummy variable for the TOTM trading days covering the -1 to the +3 days of each calendar month. While for the S&P 500 returns are not statistically significant, for the S&P ADR index, the coefficient is positive and significant at a 1% confidence level. This means that we can observe a TOTM effect on the S&P ADR index.

Finally, regarding the pre-holiday effect, Bouges compared the returns on trading days before eight holidays (New Year's Day, President's Day, Good Friday, Memorial Day, Independence Day, Labour Day, Thanksgiving Day, and Christmas). For both the S&P ADR and S&P 500 indices, the constant is positive, but insignificant (0.0009 for the S&P ADR and 0.0001 for the S&P 500) at a 10% or 5% significance level. Overall, this evidence suggests the absence of a pre-holiday effect.

While this work represents something, there is still much to do for this topic. So, I base my work on this paper, but with a larger sample and a new ADR index, using the S&P ADR index and the BNY Mellon ADR daily closing prices ranging from 1999 to 2017. The data was retrieved through Thomson Reuters Datastream

4. Research methodology

The study uses as our main index the S&P and the BNY Mellon ADR indices to study the presence of four calendar anomalies. We then use the S&P 500 as a benchmark to compare them to the U.S Market, during the same period.

The study uses the daily value and equal-weighted returns of both index on a period ranging from April 1999 to March 2017, using dummy variables on the period studied to capture excess returns.

It will consist on an approach following the standard methodology to study calendar events in which the data previously stated is regressed on a series of dummy variables representing the time-period of interest.

To test the weekend effect, we used the following regression with dummy variables:

$$(4.1) R_t = a_1 + a_2 D_{2t} + \dots + a_5 D_{5t} + \varepsilon_t$$

Where:

R_t =daily rate of return on the portfolio on date t;

$D_{2t}, \dots, D_{5t}=1$ if the day-of-the-week on day t is Tuesday–Friday and 0 otherwise;

ε_t =error term.

The coefficient ($a_2 - a_5$) on each of the dummy variables captures excess average daily return on week days from Tuesday to Friday, and the constant (a_1) captures the excess average daily return on Monday. A positive and significant intercept would suggest that the average return on Monday is significantly greater than zero.

To test the January effect, we test the following regression with dummy variables:

$$(4.2) R_t = a_1 + a_2 D_{2t} + \dots + a_{12} D_{12t} + \varepsilon_t$$

Where:

R_t =daily rate of return on the portfolio on date t;

$D_{2t}, \dots, D_{12t}=1$ if the trading day t falls in the months of February and December and 0 otherwise;

ε_t =error term.

The coefficient ($a_2 - a_{12}$) on each of the dummy variables captures excess average daily return during the months February–December, and the constant (a_1) captures the excess average daily return during January. A positive and significant intercept would suggest that the average rate of return during the month of January is significantly greater than zero

To test the Turn-of-the-month effect, we test the following regression with dummy variables:

$$(4.3) R_t = a_1 + a_2 D_{2t} + \varepsilon_t$$

Where:

R_t =daily rate of return on the portfolio on date t;

D_{2t} =1 if the trading day t is between -1 to 3 trading days of each month, and 0 otherwise;

ε_t =error term.

The coefficient (a_2) captures the excess average daily return during the last trading day of the month and the following first three days of the next month. a positive and significant a_2 indicates a greater than average return between the day -1 and + 3 of each month.

To test the pre-holiday effect, the trading days before the 9 American holidays where the markets are closed (*i.e* new year's day, Martin Luther king's Jr day, president's day, Good Friday, Memorial Day, Independence Day, Labor Day, thanksgiving and Christmas) were considered.

The following test was developed with the following dummy variable:

$$(4.4) R_t = a_1 + a_2 D_{2t} + \varepsilon_t$$

Where:

R_t =daily rate of return on the portfolio on date t;

D_{2t} =1 if the trading day t is a pre-holiday trading day and 0 otherwise;

ε_t =error term.

The coefficient (a_2) captures the excess average daily return during the pre-holiday trading day. A positive and significant (a_2) indicates a greater than average return during the trading days before a national holiday on U.S soil.

In the end, we also perform a univariate analysis.

We use a t-test to compare the means, an F-test to compare the variances and a Wilcoxon rank sums test to compare the medians of the daily returns of (1) falling on Mondays to trading days that fall on other days of the week, (2) trading days falling in January to trading days falling in other months, (3) -1 to +3 trading days around the TOTM to other trading days in the month and (4) pre-holiday trading days to other trading days.

5. Empirical Results

Tables 2 to 5 contain the results for the regressions previously stated regarding the day-of-the-week, the January, the turn-of-the-month (TOTM) effect and the pre-holiday effect. table 6 contains the univariate analysis

5.1 The day-of-the-week effect

Table 2 show the results of the regression analysis to study the day-of-the week effect on the S&P ADR, the S&P 500 and the BNY Mellon ADR.

The results on the first column of each of the regressions are the coefficients and the second column their p-values.

The intercept represents the average daily return earned on Monday. the other variables represent the average daily return earned on each of the remaining trading days of the week.

The Average daily returns on Monday for the S&P ADR, the S&P 500 and the BNY Mellon ADR are -0.076%, -0.018% and 0.08% respectively. Neither of them are significant at a 5% confidence level.

All the other coefficients are positive and greater than the average Monday returns on both the index. However, only the coefficient of Thursday is significant at a 5% level of confidence, meaning that there is a positive relation between the returns for Thursday and the day-of-the-week.

Also, the R- squared for the S&P ADR, the S&P 500 and the BNY Mellon ADR are 0.09%, 0.04% and 0.08% which means that the days of the week explain a very small fraction of the model.

From this evidence, we cannot conclude that we can get abnormally low returns on Monday in comparison with the other days of the week.

Table 2 – The day-of-the week Effect

Dependent variable	Rt S&P ADR	p-value	Rt S&P500	p-value	Rt BNY Mellon ADR	p-value
intercept	-0.0008	0.115	-0.0002	0.662	0.0008	0.12
Tuesday	0.0009	0.165	0.00055	0.353	0.0010	0.30
Wednesday	0.0008	0.222	0.0004	0.492	0.0010	0.15
Thursday	0.0013	0.048	0.0006	0.309	0.0013	0.07
Friday	0.0009	0.188	0.00003	0.963	0.0010	0.18
N	4473		4473		4512	
R ²	0.0009		0.0004		0.0008	

the table reports the results of a linear regression used to calculate the day-of-the-week effect on the S&P ADR and the S&P 500 index for the period from 1999 to 2017. The dependent variable is daily return and Tuesday-Friday represents dummy variables equal to 1 for the respective day of the week.

5.2 The January Effect

Table 3 show the results of the regression analysis to study the January effect on the S&P ADR, the S&P 500 and the BNY Mellon ADR

The results on the first column of each of the regressions are the coefficients and the second column their p-values.

The intercept represents the average daily return earned on January. The other variables represent the average daily return earned on each of the remaining trading days divided by the reminiscent months.

The Average daily returns on January for the S&P ADR, the S&P 500 and the BNY Mellon ADR are -0.08%, -0.06% and -0.02% respectively, but neither of them are significant at a 5% confidence level. The only significant months in the model at a 5% confidence level is April and December for the S&P ADR and July for the BNY Mellon ADR.

January represents the worst month on the three indices, where in the case of the S&P ADR, it is the only with a negative average daily return, and in the case of the S&P 500 there is also the month of September with a coefficient of -0.01%. As for the BNY Mellon, there are 5 months with negative returns.

Also, the R- squared for the S&P ADR, the S&P 500 and the BNY Mellon ADR are 25%, 19% and 15%, which means that 25% of the independent variables explain the model in case of the S&P ADR, 19% of the independent variables explain the model for the S&P

500 and 15% of the independent variable explain the model for the BNY Mellon ADR index.

So, we can conclude that we do not observe the January effect on neither the S&P ADR and the S&P 500.

Table 3 – The January Effect

dependent variable	Rt S&P ADR	p-value	Rt S&P 500	p-value	Rt BNY Mellon ADR	p-value
Intercept	-0.0008	0.248	-0.0006	0.37	-.0002	0.80
February	0.0005	0.63	0.0004	0.66	-0.0001	0.91
March	0.0013	0.19	0.00143	0.12	0.0006	0.57
April	0.0021	0.04	0.0014	0.12	0.0014	0.20
May	0.00006	0.95	0.0006	0.51	-0.0007	0.51
June	0.0008	0.46	0.0002	0.84	0.0001	0.90
July	0.0007	0.49	0.0007	0.43	0.00004	0.97
August	0.0004	0.65	0.0004	0.65	-0.0003	0.78
September	0.0001	0.87	-0.0001	0.87	-0.0004	0.72
October	0.0012	0.21	0.0013	0.14	0.0007	0.52
November	0.0010	0.33	0.0011	0.25	0.0003	0.76
December	0.0021	0.04	0.0011	0.21	0.0009	0.38
N	4462		4462		4512	
R ²	0.25		0.19		0.15	

results of a linear regression used to calculate the January effect on the S&P ADR and the S&P 500 index for the period from 1999 to 2017. The dependent variable is daily return and February to December represents dummy variables equal to 1 for the respective months.

5.3 The Turn-of-the-month effect

Table 4 shows the regression analysis for the TOTM effect. the independent variable “TOTM effect” represents a dummy variable for the last trading day of the month and the following first three. The constant represents the average daily returns on other days than the turn-of-the-month trading days stated before and the TOTM effect the average daily returns on the TOTM trading days. The results show a positive coefficient for the TOTM effect, but not statistically significant at a 5% confidence level for the S&P ADR and the S&P 500. As for the BNY Mellon ADR, the results are statistically significant at a 5% level.

Also, we can observe a very low R-squared which means that the TOTM effect explains a very small percentage of the model.

From the following model, we can conclude that we do not observe the TOTM effect on the S&P ADR and the S&P 500, but we do observe it on the BNY Mellon ADR

Table 4 – Turn of the Month Effect

dependent variable	Rt S&P ADR	p-value	Rt S&P 500	p-value	Rt BNY Mellon ADR	p-value
Intercept	-0.0008	0,71	0.00004	0.87	-0.0002	0.41
TOTM Effect	0.0007	0,22	0.0005	0.26	0.0012	0.04
N	4476		4476		4512	
R ²	0.003		0.003		0.001	

the table reports the results of a linear regression used to calculate the Turn-of-the-month effect on the S&P ADR and the S&P 500 index for the period from 1999 to 2017. The dependent variable is daily return and the TOTM effect is a dummy variable equal to 1 during the -1 and + 3 trading days of each month.

5.4 The pre-holiday effect

Table 5 shows the regression analysis for the pre-holiday effect. the independent variable “Pre-holiday effect” represents a dummy variable for the trading day before a U.S holiday. The constant represents the average daily returns on the trading days that aren’t before a U.S holiday and the pre-holiday effect represents the average daily returns on the trading days before a U.S market holiday. The results show a negative coefficient for the intercept and positive coefficient for the “pre-holiday effect” coefficient for the S&P ADR, and a statistically significance at a 10% confidence level for the “pre-holiday effect”. as for the S&P 500, we can observe a positive coefficient for both the intercept and the “pre-holiday effect” independent variable. Also, we can observe a negative coefficient for the intercept and a positive coefficient for the “pre-holiday effect”, being that same effect statistically significant at a 10% level of confidence.

We can also observe a very low R-squared which means that the pre-holiday effect explains a very small percentage of the model.

From the following model, we can conclude that we can observe the Pre-holiday effect on the S&P ADR, on the BNY Mellon ADR, but not on the S&P 500.

Table 5 – the Pre-Holiday effect

dependent variable	Rt S&P ADR	p-value	Rt S&P 500	p-value	Rt BNY Mellon ADR	p-value
intercept	-0.00004	0,87	0.00009	0.74	-0.00006	0.80
pre-holiday effect	0.21	0,06	0.12	0.26	0.0023	0.07
N	4476		4476		4512	
R ²	0.0008		0.0003		0.0008	

the table reports the results of a linear regression used to calculate the pre-holiday effect on the S&P ADR and the S&P 500 index for the period from 1999 to 2017. The dependent variable is daily return and the pre-holiday effect is a dummy variable equal to 1 on the trading day before a national holiday where the U.S Market is closed.

5.5 Univariate analysis

Table 6 shows the univariate analysis. For both the S&P ADR index and the S&P 500 indices, there is no difference in means, median or Variance on the average daily returns on any of the effects studied. These results are not consistent with our regression analysis since, in table 4 we could observe a TOTM effect on the BNY Mellon ADR and in table 5 we could observe the existence of a pre-holiday effect on the S&P ADR and on the BNY Mellon ADR.

Table 6 – Univariate analysis

	S&P ADR Index				S&P 500				BNY Mellon ADR			
	N	Mean	Median	Variance	N	Mean	Median	Variance	N	Mean	Median	Variance
Day-of-the week												
other days	3635	0.02	0.09	0.015	3635	0.02	0.07	0.01	3665	0.02	0.07	0.02
Monday	844	-0.08	-0.04	0.004	844	-0.02	0.01	0.003	847	-0.08	-0.02	0.02
January effect												
Other days	4115	0.01	0.07	0.02	4115	0.02	0.06	0.01	4149	0.004	0.06	0.02
January effect	364	-0.04	0.04	0.001	364	-0.06	0.05	0.001	363	-0.02	0.02	0.04
TOTM effect												
other days		-0.02	0.04	0.02	3624	0.004	0.06	0.01	3655	-0.02	0.02	0.02
TOTM		0.11	0.19	0.004	851	0.06	0.04	0.003	857	0.1	0.17	0.04
Pre-holiday effect												
other days	4314	-0.004	0.06	0.02	4314	0.01	0.05	0.01	4350	0.01	0.05	0.03
Pre-holiday	165	0.2	0.27	0.0004	165	0.13	0.13	0.0004	162	0.38	0.46	0.02

Table 2 – results of a univariate analysis to determine calendar anomalies in daily returns of the S&P ADR index and the S&P 500 index between 1999 and 2017.

6. Summary and Conclusions

This masters dissertation provides additional insight into the topic of the Calendar Anomalies, i.e the Day-of-the-week effect, the January effect, the Turn-of-the-month effect and the Pre-holiday effect on The American Depository Receipts market. The results provide evidence of the existence of a pre-holiday effect on the BNY Mellon ADR and on the S&P ADR Market, as well as a TOTM effect on the BNY Mellon ADR with a level of significance of 5% and 10%. On the other hand, we could not observe neither the January effect, or the Day-of-the week effect on any of the ADR markets, as well as the TOTM effect on the S&P ADR index with a level of significance of 5%. We could also confirm the mitigation of the studied anomalies on the S&P 500 market, where we could not find any evidence supporting the existence of any of the previously stated effects with a significance level of 5%.

However, we can observe that these anomalies explain a very small fraction of the prices of the index

Still, They seem to be difficult to reconcile with the weak-form of the Efficient Market hypothesis since, although these effects being fully disclosed and of the knowledge of the common investor, we can still observe the presence of such anomalies on the market of the ADR showing that the public information is not fully reflected on the stock prices.

Following Bouges Methodology, but now with a wider range of data and adding a new ADR index, it was possible to confirm the mitigation of the presence of the studied calendar effects on the S&P 500. But, contrary to his study, there was evidence of the presence of the TOTM effect on the BNY Mellon but not on the S&P ADR (Bouges (2009) results presented evidence of the TOTM effect on the S&P ADR), and of the presence of the pre-holiday effect, not only on the S&P ADR, but also on the BNY Mellon ADR (Bouges (2009) results presented no evidence of this effect), contradicting some of the author's conclusions and not supporting his results. They were also in conformity with the low R^2 .

Since we could observe said anomalies on the ADR market, now with a much wider range of data, I think that the path to continue this investigation is open, but now with a segmentation of the markets, namely by region of developed and emerging markets, Something that will be continued in further and related work.

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