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The Analysis of Seasonal Return Anomalies in the Portuguese Stock Market*

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Abstract

This paper assesses the existence of persistent seasonal effects in the daily returns of the Portuguese stock market. We use daily data on the stock market index to study long-lasting differences in returns across the days of the week, within months and around holidays. For the period 1988-2001, we find no evidence that daily returns are different between weekdays. However, we find a closed-market effect during 1988-1996. This effect disappears for the 1997-2001 period which coincides with the period from when the Portuguese market started to be internationally considered as a developed market.

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1 Introduction

In this paper we test for the presence of seasonal effects on the daily returns of the Portuguese stock market.

Stock exchanges are usually closed from Friday to Monday. If the return process is to be continuously generated, Monday returns are expected to be three times the standard daily returns. This hypothesis is often named 'calendar-time'. However, if one assumes that the return process is based only on trading days, returns are expected to be equal for all the days of the week. This hypothesis is often named 'trading-day'. Regardless of the existing assumptions for the patterns of returns, several papers find evidence of a persistent closed-market effect. According to this effect, daily returns are positive before markets are closed and tend to be negative following the non-trading days. Evidence of this so-called market anomaly is found after weekend returns (weekend effect) and after holiday returns (holiday effect) (French (1980), Board and Sutcliffe (1988), Lakonishok and Smidt (1988), Arsad and Coutts (1997)). According to Board and Sutcliffe (1988), this persistent effect tends to disappear in time while Arsad and Coutts (1997) find that the effects persist.

In this paper we analyze some persistent effects in the Portuguese stock market. Looking at the 1988-2001 period, our results do not support a significant general closed-market effect. However, we present evidence that the incipient structure of the Portuguese market of the late 1980s reveals differences in returns across the days of the week that tend to disappear as the market becomes more mature.

From the late 1980s to the present, increases in foreign capital inflows, portfolio investment and privatization sales, changed the shape and the size of the Portuguese stock markets. During 1997, the World Bank upgraded the Portuguese stock market to a developed market. This fast moving and increasingly integrated market suggests the relevance of the analysis of the time persistency of the market anomalies. The changes in market structure are in accordance with our findings. We find that the market inefficiency tends to disappear in time and the differences in returns observed for the period 1998-1996 vanish

when we analyze the period 1997-2001.

Returns around holidays are in accordance with what is found in Lakonishok and Smidt (1988). For the 1988-2001 period, we find that before-holiday returns are significantly higher than the after-holiday returns. Furthermore, we observe that before-holiday returns are on average 23 times higher than the standard daily returns.

Finally we analyze whether returns change according to the calender month. According to the literature, [1] capital gains and tax presssures may affect the returns for special months of the year. We find no evidence of such behavior for the Portuguese stock market.

This paper is organized as follows: in section 2 we provide the main empirical evidence found in the literature regarding the persistent effects and in section 3 we describe the behavior of the Portuguese stock market index, since it was created, in January 1988, until the end of 2001. In sections 4 to 6 we analyze the weekend, holiday and monthly effect, respectively. Section 7 provides the main conclusions.

2 Literature Review on the Evidence on Seasonal Effects

The study of market anomalies assesses three main subjects: the weekend effect, the holiday effect and the monthly effect. The empirical evidence of the persistent effects across daily returns is summarized in Tables I-III. Some studies related to market anomalies show evidence of: significant differences in mean returns across the days of the week, with negative returns on Monday; higher mean returns before holidays than on regular days and higher mean returns on regular days than on days following holidays; significant differences in mean returns across the months of the year with positive mean returns in January.

Table I presents an overview of the main studies concerning the analysis of the weekend effect. The major part of these studies show evidence of negative (and sometimes significant) mean returns on Mondays, while mean returns on Fridays tend to be positive,

[1] Santesmases (1980), Arsad and Coutts (1997) and Reinganum and Shapiro (1987).

rejecting both the calendar and the trading day hypothesis. Keim and Stambaugh (1984) study the presence of weekend effects for the S&P Composite index, between 1928 and 1982.[2] Before 1952, the authors find significant negative returns on Monday and insignificant positive mean returns on Friday. After 1952, mean returns on Monday are more negative and tend to be significant positive on Friday. Keim and Stambaugh (1984) and Athanassakos and Robinson (1994) group stocks into portfolios ordered by market value and find significantly negative returns on Mondays while returns increase through the week. Both authors reject the hypothesis that returns are equal across weekdays.[3] Looking at the Istanbul Stock Index, Balaban (1995) finds that the percentage of positive returns is above 50% on Friday. However, Balaban (1995) observes that, in most of the years, positive (negative) Friday returns are more frequently followed by positive (negative) Monday returns. Similar correlation between returns on Friday and the following Monday is found in Cross (1973), for the S&P composite index, for the 1953-1970 period.

The behavior of the returns on Friday and Monday may reflect the closed-market effect. If this effect persists everytime the market is closed, negative mean returns are expected to be present on days following holidays, while returns tend to be positive before holidays. Table II presents the results of the main studies regarding the holiday effect. Arsad and Coutts (1997) have detected significantly positive returns on the last three days before holidays and on two trading days after holidays.

Table III presents an overview of the main studies addressing the monthly effect. The empirical evidence found in literature reveals that the January daily returns are usually positive and significantly different from zero. Santesmases (1980), Arsad and Coutts (1997) and Reinganum and Shapiro (1987) argue that the January effect is often related to capital gains as a result of tax pressures at the end of the year.

[2]Before 1952, the New York Stock Exchange (NYSE) was open on Saturday, from 10 a.m. until noon. Between 1945 and 1952, NYSE was usually closed on Saturday during the summer months.

[3]Keim and Stambaugh also find that the day-of-the-week effect is stronger for smaller portfolios. Athanassakos and Robinson conclude that mean returns on Monday are more significant negative for larger portfolios, while for small portfolios mean returns are more negative on Tuesdays than on Mondays.

Additional studies analyze differences in the returns between the first and the second halves of the months, for the last days and for the first days of the months. Lakonishok and Smidt (1988) study the behavior of the Dow Jones returns between 1897 and 1986, for the first four and the last four trading days of the month. The authors find that the cumulative mean return between the last day of the month and the third day of the following month is significantly larger than the mean return on a regular four-day period (0.473% vs 0.0612%). Table III presents some empirical evidence of turn-of-the-month effects as a special case of monthly effects.

To test for the market persistent effects, linear regressions of the stock return series on dummy variables are frequently estimated. As is widely documented (Campbell, Lo and MacKinlay (1997)), stock returns do not seem to follow a log normal distribution and present time series correlations. In order to account for these factors, some authors report skewness and kurtosis tests for the returns (Theobald and Price (1984), Alexakis and Xantakis (1995)) or run some linear regressions and then test the skewness and the kurtosis values for the errors (Connolly (1989), Easton and Faff (1994)). For the BVLG index returns, the skewness is equal to –0.6205 and the kurtosis is equal to 16.6647.[4] These results are relatively similar to the ones found by Alexakis and Xanthakis (1995) for 1988-1994 (skewness = -0.9453; kurtosis = 17.7880). Individual and joint tests for these two statistics lead us to reject the hypothesis that skewness is equal to zero and that kurtosis is equal to three.

Theobald and Price (1984) and Alexakis and Xanthakis (1995) show evidence of autocorrelation in stock returns. In our sample, we find that the autocorrelation function value is nearly equal to 26% on the first lag and is significantly positive, at the 1% level. Theobald and Price (1984) do not present the results for the autocorrelation function but refer that the autocorrelation value for the first lag is more than twice the standard error for the FTAS[5] index returns (which means significance at the 5% level). Alexakis and

[4]These values are obtained using daily returns for the BVL Geral index, between the 6th of January 1988 and the 16th of November 2001.

[5]FTAS stands for Financial Times Actuaries All Shares. According to Theobald and Price (1984),

Xanthakis (1995) report tests statistics for the jointly equality of the first k lag's autocorrelation function, with k=6, 12, 24 and 36, for 1985-1994. They have obtained 147.27, 181.58, 196.28 and 232.95, respectively (all these values are significant at the 1% level). For the Portuguese index, we obtain 249.45, 273.65, 295.13 and 334.45, respectively (also significant at the 1% level).

Connolly (1989) and Easton and Faff (1994), test the presence of ARCH effects on the residuals, finding evidence of residual's conditional heteroskedasticity and re-estimating the regressions under this hypothesis. As we can see in Table I, the Easton and Faff (1994) results haven't changed, when using OLS or GARCH estimation. Alexakis and Xanthakis (1995) have also tested ARCH effects on series returns, by computing the Q statistics for testing the jointly equality for the first k lag's autocorrelation function, correspondent to the square of the returns, with k=6, 12, 24 and 36, for 1985-1994. They have obtained 157.77, 193.96, 333.40 and 454.09, respectively. For the Portuguese case, we obtain 220.9, 321.66, 418.35 and 547.74, respectively. The Portuguese and the Greek values are significant at the conventional levels.

In performing tests for market anomalies, we have checked for the presence of autocorrelations, in similar way to what is done in the literature.

3 The Data - The Portuguese Stock Market Index

The BVL Geral (BVLG)[6] index was established on the 5th of January 1988. It is computed as the average of the daily close prices for all stock listed, weighted by individual firm's capitalization. In addition, it adjusts for firms' idiosyncratic behaviors, namely, stock splits and dividend payments. In the present study, we have collected daily data between the 5th of January 1988 and the 16th of November 2001.

Throughout the past decade, both the privatization process, through public offers of

FTAS is a value-weighted index of 750 UK equities.

[6]The Lisbon Stock Exchange and the Oporto Derivatives Exchange merged in 2000. As a result, the BVL Geral was named PSI Geral.

state-owned companies, and foreign investment flows[7], significantly contributed to the increasing liquidity and depth of the Portuguese Stock Exchange. Figure 1 presents the evolution of the index since 1988 up to the end of 2001. The year 1997 was a significant milestone for the Portuguese stock exchange which started to be internationally considered as a developed market. In October 1997, nineteen firms were included in the Dow Jones indexes. In December, the Morgan Stanley Capital International upgraded the Portuguese Stock Market and included the Portuguese index in the developed markets indices group.

The 1997 landmark suggests we should consider two sub-samples: 1988-1996 (Portuguese Stock Exchange as an emergent market) and 1997-2001 (Portuguese Stock Exchange as a developed market). This partition allows us to compare among periods as well as the persistency of the effects.

The increase in the BVLG index from 1988 to 1989 (31.7%) coincided with the rise in international stock prices[8] and foreign capital inflows. Between the end of 1989 and 1992 a sequence of international political and economic events[9] was responsible for great financial instability. As a consequence, the BVLG index decreased by 41.8%. Sustained recoveries in the main international markets during 1991 (the Dow Jones Industrials index increased by 20%), further induced portfolio investment outflows into the Portuguese stock market.[10]

In 1993, the capital movements regulations were modified easing foreign investment flows (since then, foreign investors were allowed to purchase fixed income securities with floating rates). This fact contributed to a significant inflow of foreign investment.[11] The Maastricht Treaty was ratified in November 1993, defining the convergence criteria to the

[7] For 1996-2000 and considering quarterly data, the ratio of foreign investment on equity securities to Portuguese equity market capitalization was, on average, 26.1%.

[8] During the same period, the London index increased 35.11% and the German index increased 34.83%.

[9] The German reunification (1990), the exchange of political and economic systems in Eastern Europe (1990), the Gulf War (1991), the dismemberment of Russia (1991), the Yugoslav War (1992), the massacre in Timor (1992).

[10] In 1992, the Portuguese Government introduced some fiscal benefits like tax exemptions on interest earned from shares acquisition or tax incidence only on 60% of dividends earned from acquisition of reprivatized firm's shares.

[11] Foreign investment in Portuguese securities at the end of 1993 was nearly EUR 1.3 billion. One year before, it was negative by EUR 1.5 billion.

single European currency.[12] During the second half of 1993, equity market prices and the market turnover have significantly increased. During 1993, the BVLG index increased by 53.2% and the market capitalization increased by 53.3%.

Poor corporate performance and the strong decrease in the main international markets during the first half of 1994 pushed the Portuguese index to a decrease of 17.4%. Between the end of June and September 1994, the Portuguese Stock Market inverted the negative trend, and posted an increase on the BVLG Geral index. As of 1994, there were 82 stocks included in the BVLG index. In 1994 the BVLG index increased 8.4% while other major indexes (Paris, London and Frankfurt) experienced a decreasing trend. One year later, the Portuguese index registered a decrease of 4.6%, while in New York the Dow Jones index rose 33.45% and the FT-SE 100 index rose 20.35%.

After November 1995 and especially during 1996, the sustained decrease in interest rates and in public debt fuelled a rise in stock prices. As a result, the BVLG index increased 32.6% and market capitalization increased (39.6%) to around EUR 19 billion.

The favorable outlook for the main macroeconomic indicators and corporate performance determined the equity market evolution during 1997 (the BVLG index rose 65.2%) and in the first months of 1998. During this period, the government performed significant privatization sales.[13] During 1997, the equity market capitalization increased by 87.1%.

The high volatility of the index between May and September 1998 coincided with the Asian and the Russian crisis period. The spillover of the Russian crisis induced decreases in international share indexes, including the Portuguese one. Nevertheless, the BVLG index posted a positive 26.2% return during 1998, which was significantly higher than the major markets.[14] This period coincided with the announcement, in May 1998, that Portugal

[12] The UE countries have agreed this treaty on 7th of February 1992. It was only ratified in November 1993 due to French and Danish postponing decisions.

[13] In 1997, demand for the privatized company's shares was nearly 42 times the number of shares offered, reflecting investors' appetite from the new privatized firms. Portugal Telecom and the national electricity company have the highest market capitalization at the end of the year (24.8% of the total market).

[14] London: 14.55%; Chicago: 16.10%; New York: 16.55%.

would be in the first wave to join the Third Stage of the Monetary Union.[15]

The economic situation in Brazil explained the BVLG index decrease during the first four months of 1999[16], while between May and September of the same year, the index presented great volatility, also induced by the expectation of a rise in the FED rates. After October (and through March 2000), the release of a postive economic outlook by OECD and the encouraging performance of the Technology, Media and Telecommunication (TMT) sector during January and February 2000 induced an increase in Portuguese stock prices.

At the end of 2000, the equity market capitalization was EUR 116 billion, 70.6% more than in 1999. However, the BVLG index has decreased 8.2%. By the end of 2000, six out of the seven domestic firms with the highest market capitalization in the stock exchange were partially state-owned.[17] The year 2001 was characterized by a generalized decrease in the BVLG index until September, when it seems to exist a gradual recovery. Some political and economic events have contributed to the evolution of the financial markets.[18] Comparing the values at the end of 2000 and on 16 November 2001, the capitalization of the Portuguese market decreased by 13.4%.

4 The Weekend Effect

In order to analyze the persistent difference in daily returns across the days of the week, we regress the daily returns on a set of dummy variables. Daily returns are calculated on a continuously compounded basis $R_t = ln(P_t/P_{t-1})$. We define five dummy variables – denoted by D_{1t} through D_{5t} – to account for each day of the week. This means that D_{1t} assumes the value 1 in case t is a Monday and 0 otherwise. The remaining dummy variables

[15] The Third Stage of the Monetary Union was effective on 4th January 1999. Portugal was among the first eleven countries that joined the monetary union.

[16] At the end of 1998, and in the first months of 1999, the Brazilian economy was influenced by the real depreciation. In Europe, the Kosovo conflict emerged.

[17] PT, EDP, BES, Cimpor, Brisa and Telecel. The Portuguese firm with the higher market capitalization was BCP, while BSCH had the highest market capitalization (44.3% of the total).

[18] The conflict in the Middle East, the terrorist attacks in New York (11th September) and the instability in Afghanistan and in neighboring countries. In Portugal: the Entre-os-Rios events on 4th March, the incorporation of Telecel into the British group Vodafone.

are defined in similar terms.

From January 1988 to April 1989, the Portuguese stock exchange closed on Mondays, only operating four days of the week. In the test for the weekend effect we should therefore distinguish between the two "types of Tuesdays": one which follows the weekend (comprehending the 1988-1989 period) and the day corresponding to the second trading day of the week. This situation is similar to the Spanish case, presented by Santesmases (1986), since the Madrid Stock Exchange also closed on Mondays up until June 1984. As a consequence, we consider an additional dummy variable D_2^* that assumes the value 1 in case t is a Tuesday from January 1988 to April 1989 (0, otherwise).

Board and Sutcliffe (1988) analyze the day of the week effects on the FTAS index, including the first lag of the returns. Easton and Faff (1994) analyze the day of the week effects on the Statex-Actuaries Accumulation index, including on their model the first four lags of the dependent variable. In the present analysis we consider the first three lags of the returns series as explanatory variables.[19] Days immediately after and before holidays are excluded.

The empirical regression to estimate is given by:

$$R_t = \sum_{i=1}^{5} \alpha_i D_{it} + \alpha_6 D_{2t}^* + \sum_{l=1}^{3} \phi_l R_{t-l} + \varepsilon_t \qquad (1)$$

The weekend effect is tested using the hypothesis: $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6$ (H1).

As in Board and Sutcliffe (1988), we further consider the Portmanteau statistics for testing the error's autocorrelation. Table IV presents the results. We find that for the 1988-2001 period as well as for the two subperiods, the hypothesis (H1) cannot be rejected. This result is consistent with what Santesmases (1986) observes for the Madrid stock exchange.[20]

Looking at the 1988-1996 period, we observe that the coefficient on the returns for the Tuesday that follow a 3-day weekend is negative which is consistent with the findings of

[19] We have considered alternative lags on the return variable and the results do not significantly change.

[20] Although Santesmases (1986) finds negative mean returns on Tuesday for the Madrid Stock Exchange index, the hypothesis of mean returns equality across the days of the week is not rejected.

Athanassakos and Robinson (1994).[21] Furthermore, we find that the significance of the joint test of equality of the coefficients is less significant for the 1997-2001 period. These two previous evidences suggest that the weekend anomaly appears to be diminishing. This result coincides with the Board and Sutcliffe (1988) findings, who observe that the weekend effect on the FTA index diminishes after 1968.

Although the autocorrelation in returns is very significant, arbitrage opportunities that result from persistent effects do not prevail when transaction costs are taken into consideration. The magnitude of the differences across daily returns is small when compared to the stock market fees, taxes and brokers commissions.[22]

Table IV additionally presents the median of the returns and the percentage of positive returns for each day of the week. Our results reveal that the percentage of positive returns is below 50% for Monday, which also happens for Tuesdays for the 1988-89 period (when the stock market was closed on Monday). The percentage of Friday returns that are positive is higher than 50% for both sub-periods considered in the sample. These results support our previous evidence and are consistent with Cross (1973).

The histograms in Figure 2 present an additional analysis for the differences in returns across the days of the week. We find that the mass of the histograms on the Tuesday following a 3-days weekend is more concentrated on the negative region, which does not hold for the remaining days of the week.

In order to explicitly measure the impact of the closed-market effect, we consider the sub-sample 1997-2001 from where we are able to draw daily data on both closing and opening prices of the stock market index.[23] With this additional information we extend the

[21] The authors find that the returns on the first trading day of the week are more significant negative than Monday returns and that the last day of the week effect is stronger than the Friday effect (with positive returns).

[22] For the Portuguese stock market, transactions fees are, on average, 0.275% of total transaction amount. This value is divided as follows: 0.25% broker fee, 0.015% stock market fees and 0.4% broker commission value.

[23] Opening and closing prices are available for the PSI20 index, which was established in 1993. The index is different from the BVLG as it reflects the 20 most important securities in the market. However, the PSI20 market capitalization represents around 90% of the total market capitalization.

analysis performed in (1). We compute the closed-market return as an overnight return, $Rnight_t = ln\left[Open_t/Close_{t-1}\right]$, which reflects the change between the open market value and the previous trading day closing value. In the regression we distinguish between the overnight return during the week and the overnight return for Monday (in this case, the previous day close price represents a two day difference as opposed to the remaining days of the week). The empirical test in (1) reduces to:

$$R_t = \left(\alpha_i + \beta_1 Rnight_t\right) D_{1t} + \sum_{i=2}^{5} \alpha_i D_{it} + \beta_0 Rnight_t + \sum_{l=1}^{3} \phi_l R_{t-l} + u_t \qquad (2)$$

Table V presents the results. As before, we find that the coeficients associated with D_1 to D_5 are not significant meaning that daily returns do not differ across the days of the week. Looking at the new overnight returns, we observe that *Rnight* represents around 63% of the daily returns. Comparing within weekdays, overnight returns for Monday represent an increasing percentage of the daily returns. However, the non-significance of the dummy variable interacted with the overnight returns reveals that there does not seem to exist a closed-market effect across the days of the week.

5 The Holiday Effect

The analysis of daily returns around holidays provides an additional test for the closed-market effect. Under this assumption, returns following holidays are expected to be negative and pre-holidays daily returns positive.

We compute the mean returns on days before holidays, on days after holidays and on regular days. Table VI presents the results for the holiday effect. For the 1988-2001, the mean return for the pre-holiday is 0.184%, 23 times larger than the mean return for regular days. These results are similar to Lakonishok and Smidt (1988) who find a pre-holiday average daily return for the DJIA of 0.220%, also 23 higher than the standard daily return on the index. Looking at the 1988-1996 period, we find that the mean return on pre-holiday is positive, while post-holiday returns are negative. This result suggests evidence

of some closed-market effect. We further distinguish between the number of non-trading days around the holiday and find that for the 1988-1996 period, the after-holiday effect is stronger as the number of non-trading days around holidays increases.

For the 1988-2001 period, the difference between pre and post holiday mean returns becomes less relevant as the number of days between the last trading day before and the first trading day after the holiday increases.

Figure 3 presents the histograms for the returns on pre-holidays, post-holidays and regular days. We find significantly more dispersion before and after holidays than on regular days. For the 1988-2001 period, we find that the before holiday histogram's mass is more concentrated on positive values. For regular days, the histogram is more concentrated near the zero line.

6 The Monthly Effect

In this section we test for the monthly effect by computing a regression of the daily returns on twelve dummy variables – denoted by Jan_t through Dec_t – that assume the value 1 in case t corresponds to January,...,December, respectively, and 0 otherwise. Similarly to (1), we further consider the first three lags of the dependent variable as explanatory variables. We use the Portmanteau statistic to test for autocorrelation. Days immediately after and before holidays are excluded from the regression. The equation to estimate is given by:

$$R_t = \beta_1 Jan_t + \beta_2 Feb_t + ... + \beta_{12} Dec_t + \sum_{l=1}^{3} \phi_l R_{t-l} + \eta_t \tag{3}$$

In order to test for differences in returns across the months of the year, we consider the hypothesis: $\beta_1 = \beta_2 = ... = \beta_{12}$ (H2). Table VII presents our results. We find no significant differences across the dummies for the 1988-2001 period, which suggest that we cannot reject hypothesis (H2). When we consider the two sub-periods, we find that for 1988-1996, the January coefficient is negative but not significant, while significantly positive during the 1997-2001 period. We find that the January's daily returns for 1997-

1998 are on average 0.554%, while for all years except 1997 and 1998, the mean return are 0.088%. Looking at the BVLG index, we observe that the monthly return for January 1997 is 12.5% - the highest of the year. Between November 1997 and April 1998, the highest returns correspond to March (15.5%) and January (14.1%). Furthermore, looking at the international markets we find that January's mean daily return for 1997-1998 was 0.324% for the EuroStoxx50 and 0.249% for the FT 100. This suggests that for the period 1997-1998, the Portuguese index returns behaved similarly to the main international index returns. Overall, we find that the January anomaly found resumes to a 1997-1998 effect which also coincides with the period during which the Portuguese stock market starts to be considered a developed market.

We find that daily returns for August for 1997-1998 is on average -0.531%. For all the sample except 1997 and 1998, this value is 0.061%. We find that the mean daily return on the index EuroStoxx50 for August 1997 and 1998 is nearly -0.599%, while for the other years except 1997 and 1998 the correspondent mean is not significant. Looking at Figure 1, we observe that the BVLG index was characterized by certain volatility during the third quarter of 1997, while from May to September 1998, the index decreased sharply. These findings suggest that the August effect observed in our analysis is consistent with the market evolution on 1997-1998, especially during August 1998.

The turn-of-the-month effect is a special case of the monthly effect. As in Lakonishok and Smidt (1988) we consider the summary statistics for the last and the first four trading days of a month – denoted by Day –4 through Day –1 and by Day +1 to Day +4. Table VIII presents our results. For the 1988-2001 period, we observe that the highest mean returns occurs on Day +3, on Day –3 and on the last trading day of the month. Like in Lakonishok and Smidt (1988) and Ariel (1987), we detect positive mean returns on the last and on the first three trading days of the month, although sometimes not significant. Between 1997 and 2001, mean returns are also positive from Day –1 to Day 3 (significantly on Day +3, at the 10% level). For the 1988-1996 period, average returns for the last trading day are significantly positive.

7 Conclusion

The several methodologies used in the present paper, including return regression analysis, histograms and mean analysis, agree in finding that the weekend effect for the Portuguese stock market tends to disappear in time as the stock market becomes more sophisticated and integrated. Overall, we cannot reject the hypothesis of equality of returns across the days of the week for the 1988-2001 period.

The return analysis around holidays is an additional test for the closed-market effect. We find that for the 1988-2001 period, returns before holidays are on average 23 times higher than on regular days. Moreover, we find that for the 1988-1996 period, returns are significantly positive before holidays and negative after holidays and this difference increases with the number of non-trading days around holidays. This result reveals evidence of a closed-market effect. Similarly to the weekend anomaly, the holiday effect tends to vanish for the 1997-2001 period.

The monthly effect is not empirically supported. The January and the August returns' patterns, especially during 1997 and 1998, are consistent with the international indexes performances, namely EuroStoxx 50, FT 100 and the instability caused by the upgrade of the Portuguese stock market that started to be internationally considered as a developed market. Finally, returns around the end of the month do not significantly differ and therefore our results do not support the existence of a turn-of-the-month effect.

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Figure 1

The BVLG Index – the Portuguese Stock Market Index

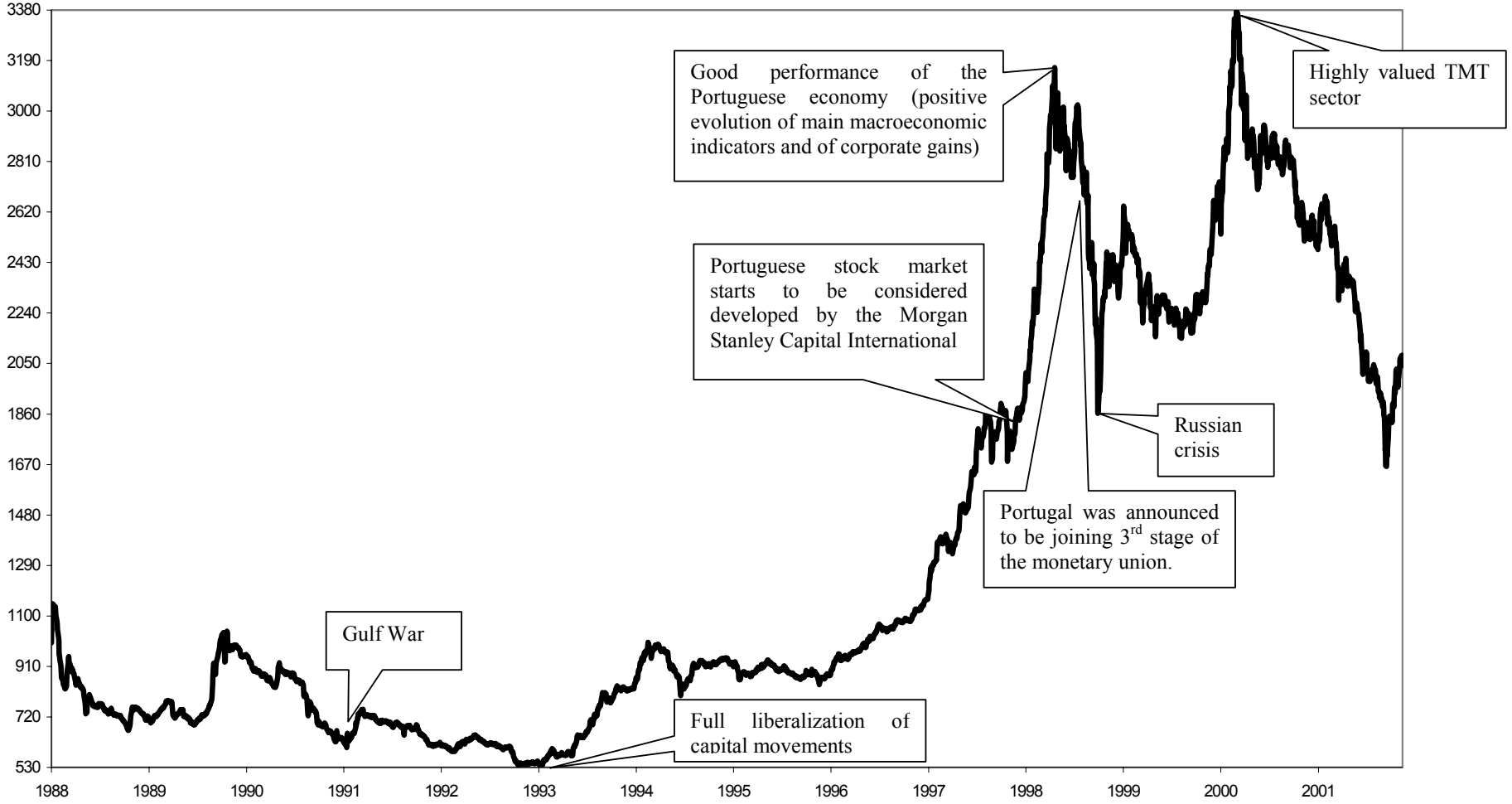

Table I

Evidence of The Weekend Effect

Reference	Country of Analysis, Data and Empirical Methodology	Results
Arsad and Coutts (1997)	Country of Analysis: UK. FT 30 Index, Jul1935-Dec1994. Linear Regressions with 5 seasonal dummies. Other samples: 35-39, 40-44…90-94.	Negative mean returns on Monday. Significant day-of-the-week effect on 35-94 and on 6 sub-samples. Monday had the largest variance on 7 sub-samples.
Theobald and Price (1984)	Country of Analysis: UK. FTO and FTAS Indices: Jun1975-May1981. Summary statistics for the days of the week. Other samples: Jun75-Dec76, Jan77-May78, Jun78-Dec79 and Jan80-May81.	Nonnormal returns, negative mean returns on Monday, stronger for 75-81, 75-76 and 77-78. Evidence of day-of-the-week effects. Autocorrelation. More strongly negative mean returns on ex-div Mondays.
Board and Sutcliffe (1988)	Country of Analysis: UK. FTA Index. May1962-Apr1986. Other samples: May62-Apr68…May80-Apr86. Summary statistics for the days of the week. Linear regressions: 8 seasonal dummies and the return's 1st lag.	Significant negative Monday mean returns (62-86 and 62-68). Significant day-of-the-week effect (62-86 and 62-68: 1%; 74-80 and 80-86: 5%). Nonnormal returns. Evidence of autocorrelation. Positive 1st account mean returns and negative Monday not 1st account mean returns. Friday/Monday mean returns: lower than in other days. Monday/Tuesday mean returns: lower than in other days.
Mills and Coutts (1995)	Country of Analysis: UK. FT-SE 100, FT-SE Mid 250 and FT-SE 350 Indexes and 29 industry baskets, grouped in: finance, consumer, industrials and others (Jan1986-Oct1992). Summary statistics for the days of the week.	Negative Monday returns, significant for Mid 250 and 350. Positive returns for all other days, largest on Wednesdays and Fridays. Negative returns for non-account Mondays. Positive returns on account Mondays for the 100, not significant for Mid 250. Large positive non-Monday first account returns. Finance and Consumer: negative Monday mean returns (large on non-account Mondays). Industrial and Others: no evidence of day-of-the-week or settlement effects.
Santesmases (1986)	Country of Analysis: Spain. Madrid Stock Exchange Index and 40 most traded stocks grouped in Banks and Investments, Utilities, Industrial (Jan1979-Dec1983). Summary statistics for the days of the week.	**Index, Banks and Investment**: Negative and lower mean returns on Tuesday; **Utilities, Industrial**: positive returns for all days of the week, highest on Tuesday. **All cases**: no day–of-the-week effect evidence.
Alexakis and Xantakis (1995)	Country of Analysis: Greece. CFS stock price Index: Jan1985-Feb1994. Other samples: 85-87, 88-94. Summary statistics for the days of the week. Linear regression (E-GARCH).	Negative returns: on Tuesdays (all samples) and on Mondays (88-94). Non-normal, stationary and autocorrelated returns. Time-dependent variance. Highest and positive Thursday and Friday returns. Higher Monday returns on 85-87. Tuesday returns became less negative and Wednesday returns became higher.
Cross (1973)	Country of Analysis: USA. S & P Composite Index. 1953-1970. Percentages of times the index advanced, declined or kept unchanged.	Percentages of advance: Fridays: 62%; Mondays: 39.5%. Percentages of advance after an advance on the previous day: Monday: 48.8%; Other Days: 63.9%. Percentages of advance after a decline on the previous day: Monday: 24%; Other Days: 49%.
French (1980)	Country of Analysis: USA. S & P Composite: 1953-1977. Summary statistics and histograms for the days of the week. Linear regressions with seasonal dummies. Other samples: 53-57…73-77, every year	Negative Monday mean returns (the lowest of the week). Rejection of the trading and calendar time hypothesis (53-77 all the sub-samples but the last). Mass of the returns histograms: Monday: mostly in the negative region; other days: centered on the positive region.
Lakonishok and Levi (1982)	Country of Analysis: USA. CRSP EW and VW indices. Jul1962-Dec1979. Adjusted returns after 68. Summary statistics for the days of the week. Other samples: 62-67, 68-73 and 74-79. Linear regression.	Earlier periods: negative Monday's and positive Friday's returns (both significant). Friday returns reduced after the adjustment. Monday returns were reducing during 68-73. Evidence of day-of-the-week effects before 74. Abnormally high Wednesday returns. Later periods: Monday and Friday returns had become insignificant.
Lakonishok and Smidt (1988)	Country of Analysis: USA. DJIA. Jan1897-Jun1986. Summary statistics, for the days of the week. Linear regressions: seasonal dummies for each day and for Fridays before a trading or non-trading Saturday. Periods: 97-86, 97-May52, Jun52-88, 97-10, 11-24, 25-38, 38-May52, Jun52-63, 64-75, 76-85.	Evidence of day-of-the-week effect (1%). Negative Monday returns (significant on 97-86, pre and post May52 and in 5 of the other sub-periods). 97-24: significant Monday mean return (1%) Returns tended to progress with the week. In general, significant % of Monday positive returns below 50% and % of Friday and Saturday positive returns above 50%.

Table I

Evidence of The Weekend Effect - continuation

Reference	Country of Analysis, Data and Empirical Methodology	Results
Keim and Stambaugh (1984)	Country of Analysis: USA. S&P Composite: 1928-1982, 28-52 (NYSE was opened Monday→Saturday), 53-82 (NYSE was opened Monday→Friday). Other samples: 28-32…78-82. 10 portfolios (63-79). 30 Dow Jones index stocks (Jul62-Dec82, Jul62-Dec72 and Jan73-Dec82). The most 30 traded OTC stocks (78-82). Summary statistics for the days of the week.	**S&P**: Significant day-of-the-week effect: 28-82, 28-52, 53-82 and on 9 five-years samples. Larger Friday return before 52 Insignificant lower Monday mean return after 53. **Portfolios**: Consistently negative Monday returns. Stronger day-of-the-week effect for smaller portfolios. **Dow Jones**: Higher correlation of Friday/Monday returns and non-autocorrelation equality across the week. **OTC stocks**: negative Monday mean returns and significant day-of-the-week effect.
Connolly (1989)	Country of Analysis: USA. S&P500, CRSP EW and VW indices: 1963-1983. Linear regressions. Test the day-of-the-week and the Monday effects. Other samples: 63-65…81-83. Tests for normality, autocorrelation and ARCH effects.	Significant day-of-the-week effect (all indices: 63-83, pre 74 and 78-80; just for VW: 75-77, 81-83). Significant negative Monday returns (63-83, pre 74 and 81-83). No normality. Untreated autocorrelation problem. ARCH effects. GARCH results: VW Monday positive returns on 63-65, 66-68, 75-77 and 78-80; S&P and EW Monday negative returns disappeared after 74.
Connolly (1991)	Country of Analysis: USA. S&P500, CRSP EW and VW indices; portfolio stocks. 1963-1983. Other samples: 63-65…81-83. Summary statistics for the days of the week and linear regressions. Test the day-of-the-week and the Monday effects.	Mean returns: positive for all days jointly but negative for Mondays alone. Insignificant negative Monday mean returns post 75. Portfolios: negative Monday returns, largely concentrated from 69 to 74. Bayesian and classic tests gave contradictory conclusions about day-of-the-week effects, especially for the indices.
Fortune (1999)	Country of Analysis: USA. S&P500, Dow30, Wilshire5000, NASDAQ and Russell2000 indices: Jan1980-Jan1999 (excluding Oct87 and days after holidays). Summary statistics: intra-week days and for weekends. Jump diffusion model for weekend and intra-week returns (80-99, 80-Sep87 and Nov87-99).	Weekend returns: lower means and less variability. Returns: negatively skewed and kurtosis significant above 3 (strongly for weekend returns). Jump Diffusion Model: significant positive mean jump frequency and lower jump effect standard-deviation, negative mean jump on weekends (S&P, Dow and Wilshire), lower volatility on weekends. Positive intra-week total drift (declined after Nov87, as the difference between intra-week and weekend drifts)
Athanassakos and Robinson. (1994)	Country of Analysis: Canada. TSE indices: 300 Composite, 300TR (Jan1977-Jun1989) and VW Jan1975-Jun1989. Individual securities: 75-89, 75-77, 78-79…87-89. Portfolios: 75-89 and 85-89. Summary statistics for the days of the week.	**Indices**: significant Monday negative returns (1%), Insignificant Tuesday positive returns. Significant positive returns for the other days. Day-of-the-week effects. 1st trading weekday effect: slightly larger than Monday effect. 5th trading weekday effect: slightly larger than Friday effect. Significant and lower 1st Mondays within the month returns. **Portfolios**: more significant negative Monday returns for the largest, negative Tuesday returns dominated negative Monday returns for the smallest, significant positive Friday mean returns and evidence of day-of-the-week effects.
Balaban (1995)	Country of Analysis: Turkey. ISE Composite Index: Jan1988-Aug1994. Summary statistics for the days of the week. Considers every year separately. Linear regressions with seasonal dummies (88-94, every year separately, 88-91 and 92-94). Tests for mean and variance equality: one year vs one year and one year vs other years jointly.	Significant positive 1st order autocorrelation (except in 93). Negative Tuesday returns (except in 89). Highest (significant) Friday return: 88-94. Not mean equality (16 of 28 cases). In general, positive relation between Friday and Monday returns sign. Significant positive Wednesday and Friday returns (88-94). Insignificant negative Tuesday mean return. Significant negative Tuesday and Wednesday coefficients in 1988 (positive in 89). No significant mean returns (90 and 94). Friday returns differed significant from the other days' returns (88-91).
Easton and Faff (1994)	Country of Analysis: Australia. 2 Sydney Stock Exchange indices and S&P (USA): 1974-1985. Other samples: 74-76…83-85. Linear regressions. Tests: day-of-the-week effect, normality, autocorrelation, ARCH effects and independence of Australian and USA day-of-the-week effects.	Returns: lower on Tuesday and higher on Thursday. Evidence of day-of-the-week effect on 74-85 and until 82. Non-normality. No autocorrelation. Presence of ARCH effects. Similar results from OLS and GARCH estimation. Independence of the Australian and the North American day-of-the-week effects.

Table II

Evidence of The Holiday Effect

Reference	Country of Analysis, Data and Empirical Methodology	Results
Arsad and Coutts (1997)	Country of Analysis: UK. FT 30 Index, Jul1935-Dec1994. Summary statistics for 1, 2 and 3 days before holidays and for 1 and 2 days after holidays. Comparison of mean returns after and non-after holidays, by day of the week.	On Mondays, Wednesdays, Thursdays and Fridays mean returns were higher following holidays. On Tuesdays, mean returns were lower following holidays. Returns immediately before and after holidays were much higher than the non-holiday returns.
Board and Sutcliffe (1988)	Country of Analysis: UK. FTA Index. May1962-Apr1986. Summary statistics for days over Bank Holidays excluding returns over a weekend and for Wednesdays, Thursdays and Fridays excluding the days over Bank Holidays.	Returns mean and variance were higher over Bank Holidays. Significant variance difference (1%). Means weren't significant different (few observations for the Bank holidays - 28).
Mills and Coutts (1995)	Country of Analysis: UK. FT-SE 100, FT-SE Mid 250 and FT-SE 350 Indexes and 29 industry baskets, grouped in: finance, consumer, industrials and others (Jan1986-Oct1992). Summary statistics for days before holidays and other trading days.	**Mean returns** Index: on pre-holidays were around seven times larger than for other days; finance and consumer: higher in pre-holidays; industrial and 'others': smaller in pre-holidays.
French (1980)	Country of Analysis: USA. S & P Composite Index. 1953-1977. Comparison of the mean returns on trading days after holidays and non-after holidays, by day of the week.	Mean return on Mondays, Wednesdays, Thursdays and Fridays were higher following holidays. Mean returns on Tuesdays were lower following holidays.
Lakonishok and Smidt (1988)	Country of Analysis: USA. DJIA. Jan1897-Jun1986. Summary statistics for days before holidays, after holidays and other days (97-86, 97-51, 52-86, 97-10, 11-24, 25-38, 39-May52, Jun52-63, 64-75, 76-Jun86).	Mean returns on pre-holidays: nearly 23 larger than in regular days. 63.9% of positive returns on pre-holidays (97-86). Pre-holidays rates of return: generally two to five times larger than on pre-weekend. All period: negative after-holidays mean returns (insignificant different from 0 and from the regular days mean, less negative than on Monday).
Ariel (1990)	Country of Analysis: USA. CRSP VW and EW daily index returns: 1963-1982. Summary statistics for pre-holidays and other trading days (63-82, 63-72 and 73-82). Post-test for 83-86. Graph for mean returns: 1, 2, 3 days before holidays and 1, 2 days after holidays; DJIA hourly returns: 63-82. Summary statistics considering each of the pre and post holiday's hours.	Pre-holidays EW and VW mean returns: 8.9% and 14% larger than in other days (significant difference). EW and VW: before-holiday returns significant different than in others; VW: after holiday (with 1stJanuary) returns significant different than in others. 83-86: significant positive pre-holiday returns (lower point estimates). **DJIA**: high pre-holiday returns, especially at the end of the day. Significant pre-holiday close to post-holiday opening mean return; insignificant pre-holiday close to post-holiday close mean return.

Table III

Evidence of the Monthly Effect

Reference	Country of Analysis, Data and Empirical Methodology	Results
Arsad. and Coutts (1997)	Country of Analysis: UK. FT 30 Index, Jul1935 to Dec1994. Linear Regressions with twelve seasonal dummies. Considers twelve five-year samples (35-39, 40-44…90-94).	For the entire sample, significant positive January, April and December mean returns. Positive April mean returns for all sub-samples (only 4 significant positive, all before 59). 4 significant positive January mean returns, after the introduction of capital gains tax in 65. Higher mean returns in April than in January (4 periods before 65); these results reversed after 65. Negative or very small mean returns: May to October.
Reinganum and Shapiro (1987)	Country of Analysis: UK. Data from the LSPD. Jan1956-Dec1980 (monthly returns). Linear Regression with two dummies for each month, for 56-65 and 66-80 (before and after the capital gains tax introduction). Test for the monthly effect in this two periods. Tests for tax effects (split securities into losers and winners portfolios).	No seasonality on 56-65. Evidence of monthly effects (5%) on 66-80. Mean returns: January – 5.38%, April 3.91%. Losers and winners mean return difference: April – before 66: insignificant negative; after 66: significant positive. January: significant difference before and after 66.
Mills and Coutts (1995)	Country of Analysis: UK. FT-SE 100, FT-SE Mid 250 and FT-SE 350 Indexes; 29 industry baskets, grouped in: finance, consumer, industrials and others. (Jan1986-Oct1992). Summary statistics by month: all observations, 1st half and 2nd half.	**Mean returns** Index: significant positive in January and February; small or negative in summer and autumn months, significant positive in the 1st half, insignificant in the 2nd half; finance and consumer: large positive on January and February, large negative in August and October; large positive in the 1st half, smaller in the 2nd half; industrials: negative in August and October; 'others': positive in January and February, smaller in the 1st half, large positive in the 2nd half.
Santesmases (1986)	Country of Analysis: Spain. Madrid Stock Exchange Index and the 40 most traded stocks grouped in Banks and Investments, Utilities and Industrial (Jan1979-Dec1983). Summary statistics, 1st Quarter, 4th Quarter, other days.	Significant mean returns difference through the year (5%), except for the utilities sector. Returns go down in the last months of the year and go up during the 1st months of the following year.
Lakonishok and Smidt (1988)	Country of Analysis: USA. DJIA index. Jan1897-Jun1986. Summary statistics: by month (monthly returns), 1st and 2nd halves of the month (daily and monthly returns). Periods: 97-May86, 97-May52, Jun52-May86, 97-10, 11-24, 25-38, 39-May52, Jun52-63, 64-75 and 76-May86; for the December 2nd half (97-86, 97-51, 52-85, 97-10, 11-24, 25-38, 39-51, 52-63, 64-75, 76-85, daily returns); for the last 4 and the first 4 month's trading days: -4, …, -1, 1, …, 4 (97-86, 97-May52, Jun52-86, 97-10, 11-24, 25-38, 39-May52, Jun52-63, 64-75, 76-May86).	August returns – 97-May52: higher; Jun52-86 – relatively low. Evidence of month effects. Positive returns for both halves (equal mean returns). Usually higher returns on the 1st half. Significant April and December returns difference for 1st and 2nd halves on 97-May52. Slightly negative returns before Christmas. Higher frequency of positive returns between Christmas and New Year. 97-86: high returns for day–1 to day3. Mean returns on -1, 1, 2, 3 significant higher than on –4, -3, -2, 4.
Ariel (1987)	Country of Analysis: USA. CRSP EW and VW indices: 1963-1981. Graph and summary statistics for the 9 trading days before the start of a month (2nd half) and after the start of a month (1st half) – 63-81, 63-66, 67-71, 72-76 and 77-81. Summary statistics for EW less VW (63-81, 63-68 and 74-81 jointly, 69-73; 1st and 2nd halves of the months, excluding January).	**Mean returns** 1st half: significant positive; 2nd half predominantly negative (insignificant); in most of the cases, significant higher in the 1st half; EW less VW: positive and insignificant different in 1st and 2nd halves (63-81 and 63-68 plus 74-81), negative mean returns for both halves, significant larger in the 2nd (69-73).
Gultekin and Gultekin (1987)	Country of Analysis: USA. CRSP daily stock returns: Jul1962-Dec1981 (900 securities grouped into 10 or 30 portfolios). APT model – tests for risk premium significance (all sample, Jan vs other months, exclude Jan-Feb vs exclude other months). 900 NYSE and AMEX stocks (same period). Summary statistics by month. Stocks grouped into 10 and 30 portfolios. Test of monthly effects for individual stocks (by month, for each portfolio).	**CRSP**: More frequently significant risk premiums on 90 stock groups. Always-significant risk premium in January (rarely priced in the other months). Insignificant risk premium when excluding January and February returns. **NYSE and AMEX**: larger January mean returns (5 to 10 times than most other months). Tests: 10 portfolios: always-significant difference for individual stocks; 30 portfolios: evidence of means equality in February, May, June, September and October.

Table IV
Analysis of the Weekly Effect

The table reports the OLS estimation where the dependent variable is the BVLG index daily return and the explanatory variables are dummies for each day-of-the-week, a dummy for Tuesdays from January 1988 to April 1989 - denoted by Tuesday* - and the first three lags of the dependent variable. The t-statistic corresponds to the individual test of coefficient's nullity, the F-statistic corresponds to the test of jointly equality of the dummy's coefficients and the Portmanteau statistic corresponds to the test of residual's autocorrelation. The table also reports the medians, the number of observations and the percentages of positive returns by day of the week and for Tuesday*. Periods: 1988-2001, 1988-1996 and 1997-2001. Days immediately before or after holidays are excluded. ***, ** and * denote significance at the 1%, 5% and 10% levels respectively.

Whole Sample						
	Coefficient	Std –Deviation	T-Statistic	Median	Positive Ret (% # obsv)	# of Observ.
Monday	-0.00027	0.00039	-0.68	-0.00026	47.6%	565
Tuesday	0.00025	0.00039	0.65	-0.00029	47.5%	630
Tuesday*	-0.00219	0.00126	-1.74*	-0.00153	36.7%	60
Wednesday	-0.00041	0.00037	-1.10	-0.00030	46.9%	622
Thursday	0.00003	0.00037	0.08	0.00002	50.2%	629
Friday	0.00052	0.00037	1.40	0.00016	51.2%	621
1st Lag	0.24316	0.01790	13.58***			
2nd Lag	0.00229	0.01853	0.12			
3rd Lag	0.02205	0.01786	1.23			
F – Test: 1.32 (P-Value: 0.253)		R^2: 0.0638				
Portmanteau Test (12): 12.86		$P>\chi^2$ (12)=0.379				
1988-1996						
	Coefficient	Std –Deviation	T-Statistic	Median	Positive Ret (% # obsv)	# of Observ.
Monday	-0.00051	0.00039	-1.32	-0.00022	47.4%	346
Tuesday	0.00020	0.00039	0.53	-0.00046	44.1%	406
Tuesday*	-0.00203	0.00100	-2.02**	-0.00153	36.7%	60
Wednesday	-0.00030	0.00036	-0.83	-0.00028	46.1%	399
Thursday	0.00053	0.00036	1.50	-0.00013	48.4%	407
Friday	0.00024	0.00036	0.66	0.00005	50.3%	400
1st Lag	0.34293	0.02243	15.29***			
2nd Lag	0.04654	0.02358	1.97*			
3rd Lag	-0.06217	0.02202	-2.82***			
F – Test: 1.83 (P-Value: 0.104)		R^2: 0.1333				
Portmanteau Test (12): 16.92		$P>\chi^2$ (12)=0.153				
1997-2001						
	Coefficient	Std –Deviation	T-Statistic	Median	Positive Ret (% # obsv)	# of Observ.
Monday	-0.00001	0.00081	-0.01	-0.00046	47.9%	219
Tuesday	0.00049	0.00080	0.61	0.00061	53.6%	224
Wednesday	-0.00042	0.00081	-0.52	-0.00064	48.4%	223
Thursday	-0.00089	0.00081	-1.11	0.00071	53.6%	222
Friday	0.00087	0.00081	1.08	0.00060	52.9%	221
1st Lag	0.17741	0.02978	5.96***			
2nd Lag	-0.02847	0.03059	-0.93			
3rd Lag	0.06654	0.03007	2.21**			
F – Test: 0.76 (P-Value: 0.628)		R^2: 0.1202				
Portmanteau Test (12): 5.52		$P>\chi^2$ (12)=0.938				

Figure 2

Histograms for the Days of the Week – Period 1988-2001

The figure presents the histograms for each day-of-the-week in 1988-2001 and for Tuesdays between January 1988 and April 1989. Days before and after holidays are excluded. The figures are centered at the zero return line.

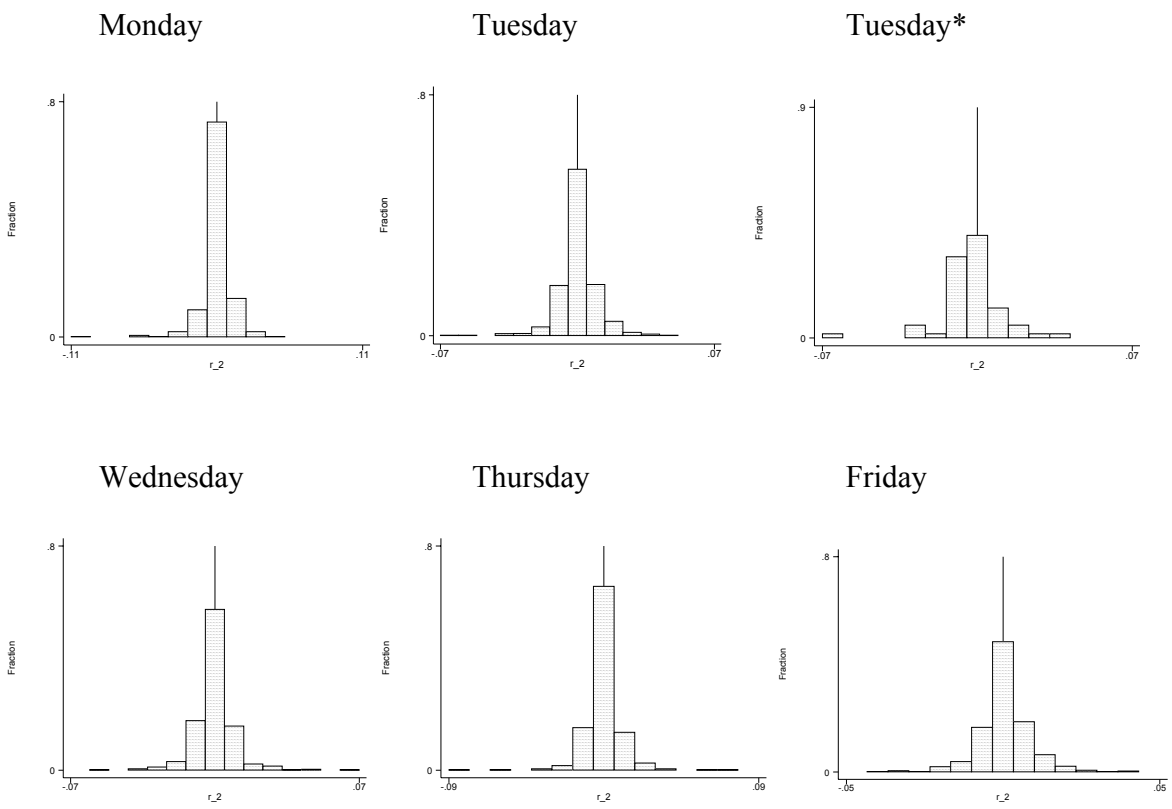

Table V

Analysis of the Weekly Effect for the PSI30 Index

The table reports the OLS estimation where the dependent variable is the PSI30-index daily return and the explanatory variables are dummies for each day-of-the-week, the variation of the index from the closing to the opening of the day after, denoted by RNight, the product of RNight by the Monday dummy, and the first three lags of the dependent variable. The t-statistic corresponds to the individual test of coefficient's nullity, the F-statistic corresponds to the test of jointly equality of the dummy's coefficients and the Portmanteau statistic corresponds to the test of residual's autocorrelation. The table also reports the medians, the number of observations and the percentages of positive returns by day of the week Periods: 1997-2001. Days immediately before or after holidays are excluded. ***, ** and * denote significance at the 1%, 5% and 10% levels respectively.

	1997-2001					
	Coefficient	Std –Deviation	T-Statistic	Median	Positive Ret (% # obsv)	# of Observ.
Monday	-0.0003332	0.0007427	-0.45	0.0000358	50.2%	219
Tuesday	0.0006127	0.0007324	0.84	0.0012167	53.6%	224
Wednesday	-0.0009078	0.0007342	-1.24	-0.0006028	48.4%	223
Thursday	-0.0012227	0.0007358	-1.66*	0.0004798	53.6%	222
Friday	0.0005794	0.000737	0.79	0.000718	52.0%	221
RNight	0.6306733	0.0339267	18.59***			
RNight * Monday	0.0985008	1.64	0.102			
1st Lag	0.1154259	0.0257697	4.48***			
2nd Lag	-0.0220609	0.0260785	-0.85			
3rd Lag	0.0704868	0.0255044	2.76***			
F – Test: 1.31 (P-Value: 0.266)		R^2: 0.3008				
Portmanteau Test (12): 13.90		$P>\chi^2(12)= 0.307$				

Table VI

Analysis of the Holiday Effect

The table reports the means, standard-deviations, medians, number of observations and percentages of positive returns from the BVLG index, on days before holidays, on days after holidays and on regular days (all observations) and for days before holidays and days after holidays considering that the number of calendar days between them is 2 and more or equal than 3. The standard deviations are corrected by the Newey-West formula. We consider the periods: 1988-2001, 1988-1996 and 1997-2001. The difference between the numbers of observations on days before holidays and on days after holidays in 1988-1996 and in 1997-2001 is due to the 1997 New Year's Day.

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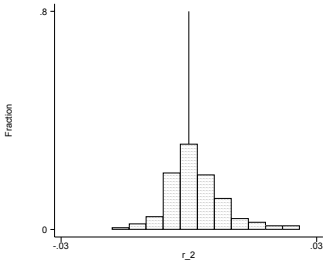
		Mean	Std –Deviation	Median	Positive Ret (% # obsv)	# of Observ.
Whole Sample						
All	Before Holidays	0.00184	.0005901	0.00107	58.0%	150
	After Holidays	0.00130	.0009952	-0.00062	46.0%	150
Observations	Regular Days	0.00008	.0002108	-0.00017	48.7%	3067
2 days difference	Before Holidays	0.00159	.0007608	0.00007	50.0%	78
	After Holidays	0.00095	.0010669	-0.00059	44.9%	78
≥3 days difference	Before Holidays	.002102	.0009263	.0012909	66.7%	72
	After Holidays	.0016843	.0016392	-.0007149	47.2%	72
1988-1996						
		Mean	Std –Deviation	Median	Positive Ret (% # obsv)	# of Observ.
All	Before Holidays	0.00025	.0004906	0.00026	51.0%	100
	After Holidays	-0.00025	.0007684	-0.00064	45.5%	99
Observations	Regular Days	0.00007	.0002318	-0.00024	47.2%	1958
2 days difference	Before Holidays	0.00040	.0006631	-0.00088	45.3%	53
	After Holidays	0.00040	.0007858	-0.00059	46.2%	52
≥3 days difference	Before Holidays	.0000781	.0006605	.0005367	57.4%	47
	After Holidays	-.0009754	.001213	-.0008361	44.7%	47
1997-2001						
		Mean	Std –Deviation	Median	Positive Ret (% # obsv)	# of Observ.
All	Before Holidays	0.00501	.001025	0.00449	72.0%	50
	After Holidays	0.00431	.0023088	-0.00009	47.1%	51
Observations	Regular Days	0.00008	.0004154	0.00031	51.3%	1109
2 days difference	Before Holidays	0.00411	.0015574	0.00362	60.0%	25
	After Holidays	0.00203	.0027792	-0.00088	42.3%	26
≥3 days difference	Before Holidays	.0059068	.0015193	.0048371	84.0%	25
	After Holidays	.0066846	.0032804	.0043567	52.0%	25

Figure 3

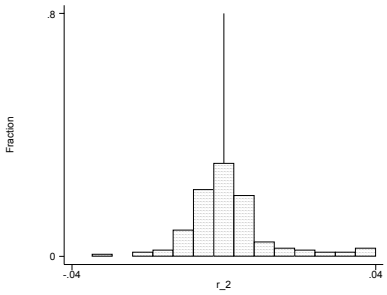
Histograms for the Holiday Effect –1988-2001

The figure presents the histograms for the days before holidays, the days after holidays and the regular days. The figures are centered at the zero return line. We consider the periods: 1988-2001, 1988-1996 and 1997-2001.

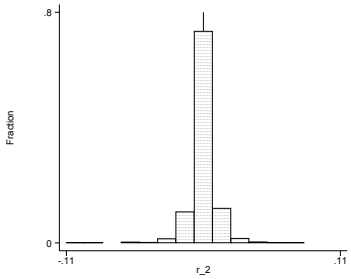
Before Holidays



After Holidays

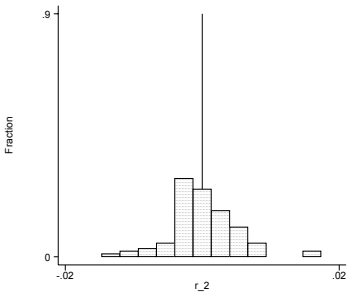


Regular Days

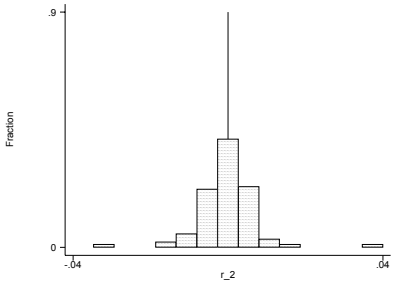


Period 1988-1996

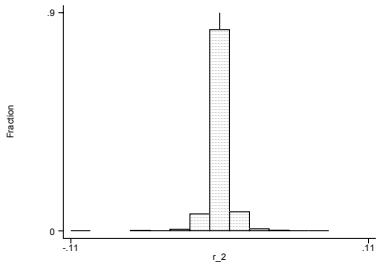
Before Holidays



After Holidays

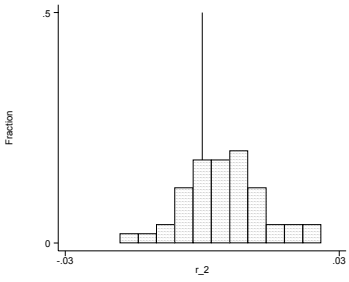


Regular Days

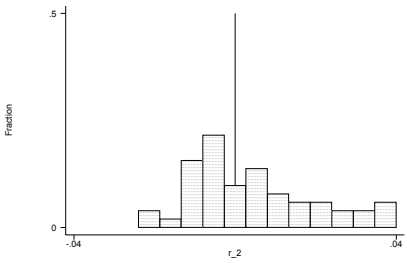


Period 1997-2001

Before Holidays



After Holidays



Regular Days

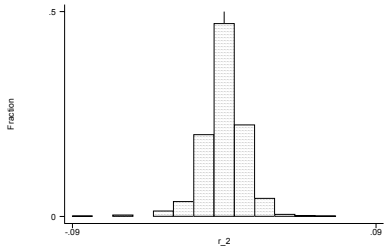


Table VII

Analysis of the Monthly Effect

The table reports the OLS estimation where the dependent variable is the BVLG-index daily return and the explanatory variables are dummies for each month and the first three lags of the dependent variable. The t-statistic corresponds to the individual test of coefficient's nullity, the F-statistic corresponds to the test of jointly equality of the dummy's coefficients and the Portmanteau statistic corresponds to the test of residual's autocorrelation. The table also reports the medians, the number of observations and the percentages of positive returns by month. Periods: 1988-2001, 1988-1996 and 1997-2001. Days immediately before or after holidays are excluded. ***, ** and * denote significance at the 1%, 5% and 10% levels respectively.

	Whole Sample					
	Coefficient	Std –Deviation	T-Statistic	Median	Positive Ret (% # obsv)	# of Observ.
January	0.00073	0.00056	1.30	0.00011	53.4%	279
February	0.00067	0.00060	1.11	0.00043	53.2%	237
March	0.00023	0.00055	0.42	0.00024	52.5%	284
April	-0.00065	0.00064	-1.02	-0.00015	48.1%	212
May	-0.00048	0.00056	-0.86	-0.00079	43.8%	274
June	-0.00046	0.00063	-0.74	-0.00066	44.1%	220
July	0.00028	0.00053	0.53	-0.00005	49.3%	304
August	-0.00013	0.00056	-0.24	0.00002	50.2%	277
September	-0.00050	0.00054	-0.93	-0.00043	45.4%	295
October	0.00005	0.00058	0.09	-0.00030	46.9%	260
November	0.00008	0.00058	0.14	-0.00027	46.3%	255
December	-0.00010	0.00071	-0.14	0.00019	51.8%	170
1st Lag	0.24133	0.01793	13.46***			
2nd Lag	0.00089	0.01855	0.05			
3rd Lag	0.01951	0.01791	1.09			
F – Test: 0.60 (P-Value: 0.828)		R^2: 0.0638				
Portmanteau Test (12): 12.49		$P>\chi^2(12)=0.407$				
	1988-1996					
	Coefficient	Std –Deviation	T-Statistic	Median	Positive Ret (% # obsv)	# of Observ.
January	-0.00013	0.00054	-0.24	-0.00105	46.1%	178
February	0.00019	0.00059	0.32	0.00034	53.4%	148
March	0.00054	0.00054	1.01	0.00039	55.9%	179
April	-0.00034	0.00062	-0.55	-0.00030	45.9%	133
May	-0.00026	0.00054	-0.48	-0.00075	43.4%	175
June	-0.00037	0.00062	-0.59	-0.00054	43.3%	134
July	0.00009	0.00052	0.17	-0.00009	48.2%	193
August	0.00087	0.00054	1.60	0.00025	54.0%	176
September	-0.00030	0.00053	-0.57	-0.00051	43.1%	188
October	-0.00017	0.00056	-0.31	-0.00052	43.3%	164
November	-0.00043	0.00056	-0.77	-0.00055	39.9%	168
December	0.00002	0.00065	0.02	0.00005	50.8%	122
1st Lag	0.34108	0.02248	15.17***			
2nd Lag	0.04532	0.02361	1.92*			
3rd Lag	-0.06307	0.02208	-2.86***			
F - Test: 0.51 (P-Value: 0.900)		R^2: 0.1316				
Portmanteau Test (12): 16.70		$P>\chi^2(12)=0.161$				

Table VII

Analysis of the Monthly Effect – continuation

	1997-2001					
	Coefficient	Std –Deviation	T-Statistic	Median	Positive Ret (% # obsv)	# of Observ.
January	0.00272	0.00121	2.24***	0.00327	66.3%	101
February	0.00159	0.00128	1.24	0.00077	52.8%	89
March	-0.00050	0.00117	-0.42	-0.00090	46.7%	105
April	-0.00109	0.00135	-0.81	0.00051	51.9%	79
May	-0.00093	0.00121	-0.77	-0.00103	44.4%	99
June	-0.00065	0.00130	-0.50	-0.00085	45.3%	86
July	0.00068	0.00114	0.59	0.00078	51.4%	111
August	-0.00222	0.00120	-1.85*	-0.00180	43.6%	101
September	-0.00092	0.00116	-0.79	-0.00015	49.5%	107
October	0.00066	0.00123	0.54	0.00064	53.1%	96
November	0.00122	0.00129	0.95	0.00175	58.6%	87
December	-0.00051	0.00173	-0.29	0.00111	54.2%	48
1st Lag	0.16347	0.02996	5.46***			
2nd Lag	-0.04067	0.03070	-1.32			
3rd Lag	0.05279	0.03026	1.74*			
F - Test: 1.22 (P-Value: 0.268)		R^2: 0.0461				
Portmanteau Test (12): 4.72		$P>\chi^2$ (12)=0.967				

Table VIII

Analysis of the Turn-of-the-Month Effect

The table reports the means, standard-deviations, medians, number of observations and percentages of positive daily returns from the BVLG index, on the last four trading days within a month – denoted by Day -4, Day -3, Day -2 and Day -1 – and in the first four trading days within a month – denoted by Day +1, Day +2, Day +3 and Day +4. The t-statistic corresponds to the individual test of mean return's nullity, Periods: 1988-2001, 1988-1996 and 1997-2001. The observations for Day -4 through Day -1 correspond to the last four trading days from January 1988 to October 2001. The observations for Day +1 through Day +4 correspond to the first four trading days from January 1988 to November 2001, except the first trading day in January 1988 (which corresponds to the price base of the index). ***, ** and * denote significance at the 1%, 5% and 10% levels respectively.

	Whole Sample					
	Mean	Std –Deviation	T-Statistic	Median	Positive Ret (% # obsv)	# of Observ.
Day –4	0.00002	0.01047	0.03	0.00007	50.6%	166
Day –3	0.00149	0.01027	1.87*	0.00078	57.2%	166
Day –2	-0.00067	0.00760	-1.14	-0.00019	48.8%	166
Day –1	0.00124	0.00816	1.96*	0.00107	57.8%	166
Day +1	0.00012	0.01314	0.12	-0.00070	45.2%	166
Day +2	0.00082	0.01173	0.90	-0.00013	49.7%	167
Day +3	0.00178	0.01002	2.30**	-0.00007	49.7%	167
Day +4	0.00064	0.00836	0.99	-0.00011	49.1%	167
	1988-1996					
	Coefficient	Std –Deviation	T-Statistic	Median	Positive Ret (% # obsv)	# of Observ.
Day –4	0.00055	0.00657	0.87	-0.00019	49.1%	108
Day –3	0.00077	0.00566	1.42	0.00061	57.4%	108
Day –2	-0.00004	0.00692	-0.06	0.00003	50.0%	108
Day –1	0.00150	0.00628	2.48**	0.00074	55.6%	108
Day +1	-0.00115	0.01042	-1.15	-0.00095	40.2%	107
Day +2	0.00013	0.01116	0.12	-0.00041	44.4%	108
Day +3	0.00119	0.00854	1.45	-0.00029	48.1%	108
Day +4	-0.00029	0.00605	-0.49	-0.00051	45.4%	108
	1997-2001					
	Coefficient	Std –Deviation	T-Statistic	Median	Positive Ret (% # obsv)	# of Observ.
Day -4	-0.00096	0.01532	-0.48	0.00044	53.4%	58
Day -3	0.00282	0.01557	1.38	0.00248	56.9%	58
Day -2	-0.00185	0.00867	-1.62	-0.00040	46.6%	58
Day -1	0.00076	0.01087	0.53	0.00303	62.1%	58
Day +1	0.00244	0.01687	1.11	0.00115	54.2%	59
Day +2	0.00209	0.01271	1.26	0.00327	59.3%	59
Day +3	0.00287	0.01229	1.79*	0.00199	52.5%	59
Day +4	0.00234	0.01133	1.58	0.00117	55.9%	59

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