Instituto Superior de Ciências do Trabalho e da Empresa – Instituto Universitário de Lisboa

TESTING INFORMATION EFFICIENCY IN THE PORTUGUESE STOCK MARKET

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Ao meu Irmão

Ao meu Pai

À mulher da minha vida

Abstract

This study attempts to discuss information efficiency based on empirical evidence about the Portuguese stock market. We examine the abnormal returns surrounding earnings announcements for all available data on I/B/E/S for the Portuguese stock market and conclude that the evidence partly support the previous studies. Furthermore, our results show persistence of the abnormal returns in the pre-event window and on day zero (*i.e.* one trading day before the announcement was made public), two anomalies that were previously documented. This fact lead us to argue that the Portuguese stock market is not informational efficient.

In addition, our findings about forecast bias suggest to some extent the existence of forecast optimism in Portuguese stock market for Earnings Per Share (EPS), Dividend Per Share (DPS) and Cash Flow Per Share (CPS). Our study points out that the forecast optimism is limited when one proceed to the correction of a currency code bias (CCB) present in I/B/E/S. Since this CCB could significantly influence the results we suggest that studies about European countries that adopted the Euro must account for this issue. In this work, we also compare some of the most known available financial databases to analyze the daily trading volume of the listed firms on Euronext Lisbon and we present the limitations of the available data. According to our conclusions there are a small number of thinly traded stocks considering all available data about these firms.

Keywords: Market Efficiency, Event Studies, Earnings Announcements, Abnormal Returns, Thin Trading, Forecast Optimism, Efficient Market Theory, Behavioral Finance, Corporate Finance.

JEL: G14, G12

Resumo

Este estudo pretende discutir a eficiência informacional baseando-se em evidência empírica para o mercado accionista português. Neste trabalho analisamos as rendibilidades anormais em torno dos anúncios de resultados para a totalidade de dados existentes na I/B/E/S relativamente a este mercado e corroboramos parcialmente a literatura existente. De acordo com os resultados obtidos verificamos a persistência de rendibilidades anormais na janela anterior ao evento e no dia 0 (*i.e.* na sessão de bolsa anterior ao anúncio ser efectuado), duas anomalias previamente documentadas. Estes factos permitem-nos afirmar que o mercado accionista português não é eficiente em termos informacionais.

Adicionalmente, os resultados obtidos sobre o enviesamento das previsões dos analistas financeiros sugerem uma evidência parcial de que o mercado accionista português apresenta um efeito de optimismo nas previsões dos analistas relativamente aos Earnings Per Share (EPS), Dividend Per Share (DPS) e Cash Flow Per Share (CPS). O nosso estudo demonstra que este optimismo nas previsões é influenciado pela correcção do enviesamento do código cambial (ECC) existente na I/B/E/S. Dado que o ECC pode influenciar significativamente os resultados consideramos que estudos sobre países europeus que adoptaram o euro devem ter em conta esta limitação. Neste trabalho, comparamos ainda algumas das mais conhecidas bases de dados financeiras na análise do volume diário de transacções para as empresas cotadas actualmente na Euronext Lisbon e documentamos as principais limitações. Segundo a nossa análise existe um pequeno número de empresas que não são frequentemente transaccionadas, considerando todos os dados existentes para as referidas empresas.

Palavras-chave: Eficiência de Mercado, Estudo de Eventos, Anúncios de resultados, Rendibilidades Anormais, *Thin Trading*, Optimismo de Previsões, Teoria da Eficiência do Mercado, Finanças Comportamentais, *Corporate Finance*.

JEL: G14, G12

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Any omissions and errors, inevitably present in this work, are the responsibility of the author.

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Abbreviations

AR - Abnormal Returns

AAR - Average Abnormal Returns

CPS - Cash Flow Per Share

CMVM - *Comissão de Mercado de Valores Mobiliários*

CAR - Cumulative Abnormal Returns

CAAR – Cumulative Average Abnormal Returns

CCB - Currency Code Bias

DPS - Dividends Per Share

EPS - Earnings Per Share

EMH - Efficient Market Hypothesis

EUR - Euro

I/B/E/S - Institutional Brokers Estimate System

JEL - Journal of Economic Literature

OLS - Ordinary Least Squares

PTE - Portuguese Escudo

RePEc - Research Paper in Economics

Abbreviations of papers cited

BOP - Bartholdy, Olson and Peare (2007)

DMS - Diether, Malloy and Scherbina (2002)

DRS - Dombrow, Rodriguez and Sirmans (2000)

FFJR - Fama, Fisher, Jensen and Roll (1969)

Commonly used Notations

$\boldsymbol{R_{it}}$ - Return of *i*-th stock for period t.

$\boldsymbol{R_{mt}}$ - Market return for period t.

$\overline{\boldsymbol{R}}_{\boldsymbol{m}}$ - Mean market return over the estimation window.

$\overline{\boldsymbol{R}}_{\boldsymbol{i}}$ - Arithmetic mean of the *i*-th stock's return over the estimation window.

$\boldsymbol{E}(\boldsymbol{R_{it}})$ - Expected or normal return of *i*-th stock on day t.

α_i - Intercept term.

β_i - Regression coefficient for the market return variable.

ε_{it} - Error term or regression residual.

$\hat{\alpha}_i$ and $\hat{\beta}_i$ - Estimated regressions coefficients of the market model.

$\sigma^2_{\varepsilon_i}$ - Variance of the *i*-th stock regression residuals.

$\sigma^2(\boldsymbol{AR_{it}})$ - Conditional variance of $\boldsymbol{AR_{it}}$.

$\boldsymbol{Var}(\boldsymbol{R_m})$ - Variance of the market return over estimation window.

$\boldsymbol{L}$ - Length of the estimation window.

$\boldsymbol{AR_{it}}$ - Abnormal return (AR) of *i*-th stock on day t.

$\boldsymbol{AAR_t}$ - Average abnormal return (AAR) on day t.

$\boldsymbol{Var}(\boldsymbol{AAR_t})$ - Asymptotically variance of the $\boldsymbol{AAR_t}$.

$\boldsymbol{CAR_i}(\boldsymbol{t_1},\boldsymbol{t_2})$ - Cumulative AR of the *i*-th stock between period $\boldsymbol{t_1}$ and $\boldsymbol{t_2}$.

$\sigma^2_i(\boldsymbol{t_1},\boldsymbol{t_2})$ - Asymptotically variance of $\boldsymbol{CAR_i}(\boldsymbol{t_1},\boldsymbol{t_2})$.

$\boldsymbol{CAAR}(\boldsymbol{t_1},\boldsymbol{t_2})$ - Cumulative AAR between period $\boldsymbol{t_1}$ and $\boldsymbol{t_2}$.

$\boldsymbol{Var}(\boldsymbol{CAAR}(\boldsymbol{t_1},\boldsymbol{t_2})$ - Asymptotically variance of the $\boldsymbol{CAAR}(\boldsymbol{t_1},\boldsymbol{t_2})$.

$\boldsymbol{FE_{it}}$ - Forecast error (FE) of variable in analysis on an annual basis.

$\boldsymbol{disp_{it}}$ - Dispersion of forecasts between the analysts.

β_o - Intercept term of the forecast error regression.

β_1 - Regression coefficient for the dispersion of forecasts variable.

"Yes, (…) you can occasionally find markets that are ridiculously inefficient – or at least you can find them anywhere except at the finance departments of some leading business schools".

Warren Buffett, Berkshire Hathaway 2007 Shareholders' Letter, 2008, p. 17.

1 Introduction

A central theme in the finance and economic theory is market efficiency and, according to financial literature, one of the best available methodologies to analyze this issue is event studies. Brown and Warner (1980: 205), in their first classical paper about this issue, state that event studies "provide a direct test of market efficiency". Thus, the primary intent of this study is to test information efficiency using the conventional methodology of event studies.

This study attempts to determine if the Portuguese stock market (hereafter Portuguese market) is efficient in the semi-strong form, finding evidence that supports the results of previous studies (*e.g.* Isidro (1998), and Duque and Pinto (2004)) for a larger period of analysis, since there is lack of evidence for more than a five year period. Using a sample of all Earnings Per Share (EPS) of listed firms in Euronext Lisbon (*i.e.* the Portuguese market) reported on I/B/E/S we tested the abnormal returns surrounding the earnings announcement date.

In the Portuguese market there is the conception that the market had historical thin trading (*i.e.* stocks with no trading). In Section 4 we pursue a narrower question: is the Portuguese market a thin trading market according to historical available data? We use two financial databases to elaborate this analysis: Datastream and Bloomberg. Finally, in section 7 we examine the analysts' forecasts for three different variables in order to study the rationality of analysts.

The remainder of this thesis is organized as follows. Section 2 presents the review of the current literature about market efficiency and behavioral finance. Section 3 briefly presents event studies and the main papers about market efficiency and event studies produced in the last decade. Section 4 describes the data sample, the statistical and econometric techniques used to study the data, and also discusses the thin trading in the Portuguese market. Section 5 and 6 lay out the findings and examine their implications and limitations. Section 7 analyzes the evidence for analysts' forecasts. Finally, section 8 concludes.

2 Efficient Markets and Behavioral Finance

2.1 Efficient Market Hypothesis (EMH)

The Efficient Market Hypothesis (hereafter EMH) is a widely accepted paradigm and has become part of financial and economic mainstream since at least the late 1950's. As Jensen (1978) points out in the financial field this concept is under the category of the "theory of random walks" and "rational expectations theory" in the economic field. Although the concept is generally attributed to Fama (1970) the creator of the concept was Harry Roberts. At least in the late 1950s[1] Roberts (1959) has implicit references to these concepts in his paper, although not defining the forms of efficiency.

When Roberts (1959: 1) states that "In extreme form such theories maintain that only the patterns of the past need to be studied, since the effect of everything else is reflected "on the tape" (…)" he clearly refers to a weak-form of EMH. Additionally Roberts (1959) made reference to the knowledge and skills of financial analysts, the statistical knowledge and the others skills of obtaining information about a stock, which is related to the concept of strong form of EMH and pointed out the importance of private information.

In general terms Roberts (1959: 7) presents market efficiency stating that "If the stock market behaved like a mechanically imperfect roulette wheel, people would notice the imperfect roulette wheel, people would notice the imperfections and by acting on them, remove them".

[1] LeRoy (1989) and Shiller (1999), among others, stated that the three forms of market efficient were presented by Harry Roberts (1967) in "Statistical Versus Clinical Prediction of the Stock Market", an unpublished document presented in a seminar.

In the late 1960s, Ball and Brown (1968) and Fama, Fisher, Jensen and Roll (1969) (hereafter FFJR) developed the event study methodology more commonly used in financial literature and their results advocated the existence of information efficiency in the stock market[2].

After that, Fama (1970) in an influential survey paper systematizes the three forms of market efficiency, stating that the market is efficient considering information set θ_t, if it is impossible to obtain economic profits on trades based on information set θ_t, assuming that economic profits are risk adjusted returns minus all the costs.

In the mid-1970s Rubinstein (1975: 812) defined three types of efficiency related to securities markets:

a) Exchange efficiency: The market is exchange efficient if "(…) participants are not motivated to create exchange arrangements not already provided by the market."

b) Production efficiency: Production efficiency occurs when "(…) value-maximizing firms make Pareto optimal production decisions."

c) Information efficiency: The market is efficiency in an informational sense if current security prices are costless known by market participants "(…) and information about future security prices is "fully reflected" in these present prices."

That paper made several interesting points, such as the ambiguity of the concept of market efficiency under nontrivial context, the potential coexistence of

[2] Ball and Brown (1968) find an anticipation effect where most of information within the annual reports is anticipated (i.e. known) by the market before the earnings announcement. The authors argue that market is efficient based on the fact that efficiency is determined by the quality of sources.

market efficiency with non-optimal behavior (*i.e.* non-optimal speculative trading) and the use of "highly specialized and unrealistic models of equilibrium" (Rubinstein (1975: 821)).

Jensen (1978) also mentions flaws related to the previous definition of market efficiency, namely a special mention to the fact that information publicly available at time "t" could be different from all information publicly available in that exact date[3].

Fewer years later Beaver (1981: 23) argues that market efficiency problem "(…) is not simply that concepts are difficult to test empirically, a pervasive phenomenon not unique to the efficient market literature, rather, the problem is that, at a conceptual level, prior to empirical testing, it is unclear what is meant by the term market efficiency." LeRoy (1989) and Beaver (1981), among other researchers, criticize the "fair game" model of Fama (1970) showing that it is tautological[4].

In order to remove this implicit ambiguity in the term "information set" Beaver (1981: 28) introduced two new concepts of efficiency:

a) Signal efficiency (y-efficiency): "A securities market is efficient with respect to a signal $\tilde{y}_t$ if and only if the configuration of security prices $\{ P_{jt} \}$ is the same as it would be in an otherwise identical economy (*i.e.* with an identical configuration of preferences and endowments) except that every individual receives $\tilde{y}_t$ as well as y_{it}".

[3] Jensen (1978) also noticed that mainstream financial researchers show reluctance to discard the notion of semi-strong market efficiency even if the empirical results are inconsistent with the concept.

[4] For more details about the debate involving this issue, see also LeRoy (1976) and Fama (1976).

b) Information system efficiency (η-efficiency): "A securities market is efficient with respect to $\eta_t^{\hat{}}$, if and only if y-efficiency holds for every signal ($\boldsymbol{y}_t^{\hat{}}$) from $\eta_t^{\hat{}}$".

So in general terms, it can be stated that Beaver (1981), in line with the above comment of Jensen (1978), presents a detailed distinction of market efficiency between two information sets: with and without universal access to an information system of interest. The author also presents a new notion of efficiency with respect to an information set, claiming the existence of efficiency when prices act as if everyone knows that specific information set. However, half year early Grossman and Stiglitz (1980) present a paper that contested information efficiency and try to redefine it.

The authors suggested that costless information is not just sufficient, but necessary for "(…) prices "fully reflect" available information (…)" (Fama (1970: 384)). Thus, Grossman and Stiglitz (1980: 404) point out that the notion of EMH is a *reducto ad absurdum*, "(…) since price systems and competitive markets are important only when information is costly (…)." This fact is known in literature as the paradox of market informational efficiency.

In a sequel of the first paper about the EMH, Fama (1991) mentioned that despite the limitations to infer about market efficiency, especially the joint-hyphotesis problem, the empirical research about EMH is still an interesting field. Furthermore, this issue significantly influences market agents and generates a new financial landscape.

In the late 1990s, Fama (1998) discusses market efficiency and Behavioral Finance and discards the notion of market inefficiency related to long-term returns (probably the most consistent field of Behavioral Finance) mainly by two reasons: (1) overreaction is as frequent as underreaction and (2) long-term returns

anomalies are inconsistent when tested with alternative methodologies. So, as mentioned by Loughran and Ritter (2000), Fama's argumentation focused on data-mining and in accordance to his analysis, since no reliable predictability is proven, informational market efficiency still is a robust paradigm.

2.2 Behavioral Finance

Kahneman and Tversky (1979) in one of the most cited paper ever of Econometrica criticize the expected utility theory and the rational choice paradigm. Although in the mid-1970s they have identified some important heuristics and bias of human behavior under uncertainty[5], this article is by far the major influence in the change of the economic and financial conceptual framework established in the mainstream and in the growing field of Behavioral Finance.

Shefrin (2000: 3) in an influential book defines Behavioral Finance as "the application of psychology to financial behavior – the behavior of practitioners." The author explains that practitioners are all people involved with financial activities, such as portfolio and firm managers, investors, brokers, analysts, traders, advisers, financial planners. These people are susceptible to make mistakes, based on rules of thumb, as well as to be influenced by the financial decision framework. Supported by these two arguments Behavioral Finance literature advocated that bias in judgments (also known as heuristic-driven bias) and framing effects lead to deviations of market prices from fundamentals.

[5] Kahneman and Tversky (1974) identify at least three major bias of human behavior: (1) representativeness, (2) availability and (3) adjustment and anchoring. For detailed analysis of this issue *vide* Kahneman, Slovic and Tversky (1982).

One strong argument against market efficiency, presented by Shiller (1981) and LeRoy and Porter (1981) is the evidence of higher volatility in aggregate stocks price than the predicted by the efficient market theory.

Another issue that remains a puzzle is the equity premium. Written in 1979, only six years later Mehra and Prescott (1985) published their paper "The Equity Premium: A Puzzle" due to the skeptical position of mainstream financial economists. In the last two decades several papers try to explain this anomaly with non-based and based risk explanation, but no individual resolution provides fully satisfactory answers to this puzzle, as presented in Mehra (2003) and Mehra and Prescott (2008a, 2008b).

In the mid-1980s De Bondt and Thaler (1985, 1987) showed indubitable evidence of the overreaction in the stock market. The empirical evidence collected unequivocally showed that abnormal returns can be achieved with strategies that buy past "losers" (*i.e.* stock with poor returns) and sell past "winners" (*i.e.* stock with higher returns) over a 3- to 5-year period. Fama (1991: 1581) denominated this fact as "(…) an aggressive empirical attack on market efficiency (…)" and the "battle" is not over yet.

Another well-known stylized fact in stock markets is the "noise trading" presented by Black (1986). Also known in some literature as "irrational trading", since investors trade based on noise, this seminal work leads to the evidence that noise traders obtain higher expected returns than informed traders and that noise trading could persist in the stock market. In the beginning of the 1990s, is consensual that daily and weekly future returns can be predicted on the basis of past return, thereby the market is inefficient, in this sense[6].

[6] Fama (1991: 1580) states that the work related to noise trading "(…) rejects the old market efficiency-constant expected returns model on a statistical basis".

Moreover, LeRoy (1989: 1616) points out that various researchers on cognitive psychology "(…) have documented systematic biases in the way people use information and make decision." The author also claims that several of "(…) these biases are easy to connect, at least informally, with securities market behavior".

Research by Jegadeesh and Titman (1993, 2001) shows extremely robust evidence about another market anomaly: momentum profits. According to the authors momentum investment strategies that buy (sell) "winners" ("losers") over the previous three to twelve months are profitable. Furthermore, they find robust evidence that these strategies persist over time, using out-of-sample tests[7]. In other words, the results supported the predictability of future returns in stock markets based on past performance.

The existence of bubbles related to asset prices (*i.e.* unexplained asset price movements according to their fundamental value) is another argument against market efficiency[8]. Furthermore, the P/E anomaly (*i.e.* price-earnings ratio anomaly), where, on average, years with low P/E had systematically higher returns than years with high P/E, and the January effect (also known as turn-of-the-year effect), where the average monthly returns of New York Stock Exchange stocks are greater in January, are two anomalies among other findings that are inconsistent with the economics and financial paradigms (*e.g.* Thaler (1987) and Shiller (2000)).

[7] The criticism of data-mining suggested by some literature (see, for example, Fama (1998)) is therefore rejected. These results also suggest that this anomaly did not disappear with its disclosure, contrasting with the standard argument presented by market efficient literature that disclosure of an anomaly leads to a correction of the market and therefore trading strategies based on anomalies are not profitable.

[8] See Shiller (2000) and LeRoy (2004) for detailed discussion about irrational and rational bubbles.

In general, one can state that Behavioral Finance field is conquering more and more space in financial literature. Thaler (1999) suggested that in recent years the field of Behavioral Finance became less controversial with the acknowledgement of the influence of human behavior in stock prices. More recently, this field is gaining ground in economic and financial models and becoming an acceptable paradigm in financial literature. In a recent paper about Behavioral Finance, Kim and Nofsinger (2008: 1) state that "The academic finance community has only recently accepted it as a feasible paradigm to explain how financial market participants make decisions and, in turn, how these decisions affect financial markets".

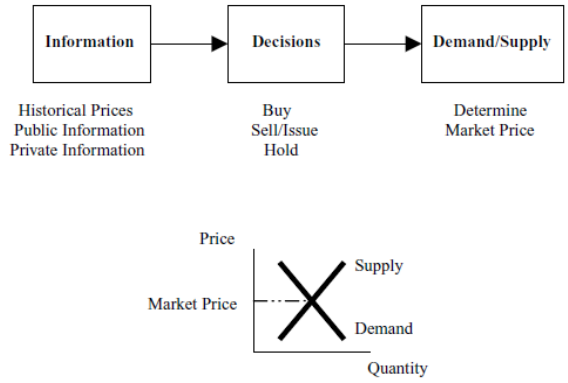
Although it is not our intent to document all anomalies present in the last decades in financial literature, the empirical evidence briefly reviewed in this section allows us to comprehend the growing interest on this field. In line with this trend, there are nowadays several papers and textbooks that provide excellent literature review about this issue (see, for example, De Bondt and Thaler (1995), Shiller (2000), Shleifer (2000), and Barberis and Thaler (2003)).

2.3 EMH and Behavioral Finance - Where do we stand?

Comparing these two paradigms, it can be stated in general terms that Behavioral Finance advocates that market shows historical evidence of anomalies and Traditional Finance, or market efficient literature, despite recognizing these phenomena, rejects the validity of these findings supported by methodological argumentation, *i.e.* criticizes the fragility of the empirical results when subjected to alternative methodologies.

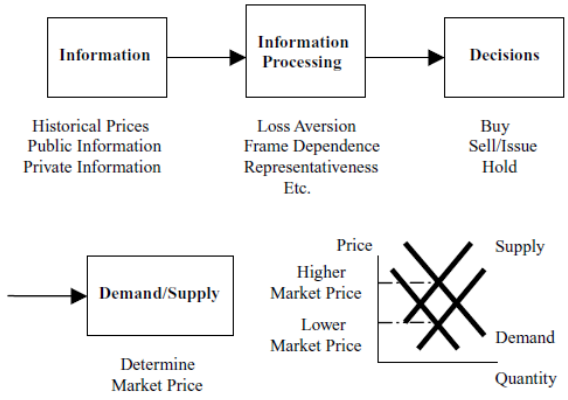
Using the diagrams suggested by Smith (2008) we can differentiate EMH and Behavioral Finance as follows:

Figure 1 - The EMH view



Source: Smith (2008: 51).

Figure 2 - The Behavioral Finance view



Source: Smith (2008: 52).

So the major difference in the two diagrams is the information processing box that reflects factors which can affect decisions and thereby price can fully reflect available information as well as the heuristic-driven bias.

Nowadays the EMH is broadly accepted due to the inability to reject the semi-strong form of market efficiency in the majority of the studies developed. This

fact led to the assumption of market efficiency as a stylized fact. According to Summers (1986), despite this fact some papers presented evidence that asset prices are not related to economic realities, in a rational way. Nevertheless these findings are discarded since they ultimately imply exploration of profit opportunities.

In a paper discussing Behavioral Finance, Thaler (1999) advocates that although behavior of the stock market often deviates from an efficient market, the exploration of these anomalies does not allow to obtain abnormal returns. This could appear contradictory, but it is not. In a clarifying example Thaler (1999: 14) states: "A drunk walking through a field can create a random walk, despite the fact that no one would call his choice of direction rational. Still, if asset prices depended on the path the drunk adopted, it would be a good idea to study how drunks navigate". So one important point is that anomalies are not necessarily equal to profit opportunities, and thereby the same is applicable for evidence of market inefficiency.

Fama (1991: 1575) suggested that "(…) the market efficiency per se is not testable" and therefore it is imperative to have a model of equilibrium. The author also stated that the joint-hypothesis problem does not allow exact inference about the form of market efficiency. Furthermore, in the review of market efficiency and behavioral finance empirical research Fama (1998), as presented before, criticizes the anomalies literature arguing that these evidences are spurious results and that these empirical evidences are fragile. In terms of event studies he criticized that post-event systematic abnormal returns are about as frequent as post-event reversal.

Notwithstanding, recent papers (e.g. Khotari (2001)) made a clear point that the market efficiency could (and should) be tested, although the appropriation of the hypotheses and the tests applied are crucial conditions for a consistent research. In addition, it is also important to notice the existence of a

differentiation within the "inefficient literature". Some authors argue its existence, but suggest that it is not possible to obtain advantage by the creation of trading rules (e.g. Black (1986)). In the order hand, there are researchers that besides stating the existence of inefficiency, also advocate the possibility of significant profit opportunities (e.g. Jegadeesh and Titman (1993, 2001)).

In conclusion, there are two types of literature, one mainstream scientific literature that advocates information efficiency in securities markets (*e.g.* Fama (1991, 1998)) and, in the other hand, a non mainstream literature (at least nowadays) that supports the existence of anomalies and sometimes also the inefficiency (*e.g.* LeRoy (2004)) or the information inefficiency (*e.g.* Kothari (2001)) of securities markets. Of course, there are several approaches to testing market efficiency, but one of the most accepted is event study methodology. We will discuss this issue in the next section.

3 Event Studies

3.1 Event Studies – Publications over the last decade

Over the last decade academics produced several papers (*i.e.* journal articles and working papers) on market efficiency and event studies. With the purpose of obtaining a picture about the number of papers on this specific topic we analyze the number of papers available in Research Paper in Economics (RePEc) database[9] between 1998 and 2008. We chose the JEL (Journal of Economic Literature) code G14 – "Information and Market Efficiency; Event Studies" and correct the available information from replication and undated problems in the papers. Table 1 summarizes these numbers.

Table 1 - Papers about "Information and Market Efficiency; Event Studies" (1998-2008)

Year	Number of papers
1998	54
1999	64
2000	52
2001	88
2002	100
2003	118
2004	196
2005	171
2006	172
2007	173
2008	160
Total	1348

Source: Author's analysis based on RePEc. (http://ideas.repec.org/j/G14.html). Data extract on 01-02-2009.

[9] According to our research this database is the best proxy available to analyze the number of papers on a specific area of research. RePEc has papers from 65 countries, including United States and the majority of European countries, according to the last available update, 6th February 2009. Furthermore major participants in RePEc are top publishers and institutions: Elsevier, Wiley Blackwell, Springer, Federal Reserve System, National Bureau of Economic Research, American Economic Association and many others.

The number of papers about this issue has risen significantly in the last decade, according to RePEc data. The year of 2004 was the year with more papers in this decade, almost 200. The total number of papers reporting market efficiency and event studies is 1348. This number provides an important proxy for the size of the literature in the last decade. According to the table below it is possible to see that this topic is one of the most used within the General Financial Markets in 2008.

Table 2 - Number of papers about General Financial Markets (G1) in 2008 - disaggregation by secondary level of classification

Secondary JEL Classification Code	Number of papers
G10 - General	125
G11 - Portfolio Choice; Investment Decisions	215
G12 - Asset Pricing; Trading volume; Bond Interest Rates	297
G13 - Contingent Pricing; Futures Pricing	96
G14 - Information and Market Efficiency; Event Studies	160
G15 - International Financial Markets	176
G17 - Financial Forecasting	n/a
G18 - Government Policy and Regulation	65
G19 - Other	9

Source: Author's analysis based on RePEc's website. Data extract on 01-02-2009.
n/a – not available.

3.2 Event Studies - Introduction

Event studies are the most disseminated way of analyzing EMH in financial literature. Brown and Warner (1980: 205) define event studies as "(…) a direct test of market efficiency". If there is evidence of systematic "(…) nonzero abnormal security returns (…)" in a specific event the EMH is inconsistent as well as the "(…) hypothesis that security prices adjust quickly to fully reflect new information." More recently, Fama (1991: 1577) classify event studies as "semi-strong-form tests of the adjustment of prices to public announcements". So event studies allow at least the testing of the semi-strong form of market efficiency.

In a review of the research about event studies Binder (1998) mentioned that event studies had mainly two applications: (1) analyze if the market incorporates

the information in the announcements in an efficient way and (2) measure the impact of an event on the returns and ultimately in the wealth of the shareholders.

The event studies attracted considerable interest in the literature namely due to the fact that they allow simple test to informational market efficiency. This trend is reflected on the event study surveys that were developed during the 1990s (e.g. Thompson (1995), MacKinlay (1997), and Binder (1998)). More recently, the survey of Kothari and Warner (2006) present a review of econometric issues related to event study methodology, with special focus to the limitations of long-horizon events studies, and it is an example of the persistent interest of this research field in financial literature.

3.3 Event Studies – Portuguese background

According to the review made about event studies in the Portuguese market the current available evidence advocates that the market is efficient in the semi-strong form. The three previous studies we present here had periods of less than five years, with Isidro (1998) studying the largest period in this review: 4 years and a half, starting nearly in the moment of the creation of the PSI 20 Index.

The findings of Isidro (1998) are completely unexpected since besides the existence of statistically significant abnormal returns on event day (day "0"), the main results also suggested consistent abnormal returns on days -18, -17 and -16 of the event period and also on days -15, -14 and -13. In accordance to the author this anomaly could be explained by a group of practitioners that know the earnings before information has been made public, and as a reaction to this fact a second group probably based on the observation of the first group generated the abnormal returns presented before. In addition, this study also presented empirical evidence of abnormal returns on the post-event period (*i.e.* the days after the event), which may reflect adjustments of the investor' portfolios, according to the

author' explanation. The empirical results obtained from this study are in favor of the semi-strong form of market efficiency in the author's view, since the abnormal return on day "0" and an increase of the abnormal returns' variance shows that the information in the earnings' announcement is not fully known on the event day. Nevertheless, Isidro (1998) also advocates that these results suggest an anticipation effect of earnings.

The second study examined was Wilton (2000) and the main empirical evidence suggested is that trading volume does not show a significant reaction to earnings announcements, although stock prices change significantly for approximately 29% of the observations. In addition, other key fact is the underestimation of the importance of earnings' announcements by the listed firms.

Finally, Duque and Pinto (2004) documented statistically significant abnormal returns for the event day (day "0") for both good and bad news and therefore state that the market is efficient in the semi-strong form. The authors also mentioned that this announcement should occur when the market is closed, so we should expect theoretically that significant abnormal returns happen on day "1". They attributed this fact to two main reasons: (1) the announcement could occur during the session if there is a necessity of quick information transmission and (2) the announcements could be a correction of information already disseminated in the market. Thus, their findings suggest the existence of information asymmetry leading them to propose the possibility of market inefficiency in the semi-strong form. Furthermore, the results also show statistical significant cumulative abnormal returns for good and bad news in the days after the event and abnormal trading volumes until the third day after the event day.

The mainly characteristics of the most recent event studies in Portuguese market presented above are summarized in table 3.

Table 3 - Some background on event studies in Portuguese stock market

Study	Event(s)	Time line of event window	Estimation window	Variables analyzed	Number of stocks	Period of analysis	Model (Stock return model)	Main Results (EMH)
Isidro (1998)	Annual earnings announcements	51 days (-20, +30),	All trading days excluding event windows	- Abnormal returns	51 stocks	January 1993 to June 1997	One factor market model	Semi-strong form of EMH
Wilton (2002)	Annual and quarterly earnings announcements	10 days (-5;+4)	10 days (5 days before and 5 days after the event window)	- Returns - Volume - Number of trades	30 stocks (20 stocks from PSI20 and other 10 stocks)	December 2001 and the first three quarters of 2002	Hypothesis testing	No direct mention to EMH
Duque and Pinto (2004)	"Price Sensitive Events" and "Others Events / Communications"[10]	11 days (-5;+5)	All trading days excluding event windows	- Abnormal returns - Volume	37 stocks	January 2000 to December 2002	One factor market model	Semi-strong form of EMH

Sources: Isidro (1998); Wilton (2002) and Duque and Pinto (2004).

[10] This classification is derived from *CMVM – Comissão de Mercado de Valores Mobiliários* (Portuguese Securities Market Commission). CMVM (2000), Santos (2002) and Duque and Pinto (2004) provides excellent discussion on this issue.

4 Data and methodology procedures

4.1 Data

The sample consists of all available data relative to earnings analysts' forecasts reported on Institutional Brokers Estimate System (I/B/E/S) for Portugal, namely the Earnings Per Share (EPS) series, and the price and volumes series are collected from Bloomberg. The initial sample period of firms' yearly earnings announcements goes from 1990 to 2008, which represents all available data about earnings announcements in the Portuguese market on an annual basis[11].

According to I/B/E/S (1998) the data obtained in the detail file appears on a split adjusted basis. It is also important to notice that we decided to use I/B/E/S Ticker as company identifier because it is unique instead of the others identifiers (such as CUSIPs and company name) that could change over time.

Analysts' forecasts are in two different currencies because before 01/01/99 the forecasts are in Escudos and thereafter in Euros, we convert all the series to Euros at the promulgated fixed exchange rate[12]. However, we detect that the currency code for data from 1998 fiscal year had a misspecification, since forecasts for this fiscal year that are expressed before 1999 had a currency code in Euros, when in reality the forecasts were expressed in Escudos. We proceed to the correction of this currency code bias in the median and mean forecasts series[13].

[11] Even if the majority of the studies about earnings announcements uses quarterly data from I/B/E/S, the scarcity of earnings observations on a quarterly basis for the Portuguese market lead us to analyze the annual data.

[12] The irrevocable conversion exchange rate between the Euro and the Portuguese escudo is 200.482 PTE = 1 EUR. This exchange rate was obtained from the EURO Exchange Rate File from the I/B/E/S data set.

[13] The reference to the currency code bias in this work means a misspecification where the forecasts made on 1998 related to1998 fiscal year are incorrectly classified as Euros, when in reality the database

Since the major intent of this study is to investigate informational market efficiency based on event study methodology we will follow the conventional methodology adopted in the empirical literature about market efficiency, which we present in the next subsection.

4.2 Measurement of abnormal returns

We adopted an announcements categorization in line with the concepts suggested by Christie, Corwin and Harris (2002), also applied in previous Portuguese event studies (Duque and Pinto (2004)), and distinguished three types of "news" (*i.e.* announcements) as follows:

- Bad news: the price change (*i.e.* return) of a specific security i is negative in the event day.

- Good news: the price change (*i.e.* return) of a specific security i is positive in the event day.

- No news: the price does not change and therefore the returns are zero.

We selected daily data as suggested by generally accepted event studies literature (*e.g.* Brown and Warner (1985), Fama (1991), Thompson (1995), MacKinlay (1997), and Khotari and Warner (2006)).

In the 1980s, event studies literature (*e.g.* Brown and Warner (1980, 1985)) recommended the use of market model, or even less complex methodologies, like market adjusted returns model, over more sophisticated methods (such as control portfolio method). In the following decade, other empirical studies (*e.g.* Lee and Varela (1997)) advocated that the market model is superior in specification and power to other types of model applied in event studies. Thus, we selected market model as the primary

gives forecasts in Escudos and actual values in Euros. Detailed evidence about this bias is provided in section 7.

model for this study. Our analysis excluded the use of multifactor models, because of their limitations in testing EMH[14]. Moreover, we selected the ordinary least squares (OLS) estimation of the market model as parametric procedure [15].

The market model for a stock *i* is defined as:

$$\boldsymbol{R}_{it} = \alpha_i + \beta_i \boldsymbol{R}_{mt} + \varepsilon_{it} \qquad (1)$$

Where,

$\boldsymbol{R}_{it}$ - Actual return of *i*-th stock for period t.

$\boldsymbol{R}_{mt}$ - Actual return of market portfolio for period t (*i.e.* market return for period t).

α_i - Intercept term.

β_i - Regression coefficient for the market return variable.

ε_{it} - Error term, with $\boldsymbol{E}(\varepsilon_{it}) = 0$.

Our choice in the calculation of market model were the PSI Geral, a market capitalization weighted price index, for $\boldsymbol{R}_{mt}$, since it represents all stocks listed on Portuguese market.

In general terms, the stock *i*'s abnormal return on day t ($\boldsymbol{AR}_{it}$) is the difference between the stock *i*'s actual return on day t ($\boldsymbol{R}_{it}$) and the stock *i*'s expected or normal return on day *t* ($\boldsymbol{E}(\boldsymbol{R}_{it})$), as follows:

$$\boldsymbol{AR}_{it} = \boldsymbol{R}_{it} - \boldsymbol{E}(\boldsymbol{R}_{it}) \qquad (2)$$

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[14] MacKinlay (1997) mentioned that multifactor models have limited gains over other procedures. More recently, Loughran and Ritter (2000), for example, argue that this type of model test patterns in returns and has no power to test EMH.

[15] The use of OLS has been widely discussed. There are some researchers that advocated alternatives methods (*e.g.* Collins and Dent (1984), Chandra and Balachandran (1992), and Dombrow, Rodriguez and Sirmans (2000) (hereafter DRS)). DRS (2000), for example, suggest Theil's approach, an interesting alternative to OLS, although it implies the exclusion of outliers, which could be relevant. In the other hand, some literature shown empirical results that support the use of OLS or at least that more complex methods have little gains (*e.g.* Malatesta (1986), McDonald (1987), and Lee and Varela (1997)). In the absence of a consensus we will follow the conventional event study methodology (*i.e.* OLS).

More specifically, with the application of the market model:

$$\boldsymbol{AR}_{it} = \boldsymbol{R}_{it} - (\hat{\alpha}_i + \hat{\beta}_i \, \boldsymbol{R}_{mt}) \qquad (3)$$

Where,

$\hat{\alpha}_i$ and $\hat{\beta}_i$ - Estimated regressions coefficients of the market model.

In addition, it is important to notice that $\boldsymbol{AR}_{it}$ is equal to the error term or regression residual (ε_{it}) which captures the unexplained deviation of the stock *i*'s return from the market on day t.

Under the null hypothesis, that the abnormal return is equal to zero, the distribution of the sample abnormal returns of a specific observation is:

$$\boldsymbol{AR}_{it} \sim \boldsymbol{N}(0, \sigma^2(\boldsymbol{AR}_{it})) \qquad (4)$$

With the conditional variance equal to:

$$\sigma^2(\boldsymbol{AR}_{it}) = \sigma^2_{\varepsilon_i} + \left[1 + \frac{1}{\boldsymbol{L}} + \frac{(\boldsymbol{R}_{mt} - \overline{\boldsymbol{R}}_m)^2}{\boldsymbol{L}(\boldsymbol{Var}(\boldsymbol{R}_m))}\right] \qquad (5)$$

Where,

$\sigma^2_{\varepsilon_i}$ - Variance of the *i*-th stock regression residuals.

$\overline{\boldsymbol{R}}_m$ - Mean market return over the estimation window.

$\boldsymbol{L}$ - Length of the estimation window.

$\boldsymbol{Var}(\boldsymbol{R}_m)$ - Variance of the market return over estimation window.

The common procedure adopted after the calculations of abnormal returns are aggregation of this data though a period of time for all stocks with the aim of infer about the event in analysis (*e.g.* Ball and Brown (1968), FFJR (1969), MacKinlay (1997)).

Abnormal returns (AR) are aggregated using the arithmetic mean of the abnormal returns (or average abnormal returns ($\boldsymbol{AAR}_t$)), with N equal to the total number of AR on day t:

$$\boldsymbol{AAR}_t = \frac{1}{\boldsymbol{N}} \sum_{\boldsymbol{i}=1}^{\boldsymbol{N}} \boldsymbol{AR}_{\boldsymbol{it}} \qquad (6)$$

With the asymptotically variance of the $\boldsymbol{AAR}_t$ equal to:

$$\boldsymbol{Var}(\boldsymbol{AAR}_t) = \frac{1}{\boldsymbol{N}^2} \sum_{\boldsymbol{i}=1}^{\boldsymbol{N}} \sigma_{\varepsilon_t}^2 \qquad (7)$$

In this case the event study methodology is designed to test the following hypotheses:

$\boldsymbol{H}_0$ - Mean or average abnormal returns ($\boldsymbol{AAR}_t$) of all events at period t is equal to zero.

$\boldsymbol{H}_1$ - Mean or average abnormal returns ($\boldsymbol{AAR}_t$) of all events at period t is not equal to zero.

After that the cumulative abnormal returns are computed. Considering the null hypothesis the distribution of the *i*-th stock cumulative abnormal returns between period $\boldsymbol{t}_1$ and $\boldsymbol{t}_2$ ($\boldsymbol{CAR}_i(\boldsymbol{t}_1, \boldsymbol{t}_2)$) is given by:

$$\boldsymbol{CAR}_i(\boldsymbol{t}_1, \boldsymbol{t}_2) \sim \boldsymbol{N}(0, \sigma_i^2(\boldsymbol{t}_1, \boldsymbol{t}_2)) \qquad (8)$$

With the asymptotically variance of $\boldsymbol{CAR}_i(\boldsymbol{t}_1, \boldsymbol{t}_2)$ equal to:

$$\sigma_i^2(\boldsymbol{t}_1, \boldsymbol{t}_2)) = (\boldsymbol{t}_2 - \boldsymbol{t}_1 + 1)\sigma_{\varepsilon_i}^2 \qquad (9)$$

Cumulative average abnormal returns (CAAR) are the aggregation of the sample $\boldsymbol{AAR}_t$. So for estimation windows starting at t_1 and ending at t_2 the arithmetic mean will be as follows:

$$\boldsymbol{CAAR}(t_1,t_2)=\sum_{t=t_1}^{t_2}\boldsymbol{AAR}_t \qquad (10)$$

With the asymptotically variance of the $\boldsymbol{CAAR}(t_1,t_2)$ equal to:

$$\boldsymbol{Var}(\boldsymbol{CAAR}(t_1,t_2))=\sum_{t=t_1}^{t_2}\boldsymbol{Var}(\boldsymbol{AAR}_t) \qquad (11)$$

The hypotheses underlying the test are:

$\boldsymbol{H}_0$ - Average daily cumulative abnormal return ($\boldsymbol{CAAR}(t_1,t_2)$) between period t_1 and period t_2 is equal to zero.

$\boldsymbol{H}_1$ - Average daily cumulative abnormal return ($\boldsymbol{CAAR}(t_1,t_2)$) between period t_1 and period t_2 is not equal to zero.

In order to test the hypotheses related to AAR and CAAR assuming large samples, the following statistics should be applied, in accordance with previous event study literature (*e.g.* MacKinlay (1997)):

$$\Theta_1=\frac{\boldsymbol{AAR}_t}{(\mathrm{var}(\boldsymbol{AAR}_t))^{1/2}}\sim \boldsymbol{N}(0,1) \qquad (12)$$

$$\Theta_2=\frac{\boldsymbol{CAAR}(t_1,t_2)}{(\mathrm{var}(\boldsymbol{CAAR}(t_1,t_2)))^{1/2}}\sim \boldsymbol{N}(0,1) \qquad (13)$$

Alternatively, the literature also suggests the application of conventional t-test to study AAR and CAAR, with the estimate variable divided by the square root of variance of this variable, which is divided by the number of observations (N). In this case, we have a student *t*-distribution with N-1 degrees of freedom, as suggested by Collins and Dent (1984) and Lee and Varela (1997).

Since event study evidences are sometimes criticized for the inconsistent of results though alternative methodologies (*e.g.* Fama (1998)), we cross-check our results using mean adjusted model and market adjusted model. According to the definitions presented in Brown and Warner (1985) the mean adjusted model and the market adjusted model are showed in equation 14 and 15, respectively:

$$AR_{it} = R_{it} - \overline{R}_i \qquad (14)$$

Where,

$\overline{R}_i$ - Arithmetic mean of the *i*-th stock's daily return over the estimation window.

$$AR_{it} = R_{it} - R_{mt} \qquad (15)$$

Where,

R_{mt} - Market return for period t (*i.e.* for day t), as presented above.

4.3 Time line of the event study

A convention in event study methodology is that the event time is kept relative to the announcement (*i.e.* event day). Nevertheless, this seems the unique convention, since the literature is not consensual when defining event period (*i.e.* pre-event window, event window and post-event window) and also estimation window, in accordance with table 4. Our choice was 230 days for the estimation window (-250 through -21) and an event period of 41 days (days -20 through +20). The choice of this event period, in line with MacKinlay (1997) and Isidro (1998), is mainly due to the fact that Isidro (1998) found abnormal returns in the first days of the event period. Thus, the application of a shorter event period could be excluding some important evidence for Portuguese market.

Table 4 - Comparison of event period and estimation window employed in event studies literature

Study	Event	Time line of the event study (event period), in days			Estimation window, in days
		Pre-event Window	Event window	Post-event window	
International studies					
Brown and Warner (1985)	Event study simulation	[-5,-1]	[0]	[+1,+5]	[-244;-6]
Klein and Rosenfeld (1987)	Voluntary sell-off	[-30,-2]	[-1,0]	[+1,+30]	[-250;-31]
Thompson (1995)	Several events	-	1 to 5 days	-	1) Period of 250 days before the event day(s), 2) Period between 300 and 200 days prior to the event day(s)
MacKinlay (1997)	Earnings announcements	[-20,-1]	[0]	[+1,+20]	1) [-270;-21], 2)120 days before the event
Lee and Varela (1997)	Event study simulation	[-5,-1]	[0]	[+1,+5]	[-255;-16]
DRS (2000)	Event study simulation	[-10,-1]	[0]	[+1,+10]	[-250;-11]
Portuguese studies					
Isidro (1998)	Earnings announcements	[-20,-1]	[0]	[+1,+30]	All trading days excluding event windows
Wilton (2002)	Earnings announcements	[-5,-1]	[0]	[+1,+4]	[-10,-6] and [+5,+9]
Duque and Pinto (2004)	Several events	[-5,-1]	[0]	[+1,+5]	All trading days excluding event windows

Source: Author´s analysis of the papers presented in this table.

4.4 Thin trading

The thin trading problem is generally discarded in the event study methodology. As point out by Bartholdy, Olson and Peare (2007: 228) (hereafter BOP) "nontrading, and the subsequent problem of missing return observations, is not encountered in most event studies". Although there is literature that suggested that the adjustment for thin trading is practically irrelevant (see, for example, the comments about thin trading of MacKinlay (1997) for further detail), a significant body of literature in finance argues the opposite (*e.g.* Cowan and Sergeant (1996), and BOP (2007)).

In the first paper to analyze the effects of thin trading on event study test statistics using daily volume data Cowan and Sergeant (1996) argue that thin trading may originate poorly specification of the statistical tests. The authors point out that higher presence of zero returns in thinly traded stocks increase the probability of non-normal returns distributions in these stocks. At the conclusion, they report that there is not a clear superior test to analyze the thin trading and the correct application of a test will depend on the conditions of the study and the return distribution.

More recently BOP (2007: 244) analyze the data from the Copenhagen Stock Exchange and some of their main findings are: that in presence of thin trading trade to trade returns are recommended, that there is a restriction on detecting robust abnormal returns if the sample does not include stocks with thickly trading (*i.e.* stocks with high levels of liquidity) and that with the combination of four factors, namely "(…) non-normality, event induced variance, unknown event day, and problems of very thin trading(…)" there is not a superior test statistic.

In the current literature about event studies in the Portuguese market there is scarce reference to this issue[16] and to correction methodology that deals with potentials misspecifications of market model. With this purpose we analyzed the available volume

[16] An exception was Isidro (1998), which carry out an analysis of the most traded stocks.

time series of the 57 constituents of PSI Geral Index. Since PSI Geral Index is a market index of all eligible companies listed on Euronext Lisbon (*i.e.* Portuguese stock market) the use of the 57 constituents allows us to analyze the universe of listed companies and not only a sample.

BOP's research suggested four different techniques for dealing with this issue:

a) Simple returns for consecutive prices: This adjustment is applied by the calculation of the stock's simple returns only for days with successive prices. The second step is to remove the market return for these days and finally compute daily abnormal return.

b) Lumped returns: Since stock exchanges, in general, list the close price of the previous trading session if the stock did not trade, the calculation of daily returns for these non-trading days will be zero returns.

c) Uniform Method (or Uniform returns): This method is based on two steps, first the calculation of aggregated return and the average daily return for each interval between trading days and second the allocation of the average daily return to each day over their specific interval.

d) Trade to trade returns: The first step is to calculate an individual stock's return between the days when transactions actually take place. Then, trade to trade returns for the market index are calculated over the same period as for the stock. These two sets of trade-to-trade returns are used to estimate the market model to obtain abnormal returns for the stock over this period.

This last technique is the best adjustment for thin trading, in accordance to their results. The authors state that although the information about non-trading days is omitted, this disadvantage is more than compensated by the unbiased characteristics of this method. So, in short, simple returns for consecutive prices is not recommended to deal with thin trading; uniform returns and lumped returns have similar performance, although the uniform method as the disadvantage of giving no emphasis on the days in

each interval; and, finally, trade to trade returns appears to be the method with best performance among the others.

According to the definitions suggested by BOP (2007: 230) there are three kinds of trading frequency, in a yearly basis: thick, medium and thin trading. Thick traded stocks are defined as stocks trading "(…) on more than 80% of trading days, or an average of more than four days per week." Medium trading occurs when a stock is traded "on 40% to 80% of all trading days, or about two to four days per week." Thin trading takes place when a stock trade on less than 40% of all trading sessions or, in alternative, less than two trading sessions per week. Following BOP (2007), we will analyze this issue using alternative databases in the next subsection.

4.4.1 Databases analysis

The Portuguese market has several limitations when it comes to obtain data about stock market especially volume data for the first years after its creation. Thus, since there are several databases we will briefly examine their advantages and disadvantages. We chose to use the most known and broadly available databases in Portugal: Datastream and Bloomberg[17]. Our selection criteria are selection of the 57 listed companies in the Portuguese stock exchange (Euronext Lisbon) and starting at the first trading day available for each firm.

4.4.1.1 Datastream

Datastream defines volume as the number of shares traded for a particular stock on a specific day and is expressed in thousands of shares. This data is on a daily basis and is adjusted for capital changes. Datastream also states that the default volumes represented the volumes from the primary stock exchange of the country, which can be different from the "home" stock exchange, except for volumes of US stocks where the

[17] One also briefly examine Reuters 3000 Xtra Hosted Terminal Platform, but since the volume data has the same characteristics of Bloomberg and has the disadvantage of having fewer historical data, further analysis does not provide significant gains. In this analysis it seems importance to notice that all three databases have some differences in volume and price series, especially in data from the 1990s.

data is consolidated across all stock exchanges. Since Portugal nowadays has just one stock exchange (Euronext Lisbon), the volumes are the total volumes for the Portuguese stocks on PSI Geral Index. Nevertheless, it is important to notice that due to the fact that some Spanish listed firms are listed in Euronext Lisbon, the volumes for these firms are from their primary stock exchange (Bolsa de Madrid), in this case. Thus we exclude these stocks from the Datastream' analysis and therefore the databases are not comparable.

This data set ranging from 5th January 1988 to 31st December 2008 is based on the Portuguese stock exchange trading sessions for the 53 listed companies available[18] on this database. Table 5 shows the division of these listed companies[19] by trading activity through time. According to the data the thin trading problem, also known as liquidity problem, seems to be overstated for Portuguese stock market, at least taking into account the Portuguese listed companies at the time of this study. The liquidity is "(…) the matching of buyers and sellers (…)" that is "(…) intertemporal in nature and it is not necessarily linked to price discovery" (O'Hara (2003: 1338)). Although the concept of liquidity allows to define the liquidity problem as the thin trading problem, it seems that sometimes liquidity problem in Portugal is addressed to the fact that some stocks have low levels of trading, which is different from no trades.

Looking into the results obtained by this database the evidence suggests that only a small number of companies experience thin trading. The biggest number of stocks with thin trading occurred in 2003 and 2008 with five stocks showing yearly trading frequency below 40% of the total trading sessions in a year. The majority of the Portuguese stocks were actively traded with the yearly average trading frequency over the last decade ranging between 97% and 99%.

[18] Portuguese stock market has 57 listed companies from which 4 are Spanish listed companies that are also listed in Euronext Lisbon.

[19] Table 5 does not contain 53 listed firms in 2008, as expected, since one of these firms does not have volume data for 2008.

Table 5 - Trading frequency of the actual Portuguese listed companies using Datastream's volume data

Year	Thick trading		Medium trading		Thin trading		Total number of stocks
	Number of stocks	Average trading frequency	Number of stocks	Average trading frequency	Number of stocks	Average trading frequency	
1988	1	100.0%	1	77.0%	1	36.4%	3
1989	3	93.5%	1	66.4%	0	-	4
1990	4	100.0%	0	-	0	-	4
1991	1	96.3%	4	67.1%	0	-	5
1992	3	93.4%	2	69.1%	1	32.9%	6
1993	13	91.3%	6	69.7%	2	20.4%	21
1994	14	92.0%	6	68.2%	3	19.3%	23
1995	16	93.6%	7	57.7%	4	24.4%	27
1996	18	93.3%	5	62.8%	4	23.3%	27
1997	23	97.5%	4	60.1%	2	15.9%	29
1998	30	97.9%	6	67.6%	0	-	36
1999	32	97.1%	6	60.1%	1	23.2%	39
2000	37	98.0%	4	68.3%	1	14.6%	42
2001	35	98.9%	6	55.4%	1	10.1%	42
2002	32	99.0%	7	65.4%	3	27.1%	42
2003	34	97.4%	4	60.6%	5	26.6%	43
2004	33	98.2%	7	64.9%	4	27.8%	44
2005	37	97.3%	4	63.9%	4	26.1%	45
2006	39	97.5%	5	54.0%	2	18.4%	46
2007	40	98.5%	7	65.0%	3	13.0%	50
2008	40	98.8%	7	61.2%	5	20.9%	52

Source: Author's analysis based on Datastream's volume data.

4.4.1.1 Bloomberg

Bloomberg describes volume as the number of shares traded on a security at a specific day and is expressed in units. In accordance to Bloomberg's definition if the stock exchange sends the last trade price without a volume, the value will be zero.

The volume data for the constituents of PSI Geral Index starts on 3rd February 1993, exclusively with thirteen stocks[20]: BCP, Cires, Corticeira Amorim, Estoril Sol, Grupo Soares da Costa, Inapa, Jerónimo Martins, Mota Engil, Papelaria Fernandes, Reditus, SOC Comercial Orey Antunes, Sonae and Toyota Caetano Portugal.

This data set ranging from 3rd February 1993 to 31st December 2008 is based on the 57 Portuguese stocks available on Bloomberg's database, considering the dates from the PSI Geral price series as proxy to the trading sessions. So one important difference is that this database allows obtaining the trading volumes for the Spanish listed companies in the Portuguese stock exchange, mentioned before.

The figures shown in table 6, although not comparable, support the findings obtained from Datastream's volume data. The results suggest that only a small number of companies presented thin trading. The year of 2008 was the year with the largest number of thinly traded stocks, seven stocks.

This also supports the conclusion that the majority of the Portuguese stocks were actively traded and that over last decade the yearly average trading frequency of the thickly traded stocks range approximately between 97% and 99%.

[20] First price data available is from Corticeira Amorim at 19th July 1991.

Table 6 - Trading frequency of the actual Portuguese listed companies using Bloomberg's volume data

Year	Thick trading		Medium trading		Thin trading		Total number of stocks
	Number of stocks	Average trading frequency	Number of stocks	Average trading frequency	Number of stocks	Average trading frequency	
1993	0	-	17	60.5%	1	31.5%	18
1994	9	89.1%	9	67.8%	3	15.7%	21
1995	14	94.2%	7	57.4%	4	23.9%	25
1996	17	92.4%	4	61.9%	4	22.6%	25
1997	22	98.1%	4	60.0%	2	15.9%	28
1998	27	97.9%	6	67.2%	0	-	33
1999	30	98.0%	6	62.0%	0	-	36
2000	38	98.1%	3	64.5%	0	-	41
2001	36	98.5%	7	57.6%	0	-	43
2002	32	99.1%	9	65.3%	2	36.4%	43
2003	35	97.6%	4	60.0%	4	32.0%	43
2004	33	98.3%	9	62.8%	3	36.0%	45
2005	38	97.4%	5	62.9%	4	31.3%	47
2006	42	97.6%	5	54.0%	3	26.2%	50
2007	44	98.5%	7	65.0%	3	27.6%	54
2008	43	98.7%	7	61.2%	7	25.2%	57

Source: Author's analysis based on Bloomberg's volume data.

4.4.1.2 Limitations of the available data

According to these two databases we find that Datastream has the advantage of longer time series with series at least from the creation of the PSI Geral in 5th January 1988. On the other hand, although Bloomberg volume series' only start in 3rd February 1993 they are more accurate since they are expressed in units instead of thousands.

One important limitation of these data sets is the fact that these series can be affected by trading suspension. For example in 03/28/06 the VAA – Vista Alegre Atlantis, a Portuguese listed company, went into a trading suspension that lasted until 04/08/06. This fact was considered as a period of non-trading days, which is correct, but since these days are actually days on which stocks cannot be traded they should not be in the sample. As far as we can determine, previous studies in the Portuguese market do not focus on this issue. Although this limitation can be identified, the lack of available Portuguese data about trading suspension as well as the lack of organized data about this issue, at least to the broadly available databases[21], restricts significantly a consistent correction of this trading suspension bias. Due to this fact and to the fact that thinly traded stocks are in small number, our study will not consider the recommended trade to trade adjustment methodology to correct thin trading problems[22]. Instead we adopted the simpler procedure of lumped returns adjustment which performs almost equally well as trade to trade adjustment (BOP (2007)).

[21] The use of alternative sources is documented to the Portuguese stock market. See Duque and Fazenda (2002) for detailed analysis.

[22] Moreover, our final sample just has four thinly traded stocks each one with three or fewer events. Thus are expected small benefits from the application of this methodology.

5 Results

Selecting all available information for the Portuguese market on EPS in I/B/E/S at 7th April 2009 we identified 670 event observations[23]. According to our analysis there are 366 events related to listed companies. We establish that each stock, connected to an event, should have a minimum time series of 271 days window in order to collect sufficient data to perform the tests, in line with the idea presented in experimental design of DRS (2000). In other words, we need to guarantee the existence of returns to the estimation window (from -250 day to -21 day) and to the time line of event study (days -20 through +20). In addition, we exclude events where there existed overlapping returns, in order to eliminate clustering problems. The sample has 159 events: 70 are bad news, 62 are good news and 27 are no news. Thus, the number of event seems acceptable in size and power of statistical and econometric methods, according with BOP (2007)[24]. Nevertheless, due to the small number of events related to no news and the relative irrelevance of these results to infer about informational market efficiency we decided not to comment or analyze these events in the following analysis. After the application of these selection criteria our final sample extends from 1995 through 2008 and has 34 listed firms.

Since the samples of bad news and good news do not have a larger number of events it seems to us appropriate to apply the conventional t-test, normally applied with OLS. The results present in table 7 are consistent with previous studies for Portuguese market (Isidro (1998) and Duque and Pinto (2004)) and also with previous financial literature about earnings (see, for example, MacKinlay (1997)), with the existence of an average abnormal return (AAR) on event day (day 0).

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[23] Our initial sample had 8265 observations, with monthly revisions of the estimates. We choose to use the last monthly revision of the estimates for each announcement and exclude the actual values that are not meaningful and not available. This data was used to obtain the announcement dates.

[24] As pointed out by MacKinlay (1997) a small sample can implicate a bias in the results. Nevertheless, in a recent study, BOP (2007) argue that a minimum of 25 events allows satisfactory application of event study methodology in a small stock market. Moreover, Warner and Brown (1985) mentioned that small samples (with five and twenty stocks) do not show misspecification of test statistics. Notwithstanding the kurtosis and skewness are larger than for sample with more stocks.

Table 7 - Results of AAR and CAAR of EPS announcements – Bad and Good News

	Bad News				Good News			
Event day	AAR_t	Test t_1	$CAAR_t$	Test t_2	AAR_t	Test t_1	$CAAR_t$	Test t_2
-20	0.33%	1.5211	0.33%	1.5211	-0.09%	-0.5331	-0.09%	-0.5331
-19	0.33%	1.4656	0.66%	2.9965*	0.42%	1.1248	0.33%	1.1605
-18	0.09%	0.4585	0.75%	3.5219*	-0.04%	-0.2275	0.29%	1.1083
-17	0.15%	0.9881	0.90%	4.5186*	-0.21%	-1.2762	0.08%	0.3232
-16	-0.19%	-1.2500	0.72%	3.7404*	-0.06%	-0.1996	0.02%	0.0907
-15	-0.12%	-0.6627	0.60%	3.1506*	-0.33%	-1.7867	-0.30%	-1.2696
-14	-0.56%	-3.0580*	0.04%	0.2187	0.22%	0.9675	-0.08%	-0.3506
-13	-0.10%	-0.6308	-0.06%	-0.3325	0.40%	1.3503	0.32%	1.2858
-12	0.31%	1.5789	0.24%	1.2932	0.24%	1.1956	0.55%	2.3020**
-11	0.32%	1.4871	0.56%	2.9514*	-0.03%	-0.1452	0.52%	2.1873**
-10	-0.37%	-1.7196	0.19%	0.9776	0.06%	0.3232	0.58%	2.4842**
-9	0.28%	1.4241	0.47%	2.4073**	-0.09%	-0.3530	0.49%	2.0778**
-8	0.05%	0.3438	0.51%	2.7016*	-0.12%	-0.4275	0.37%	1.5243
-7	-0.14%	-0.7914	0.38%	2.0025**	0.15%	1.0347	0.51%	2.1891**
-6	0.21%	1.0791	0.59%	3.0959*	0.10%	0.4981	0.61%	2.6286*
-5	0.09%	0.5387	0.67%	3.5861*	-0.24%	-1.4602	0.37%	1.6318
-4	0.06%	0.3054	0.73%	3.8976*	0.09%	0.4943	0.47%	2.0632**
-3	0.11%	0.6752	0.84%	4.5122*	-0.34%	-1.2850	0.13%	0.5575
-2	0.08%	0.4271	0.93%	4.9498*	0.09%	0.2463	0.21%	0.9010
-1	-0.11%	-0.5280	0.82%	4.3653*	-0.07%	-0.2256	0.14%	0.5975
0	-1.35%	-5.9023*	-0.53%	-2.7303*	1.20%	6.5387*	1.34%	5.5917*
1	0.00%	-0.0019	-0.53%	-2.6992*	-0.27%	-1.0835	1.07%	4.4706*
2	0.05%	0.3846	-0.48%	-2.4977**	-0.17%	-0.4502	0.91%	3.6663*
3	0.02%	0.1076	-0.46%	-2.3918**	0.10%	0.4533	1.01%	4.0980*
4	-0.02%	-0.1032	-0.48%	-2.4944**	0.01%	0.0499	1.02%	4.1472*
5	0.12%	0.7172	-0.36%	-1.8757	-0.32%	-1.4593	0.70%	2.8581*
6	-0.01%	-0.0740	-0.37%	-1.9496	-0.07%	-0.2979	0.64%	2.5971**
7	0.27%	1.1577	-0.10%	-0.5232	-0.40%	-1.5987	0.23%	0.9584
8	-0.19%	-1.1049	-0.29%	-1.5263	-0.21%	-0.5483	0.03%	0.1184
9	-0.07%	-0.3509	-0.36%	-1.8721	0.12%	0.4906	0.15%	0.5807
10	-0.05%	-0.2895	-0.41%	-2.1471**	-0.01%	-0.0527	0.14%	0.5496
11	0.20%	1.2096	-0.21%	-1.1185	-0.01%	-0.0454	0.13%	0.5072
12	0.12%	0.5206	-0.09%	-0.4752	0.12%	0.4789	0.25%	1.0097
13	-0.34%	-2.0923**	-0.43%	-2.2692**	0.08%	0.5185	0.33%	1.3556
14	0.20%	0.9223	-0.24%	-1.2320	0.24%	1.0692	0.58%	2.3516**
15	0.11%	0.4252	-0.13%	-0.6626	-0.04%	-0.1792	0.54%	2.1918**
16	0.42%	0.9071	0.29%	1.4032	0.09%	0.4884	0.62%	2.5648**
17	-0.04%	-0.2482	0.25%	1.2183	0.25%	1.2089	0.87%	3.5918*
18	0.22%	1.2506	0.47%	2.3118**	-0.35%	-1.8479	0.52%	2.1562**
19	0.21%	1.4326	0.68%	3.3572*	0.24%	0.9866	0.76%	3.1578*
20	0.09%	0.4849	0.77%	3.8230*	-0.16%	-0.7352	0.60%	2.4798**

Source: Author's analysis.

* Parameters statistically significant at the one percent significance level. ** Parameters statistically significant at the five percent significance level.

Our findings suggest an AAR in day 0 of -1.35% for bad news and 1.20% for good news, both statistically significant at the one percent significance level. In other words, the null hypothesis that the AAR in day 0 is equal to zero is strongly rejected for both good and bad news and thus the information contained in earnings has impact on returns. Nevertheless, it is important to notice two important facts: (1) the event day is the date of the announcement of the event which should occur when the trading session is closed and (2) our findings are partial consistent with evidence presented by Isidro

(1998) that within the event period some days presented statistical significant average abnormal returns.

The figures in table 7 provide evidence that on day -14 the AAR is statistical significant at the one percent significance level. Comparing these findings with the results of Isidro (1998) we can state that the anticipation effect detected by her work appears to persist, although there is attenuation over time. As presented before Isidro's findings suggest abnormal returns in days -15, -14 and -13, among others. The author also presented abnormal returns in days +10 and +11 and argued that there are probably adjustments of the investors' portfolio. This hypothesis could be a possible explanation to the statistically significant abnormal return, at the five percent significance level, presented in day +13. We cross-check all the results with the market adjusted model and mean adjusted model and the results remain unchanged.

The examination of the CAAR figures lead us to corroborate the previous findings of Duque and Pinto (2004), with our CAAR statistically significant at least at the five percent in the four to six days following the announcement (*i.e.* day 0) for bad and good news, respectively. Moreover we find statistically significant abnormal returns in other days of the post-event window and in the pre-event window. The CAAR of the bad news has systematic cumulative average abnormal between day -9 and day 4, at least at the five percent significance level. According to table 7 the CAR of the bad news also is statistically significant at one percent level at the beginning of the pre-event window (between day -19 and day -15) and at the ending of the post-event window (between day 19 and day 20). In addition, the CAAR of the good news is statistically significant at the one percent level in days -6, 17 e 19 and presented CAAR statistically significant at least at the five percent level in the middle of the pre-event window and at the ending of the post-event window (between day 14 and day 20).

In accordance with results of Duque and Pinto (2004) our figures also present an AAR equal to zero for bad news on event day 1, which is at least a peculiar fact since theoretically this day is when the market reacts to the announcement. Also in line with this previous study, our findings suggest that the two days following an announcement of good news show negative abnormal returns. These returns although no statistically significant, clearly confirm that this behavior was not due to a bear market, taking into account the period analyzed by those authors[25]. In fact this finding could be related to the disposition effect suggested in the financial literature using daily data (Nofsinger (2001)) and also monthly data (Shefrin and Statman (1985)). This first paper stated that there is a trend to sell on announcements related to good news, but not on bad news and the second one mentioned that there is trend to sell winning stocks too soon and ride losing stocks through long periods. Nevertheless, a detailed analysis of the number of transactions and capital gains and losses is needed to obtain consistent findings about this effect.

In conclusion, we can question: is it possible to create a trading rule to explore the opportunity in the post-event window? We think not. Is the market inefficient according to our findings? Considering that our methodology is designed to test information market efficiency, we just can state that the Portuguese market is not information efficient in respect to earnings. Thus, as suggested by Kothari (2001) to correctly test inefficiency one would need to have a different experimental design.

[25] According to Duque and Pinto (2004) their sample was collected in a bear market.

6 Limitations of the results

This study tried to identify the existence or the absence of market efficiency in a small stock exchange. After the discussion of the results obtained it is important to point out some of the most important limitations connected to event study methodology and to this specific study:

a) Bias: Survival bias or hindsight bias (*i.e.* overstatement of the likelihood of being able to predict an event in advance based on the likelihood of an event after it has occurred), among others.

b) Data aggregation: Another criticism to the event study methodology is that it does not allow developing an accurate valuation of a unique event related to a single firm, since the aggregation is indispensable to perform the analysis.

c) Sample size: Sample size can be an important issue when dealing with event studies. Nevertheless, as stated before previous studies (*e.g.* BOP (2007)) support that our sample size is satisfactory to infer consistent results.

d) Thin trading – There is mixed evidence about the influence of thin trading in event study methodology. Furthermore, the identification of thin trading samples are important, since it could influence or lead to poorly specified test statistic (*e.g.* Cowan and Sergeant (1996)).

e) Model inaccuracy – There is not a consensual model in the event study literature. Despite this fact we try to minimize the influence of the results based on just one model by cross-checking the results with alternative models. In addition the debate about parametric versus non-parametric tests will remain an interesting field of research.

f) Potential statistical problems – Binder (1998: 116) mentioned that event study methodology could appear to be too many statistical problems, but "(…) it should be stressed that they are all "solvable" (…)" and that in several cases "(…) the problems can simply be ignored, because, in practice, they are quite minor".

g) Data limitation and reliability – The use of price and volume series that have a larger horizon can change the results obtained. The data-mining could also be a limitation pointed out to empirical work (*e.g.* Thaler (1999)). In our results this limitation appears to be overwhelmed since our starting point was all available Portuguese data and thus the main criticism which can be made on this issue is the already presented survival bias.

h) Selection criteria- Our methodology was applied in accordance with general acceptance procedures related to event studies literature, although the results could be different with other selection criteria, namely smaller event period and estimation window.

i) The existence of other events in the time line of event window – There are several events that can influence the firms' stock prices. Notwithstanding, their identification is a difficult (and sometimes impossible) task, due to the absence of sources that can provide such information.

j) Benchmark contamination - This issue could be solved with the use of a portfolio of companies that does not contain the companies in the sample, as suggested by Loughran and Ritter (2000). Nevertheless, this seems impractical due to the small number of companies present is the Portuguese market.

7 Bias in analysts' forecasts

The overreaction bias in analysts' earnings forecasts also identified as upward bias is a fact well documented in the financial literature. De Bondt and Thaler (1990), Butler and Lang (1991) and more recently Das, Levine and Sivaramakrishnan (1998), Easterwood and Nutt (1999) and Diether, Malloy and Scherbina (2002) (hereafter DMS) show evidence on this bias.

In order to analyze the upward bias in the Portuguese market we use the regression suggested by DMS (2002)[26]:

$$\boldsymbol{FE}_{it} = \beta_o + \beta_1 \boldsymbol{disp}_{it} + \varepsilon_{it} \qquad (16)$$

$\boldsymbol{FE}_{it}$ - Forecast error (FE) of variable in analysis on an annual basis.

$\boldsymbol{disp}_{it}$ - Dispersion of forecasts between the analysts measure by the standard deviation.

β_o - Intercept term.

β_1 - Regression coefficient for the dispersion of forecasts variable.

ε_{it} - Error term (component of FE which is unexpected), with $\boldsymbol{E}(\varepsilon_{it}) = 0$.

Forecast error (FE) is the difference between the actual value of the variable and the forecasted value. Our analysis includes FE of three variables: Earnings Per Share (EPS), Dividends Per Share (DPS) and Cash Flows Per Share (CPS). The series were extracted from the summary statistics file from the "I/B/E/S Summary History" and we examine all available data, including forecast revisions. According to the data available for company identification file data from all companies in our analysis is in a primary basis, therefore no conversion from diluted to primary basis were made. We choose median values in analysis of security analysts´ forecasts because mean values could be

[26] We use OLS estimation. Although it is possible to develop a sophisticated analysis on this issue, as several papers present in the last years, our aim is solely to identify the existence of this bias, since the lack of evidence for Portuguese market. Moreover, this method has the advantages of being objective and easy to implement.

significantly influenced by extreme observations as pointed out by previous studies (e.g. Butler and Lang (1991), Doukas, Kim and Pantzalis (2002)).

Table 8 reports the number of observations excluded by the application of two criteria: (1) exclusion of date values that are not available or not significant and (2) exclusion of observations where it is not possible to determine the standard deviation and thereby the dispersion of forecasts. After selection criteria were applied, our final samples of EPS, DPS and CPS had 6076, 3678 and 2368 observations, respectively.

Table 8 - Final samples of FE after application of selection criteria

Criteria	EPS series	DPS series	CPS series
Initial sample	8265	6605	6299
Date values that are unavailable or not meaningful	937	2169	3344
Standard deviations unavailable	1252	758	587
Final sample	6076	3678	2368

Source: Author's analysis based on I/B/E/S data.

Examining the results for all data available in I/B/E/S for Portugal, after application of selection criteria, our findings suggest the existence of forecast optimism consistent with financial literature about this issue, but not unequivocal. In particular, the negative intercept (β_o) present in table 9, that allows to identify the forecast optimism, only is statistical significant at the ten percent level for the regression of median FE of EPS and is statistical significant at the five percent level for mean-based results of FE of EPS. This implies that the null hypothesis that intercept is equal to zero would be rejected at the ten percent level and five percent level, respectively.

Our results also suggest that the use of series with CCB could lead to misperceptions, since FE median and mean results with CCB induce us to conclude the existence of forecast optimism at the one percent significance level. Furthermore, the negative regression coefficient for dispersion of analysts' earnings forecasts (β_1)

suggest that, on average, the greater the dispersion of forecasts (***disp***) the greater the FE (*i.e.* the greater the negative value of FE) and thereby the difference between actual value and forecasted value increases, with the forecasted value being higher than the actual value. In other words, there is a positive correlation between forecast optimism and the uncertainty about EPS (measured by the dispersion of forecasts), in accordance with evidence provided by DMS (2000).

According to the correlation coefficients (R^2s) the dispersion of analysts' earnings forecast explains almost the same amount of the FE to the four regressions analyzed. The R^2 of the median FE of EPS regression suggests that approximately 7.6% of the total variation on FE is explained by the variation on the forecasts' dispersion.

Table 9 - Forecast error regressions of Earnings Per Share (EPS)

	FE_{EPS}_Median	FE_{EPS}_Mean	$FE_{EPS(CCB)}$_Median	$FE_{EPS(CCB)}$_Mean
β_o	-0.010209 (0.0655)***	-0.012798 (0.0206)**	-0.035081 (0.0000)*	-0.037669 (0.0000)*
β_1	-0.003147 (0.0000)*	-0.003119 (0.0000)*	-0.003409 (0.0000)*	-0.003382 (0.0000)*
R^2	0.076289	0.075412	0.083838	0.082711
N	6076	6076	6076	6076

Source: Author's analysis based on I/B/E/S data.
P-value is presented in parentheses below the regression coefficients and test whether they differ from zero. *** P-value < 0.1; ** P-value < 0.05; * P-value < 0.01

In sharp contrast with the results presented above in the case of DPS mean and median regressions with CCB R^2s suggested that the variation on the forecasts' dispersion explains respectively 14.1% and 8.9% of the total variation on FE, when in fact the forecasts' dispersion for median and mean regressions corrected from CCB only explains approximately 1.7% and 1.6% of total variation on FE of DPS, respectively. The results to median regression without CCB presented in the table below imply that (1) DPS forecasts exhibit excessive optimism and (2) forecast optimism in DPS has a

positive relationship with uncertainty about DPS, both at the one percent significance level.

Table 10 - Forecast error regressions of Dividends Per Share (DPS)

	FE_{DPS}_Median	FE_{DPS}_Mean	$FE_{DPS(CCB)}$_Median	$FE_{DPS(CCB)}$_Mean
β_o	-0.007712 (0.0008)*	-0.010945 (0.0024)*	-0.007420 (0.0021)*	-0.010653 (0.0035)*
β_1	-0.003223 (0.0000)*	-0.004988 (0.0000)*	-0.010523 (0.0000)*	-0.012287 (0.0000)*
R^2	0.016688	0.016295	0.141297	0.089785
N	3678	3678	3678	3678

Source: Author's analysis based on I/B/E/S data.
P-value is presented in parentheses below the regression coefficients and test whether they differ from zero. *** P-value < 0.1; ** P-value < 0.05; * P-value < 0.01

As the results presented above for DPS, R^2s from the regressions with CCB could lead to excessive values of how much the variation in forecasts' dispersion explains the total variation on FE of CPS. In this case, however, the regressions with CCB present intercepts that are not statistically significant. The evidence reported in table 11 provides similar results to the previous table, namely (1) CPS forecasts show excessive optimism at the five percent level and (2) forecast optimism in CPS has a positive relationship with uncertainty surrounding the DPS at the one percent significance level.

Table 11 - Forecast error regressions of Cash Flows Per Share (CPS)

	FE_{CPS}_Median	FE_{CPS}_Mean	$FE_{CPS(CCB)}$_Median	$FE_{CPS(CCB)}$_Mean
β_o	-0.049711 (0.0146)**	-0.057750 (0.0049)*	0.005717 (0.7565)	-0.002322 (0.9010)
β_1	-0.004825 (0.0000)*	-0.004898 (0.0000)*	-0.008685 (0.0000)*	-0.008759 (0.0000)*
R^2	0.086475	0.087566	0.271891	0.270489
N	2368	2368	2368	2368

Source: Author's analysis based on I/B/E/S data.
P-value is presented in parentheses below the regression coefficients and test whether they differ from zero. *** P-value < 0.1; ** P-value < 0.05; * P-value < 0.01

As presented earlier, there is a relevant difference between the uses of mean or median "consensus forecast" for CPS and EPS, which contrasts with the results from previous studies (*e.g.* Doukas, Kim and Pantzalis (2002)). A possible explanation to this fact is the small number of forecasts for a small stock market like the Portuguese, comparing with other stock markets widely covered by analysts. Since there are fewer analysts and also fewer coverage of analysts for some stocks in the Portuguese market the difference between median and mean could differ significantly.

In conclusion, if the intercept is significantly negative, the literature suggests that the analysts' forecasts are excessively optimistic (e.g. De Bondt and Thaler (1990), DMS (2002)). Our findings suggest that the empirical evidence obtained support financial literature. Accordingly, in light of our results it can be stated that analysts' forecasts overestimate effective earnings at a ten percent significance level. Moreover, we also identify forecast optimism for DPS and CPS, at the one and five percent significance levels, respectively. The forecast optimism has been intensively debated in financial literature and some explanations were suggested to explain this issue, for example De Bondt and Thaler (1990) argue that several analysts are employees of brokerage firms, which have as primary objective to obtain profits from trading and many other economic and behavioral explanations have been provided[27]. Finally, we suggest that the bias induced by the currency code misclassification could lead to significant difference in the results for Portuguese and other countries presented in I/B/E/S that adopted the Euro[28].

[27] For excellent detailed review of this issue see Khotari (2001). The author classifies the explanations in three categories: (1) economic incentives, such as analysts' compensation received from corporate finance divisions of investment-bank firms for helping creating business or affiliated analysts; (2) cognitive-bias explanations, as, for example, analysts' overreaction to information about earnings; and (3) other explanations, namely herd behavior, low earnings predictability and the preference of analysts to restrain the release of unfavorable forecasts.

[28] We select EPS series from Spanish and French stock markets and they presented the same problem.

8 Conclusions

Our primary intent with this study is to examine informational market efficiency in a small stock market, as well as develop an analysis that facilitate and promote the study of the stock market in Portugal. Surely it is not a simple task, due to the limitations presented in terms of data quality for the first years of this market, but with time this problem will be overcame.

Our findings about thin trading related to Portuguese listed firms suggest that thinly traded stocks represent a small percent of the total number of stocks across all period. In this field a promising direction for future research in volume data analysis is the identification and systematization of trading volume data of Portuguese stocks correct from trading suspension bias as well as the measure of this bias to determine if it can significantly influence the volume data results and trading frequency analysis.

We examine the observed earnings abnormal returns for the Portuguese market and conclude that the evidence partly supports the previous studies. We argue the stock market in Portugal is not informational efficient, but we also believe that it is very difficult to create a trading rule and thereby it is exaggerated to assume that the market is not efficient in the weak form. Our findings are of course limited by the adopted methodology and several limitations could be pointed out to the event study methodology. The joint-hypothesis problem is probably one of the most important limitations. Fama (1991: 1576) states that "(…) because of the joint-hypothesis problem, precise inferences about the degree of market efficiency are likely to remain impossible". Furthermore, survival bias could also be an important issue, although some recent studies question it significance (*e.g.* Li and Xu (2002)). As suggested by Thompson (1985: 989) ultimately "(…) it is agreed that all results are reported and the interpretation of conflicting results left to the reader". So we are leaving the final interpretation to the reader.

In our view there are considerable possibilities for further research about event studies. The study of macroeconomic events is surely one of them. The Portuguese market presents some economic events that could be an interesting field for future analysis. For example, on 04/14/2009 the *Banco de Portugal* (Portuguese Central Bank) announced in a conference started at 15 p.m. that the economic growth forecast for 2009 will be -3.5%, the worst value of the last 30 years. At the end of trading day the PSI20 as well as the PSI Geral had a positive variation. Although this fact can suggest in a simplistic view that Portuguese market does not quickly assimilate new relevant macroeconomic information a detailed analysis is necessary for the understanding of this types of events[29]. In this context a study focused in the impact of macroeconomic events on financial markets or the incorporation of economic information by stock market is certainly an interesting issue.

The discussion about market efficiency will probably remain an agnostic debate, while some investors consistently beat the market in long horizons (see, for example, Berkshire Hathaway's Investments), because of cumulative lucky investments in stock market. Is this luck? Probably not. Is there a possibility of further analysis based on new approaches? It surely is. In a recent paper Coval, Hirshleifer and Shumway (2005) study more than 115.500 accounts of a brokerage firm[30]. Although we will not discuss the methods, models or the results of the paper, surely the study of investors (i.e. individual and institutional) in their "natural environment" (i.e. observation of the investors' behaviors with no influence of researchers) is one of the potential field for further investigation.

Based on a regression where dispersion of analysts' forecasts (measured by standard deviations) explains forecast errors we documented some evidence about the

[29] In this field of research the financial literature has presented different findings. McQueen and Roley (1993) and Nofsinger (2001), for example, suggested that stock market reacts quickly to macroeconomic events, at least in the case of large firms. In other hand, some research argue that macroeconomic events do not explain the behavior of stock price (*e.g.* Schwert (1981), French, Ruback and Schwert (1983)).

[30] The authors replicate several of their tests to more than 16.500 accounts that had at least 25 trades during the period of analysis, in order to have a comparable basis of most active traders.

rationality of analysts. Our findings suggest that the empirical evidence obtained support financial literature that states the overestimation of effective earnings by analysts, in our case at a ten percent significance level. Nevertheless, if the analysis omitted the correction to the currency code bias the results will state strong evidence of forecast optimism, with the intercept statistically significant at one percent significance level. In light of our results, we also identify forecast optimism for DPS and CPS, at the one and five percent significance levels, respectively. Furthermore, we find that mean and median-based results appear to be statistically different and therefore inconsistent with the previous studies. We suggest that this fact could be connected to the dimension of Portuguese market and the small number of analysts that cover small stocks.

When investigating forecast optimism or related issues where the use of I/B/E/S data is indispensable our findings suggest the correction of the currency code bias (CCB) present in the forecasts series. This bias is due to the change from local currency to Euro and occurred on the year of the introduction of the Euro. Since this CCB could significantly influence the results, we argue that studies about European countries that adopted the Euro must account for this limitation.

Finally, as suggested by Thaler (1987: 198) the existence of a confirmation bias[31] should lead us to naturally search "disconfirming evidence" (*i.e.* economic and financial anomalies). Notwithstanding, in line with conclusions of Fama (1998) about over- and underreaction, the confirmation bias in efficient market researchers can be as frequent as in behavior finance researchers. Probably this is one of the first anomalies that researchers have to take into account when developing their study. Ultimately the aim of the majority (all seems exaggerated) of the researchers is to thinking outside the box, but are the economics and financial literature really thinking outside the box? Only time will tell.

[31] This bias is defined as the people's natural tendency "to search for confirming rather than disconfirming evidence" (Thaler (1987: 198)).

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