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Does stock trading volume signal future dividends? Evidence from Iberian firms

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Biographical Note

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Abstract

Literature suggests that investors have preference for regular and high dividend payments instead of capital gains. Dividend payments are associated with commitment by the managers, in the sense that, when firms pay dividends, they are maximizing the shareholder's wealth rather than investing in risky projects. It is also known that the market reacts negatively to dividend decreases. Numerous studies provide evidence that dividends and dividend changes may convey information to the market, and so, it is important for investors to be able to predict the evolution of dividends.

In this dissertation, we test for the first time the ability of trading volume to predict dividend changes. In specific, we assess whether there is any relation between stock trading volume and subsequent dividend changes and whether this relation is more pronounced in the presence of short selling constraints.

The analysis was performed using panel data methodology on a sample composed by 103 Portuguese and Spanish listed companies, in the period between 2005-2018.

The results reject the hypothesis that unusually low trading volume can predict unfavorable dividend changes. In fact, we found evidence of a positive and significant relation between dividend changes and unusually high volume, the return of the stocks on the 50-day window period prior to the dividends announcements, turnover, return on assets and book to market ratio. Also, a significant negative relation was found between the dividend changes, volatility and firm size.

Our findings of a positive relation between dividend changes and unusually high volume are important to investors as it enables them to improve their dividend forecasting capabilities.

Keywords: dividend changes, panel data, short selling, trading volume.
JEL-Code: G12; G35

Resumo

A literatura sugere que os investidores têm preferência por pagamentos regulares e altos de dividendos em vez de ganhos de capital. Os pagamentos de dividendos estão associados ao comprometimento dos gerentes, no sentido em que, quando as empresas pagam dividendos, estão a maximizar os ganhos dos acionistas em vez de investir em projetos arriscados. Sabe-se também que o mercado reage negativamente à redução de dividendos. Numerosos estudos fornecem evidências de que os dividendos e as mudanças de dividendos podem transmitir informações ao mercado e, portanto, é importante que os investidores possam prever a evolução dos dividendos.

Nesta dissertação, testamos pela primeira vez a capacidade que o volume de transação tem para prever mudanças no pagamento de dividendos. Especificamente, queremos testar se existe alguma relação entre o volume de transação e subsequentes alterações de dividendos, e se este efeito é mais pronunciado na presença de restrições short-selling.

A análise foi realizada utilizando uma metodologia de dados em painel numa amostra composta por 103 empresas portuguesas e espanholas cotadas, no período entre 2005-2018.

Os resultados rejeitam a hipótese de que um volume de negócios extraordinariamente baixo pode prever mudanças desfavoráveis nos dividendos. De facto, encontrámos evidências de uma relação positiva e significativa entre as alterações de dividendos e o volume extraordinariamente alto, o retorno das ações no período de 50 dias anteriores ao anúncio de dividendos, volume de transação (turnover), retorno sobre ativos e *book to market ratio*. Além disso, as mudanças de dividendos apresentam uma relação negativa e significativa com a volatilidade e o tamanho da empresa.

As nossas descobertas de uma relação positiva entre as mudanças de dividendos e o volume extraordinariamente alto são importantes para os investidores, pois permitem melhorar as suas capacidades de previsão de dividendos.

Palavras-chave: alteração de dividendos, dados em painel, short selling, volume de transação.

Código-JEL: G12; G35

Index

1. Introduction 1
2. Literature Review and Research Hypothesis 3
2.1. Literature Review 3
2.1.1. Dividends 3
2.1.1.1. Trading Volume 6
2.1.2. Short Selling 7
2.2. Research Hypothesis 9
3. Methodology and Data Description 11
3.1. Methodology 11
3.2. Variables 14
3.2.1. Dependent Variable 14
3.2.2. Independent Variables 15
3.3. Sample 19
3.3.1. Data 19
3.3.2. Descriptive Statistics 23
3.3.3. Correlation Matrix 26
4. Results and Discussion 28
5. Conclusions 32
6. Annexes 39
Annex 1 - Results of Hausman Test and Likelihood Ratio for the variable DC 39
Annex 2 - Results of Hausman Test and Likelihood Ratio for the variable DY 40
Annex 3 - Companies present on final sample 41
Annex 4 - Companies Deleted from sample 44
Annex 5 - EViews Results for Eq. 4.2, Pooled OLS, DChange 47
Annex 6 - EViews Results for Eq. 4.2, Pooled OLS, DY 47
Annex 7 - EViews Results for Eq.4.3, Pooled OLS, DChange 48
Annex 8 - EViews Results for Eq. 4.3, Pooled OLS, DY 48
Annex 9 - EViews Results for Eq. 4.2, Fixed Effects, DChange 49
Annex 10 - EViews Results for Eq. 4.2, Fixed Effects, DY 49
Annex 11- EViews Results for Eq. 4.3, Fixed Effects, DChange 50
Annex 12- EViews Results for Eq. 4.3, Fixed Effects, DY 50

Figure Index

Figure 1 - Evolution of Dividend Payments between 2005-2018 21
Figure 2 - Evolution of the Dividend Change between 2005-2018 22
Figure 3 - Evolution of Standard Deviation between 2005-2018 23

Table Index

Table 1 - Variables definition 13
Table 2 - Sample Description 20
Table 3 - Descriptive Statistics of all sample 23
Table 4 - Descriptive Statistics of the divided sample 25
Table 5 - Correlation Matrix 27
Table 6 - Estimation Output for Equation 1 and 2 28

1. Introduction

Miller and Modigliani (1961) proposed that dividends are irrelevant. However, there are numerous studies evidencing that dividends and dividend changes may convey information to the market. Diamond and Verrecchia (1987) suggest that periods of the absence of trade are bad news because they indicate an increased chance of informed traders with negative information who are constrained from selling short. Akbas (2016) provides evidence that stocks experiencing unusually low trading volume over the week prior to earnings announcements have more unfavorable earnings surprises.

In this dissertation, we test if there is any relation between stock trading volume and subsequent dividends changes, and if this relation is more pronounced in the presence of short selling constraints. Additionally, we also use some control variables, like firms' size, profitability measures, volatility, average turnover, and returns to see if they have any explanatory power over the dividend policy of the companies before the announcement of unexpected dividend changes.

In order to do this, we used a sample composed by 103 Portuguese and Spanish listed companies, in the period between 2005-2018. For the purpose of this study, panel data methodology was used.

This study will complement the current literature, in a sense that there are very few studies testing the connection between changes in dividend policies and trading volume. In fact, most studies relate the dividend policies with returns and stock prices, and study the relation after the announcement of the dividends (like Dasilas and Leventis (2011) and Felimban, Floros, and Nguyen (2018)).

Our findings, contrary to what we were expecting, suggest that unusually high volume prior to dividend announcements is positively related with dividend changes. Higher levels of trading seem to predict better upcoming news. We also found evidence of a positive and significant relation between dividend changes and the return of the stocks on the 50-day window period prior to the dividends announcements, turnover, return on assets and book to market ratio. Also, a significant negative relation was found between the dividend changes, volatility and firm size.

The structure of this dissertation is as follows. In the second chapter the literature about the topic is reviewed and the hypothesis under study are described. Since we did not found any literature directly related to our study, the literature review has focus on dividends and its main theories, trading volume, short selling and some relevant studies. The third chapter presents the methodology and the data used in the empirical study. In chapter four, we conduct a detailed analysis of the test results. In the last chapter, we present the main conclusions of our study.

2. Literature Review and Research Hypothesis

This chapter is intended to explain some of the main literature about the topic and the research hypothesis. Considering that dividend announcements convey information to the market, short sellers can acquire private information, and stocks are submitted to short sale constraints, we expect to find unusually low trading volume prior to unfavorable dividend announcements.

Hopefully, this study will contribute to the present dividends literature, since there is a gap regarding the connection between changes in dividend policies and trading volume prior to unexpected changes, and it will allow a better comprehension on whether the transaction volume allows to predict changes in dividends.

2.1. Literature Review

Since, to my knowledge, there is very little literature regarding the topics that will be studied, this literature review is divided into two main subsections. We start by discuss the literature about dividends and the main theories surrounding them, as well as some studies relating dividend changes and trading volume, followed by short selling.

2.1.1. Dividends

The literature regarding dividends has been focused on answering two main questions: 1) Why do companies pay dividends, when in fact, it is very common for investors to be taxed at a higher rate than capital gains?, and, 2) Do the announcements of dividends (initiations, increases or decreases) affect the stock prices?

There are many theories that try to explain why companies pay dividends (or why they do not). The main theories regarding this subject are presented next.

In 1961, Miller and Modigliani proposed the **dividend irrelevance theory**. They demonstrated that, in the presence of a perfect capital market, with no taxes, it does not matter whether the expected returns come back to the shareholders as dividend payments or as share repurchases. Miller and Modigliani (1961) suggested that the dividend payout was irrelevant for a firm's value, and it is expected that the market will not respond to the level of

dividends, independent of them being high, low, or non-existent, and there has been a lot of discussion about the dividend policy since then.

There are some studies that support this theory. For example, in Black and Scholes (1974) study performed in the USA, the authors argue that changes in dividend policies will have no permanent effect on the stock price. Conroy, Eades, and Harris (2000) studied the pricing effects of dividend and earnings announcements in Japan and concluded that current dividend surprises have no material impact on stock prices in Japan.

The **clientele effect** was first suggested by Miller and Modigliani (1961), arguing that, in imperfect markets, the existence of a preference for stocks paying dividends instead of capital gains could lead to a clientele effect, where investors select their portfolio according to their payout policies preferences and the way they are taxed. Elton and Gruber (1970) tested the clientele effect in the USA and provide evidence to support it. They concluded that ex-dividend stock price behavior is related to the tax rate of marginal shareholder and that shareholders in higher tax brackets show a preference for capital gains over dividend income relative to those in lower tax brackets.

Brav, Graham, Harvey, and Michaely (2005) determined that the dividend policy is still conservative, and that companies should not cut dividends except in extreme circumstances. This conservatism also affects nonpayers, that are reluctant to initiate dividends because, when they do it, they must operate in the inflexible dividend-payers' world. Hotchkiss and Lawrence (2007) examined the individual institutions preferences for dividend paying stocks based on the characteristics of stocks held in their portfolio and found that stock price reactions to announcements of dividend increases are in line with the characteristics of the institutions holding the stock.

According to the **bird in hand theory**, "a bird in the hand is worth two in the bush". Gordon (1959) provide support for this theory, suggesting that investors are risk averse and prefer safe and certain dividend payments (bird in hand) than risky future capital gains (two in the bush). The author based this theory on the uncertainty of the market conditions and on the information asymmetry. In these conditions, the dividends are evaluated differently from capital gains, and the higher the dividends payments, the lower is the risk and the investors uncertainty of future cash flows. Dividend payment represent commitment by the managers in maximizing the shareholder's wealth instead of investing the funds into risky projects.

Gordon (1959) stated that the dividend policy influences the value of a share, and that high dividend payments maximize the value of the company. There are more studies that provide support for this theory, like Gordon (1963) and Walter (1963).

Bhattacharya (1979), on the other hand, presented the "bird in hand" fallacy, suggesting that the firms risk affect the level of dividends and not the opposite, he stated that the increases in dividends do not reduce the firm's risk.

The **behavioral finance** models suggest that usually, investors prefer regular and high dividend payments instead of capital gains. Shefrin and Statman (1984), following Thaler and Shefrin (1981) theory of self-control and Kahneman and Tversky (1979) theory of choice under uncertainty, present a framework that explains why investors exhibit preference for dividends. According to the authors, the higher tax payments resulting from the preference for dividends instead of capital gains can be interpreted as a price paid for self-control, segregation and/or regret reduction.

The first empirical study about the **dividend signaling hypothesis**, or information content of dividends, was conducted by Lintner (1956), and he concluded that changes in earnings can impact the dividend policy and that dividends are dependent on past and current earnings.

This hypothesis was further developed by many authors, like Ross (1977) and Bhattacharya (1979), that proposed signaling models based on the **information asymmetry** between the managers and investors. Increases in dividends can reduce the agency costs, making investors more confident about future prospects, and thus, decrease the return volatility. Miller and Rock (1985) and Ambarish, John, and Williams (1987) stated that the dividend payments announcements convey valuable information to the market, it is a way through which managers can transmit inside information to its investors. Unexpected changes in dividends can be viewed as management's expectations about future prospects of the company (Bhattacharya (1979), John and Williams (1985) and Miller and Rock (1985)).

DeAngelo, DeAngelo, and Skinner (1992) also argue that an annual loss is a necessary condition for a firm to reduce dividends.

2.1.1.1. Trading Volume

The changes in trading volume reflects the differences in the traders reactions to announcements, whereas the change in price reflect the change in traders expectations (Beaver (1968), Karpoff (1986), Kim and Verrecchia (1991)).

There are several papers that study the relationship between the impact of dividend policies and the announcement of dividends on stock prices. Regardless, we found some studies that relate the trading volume with dividend decreases (the main variable of this study), as shown next.

Gurgul, Majdosz, and Mestel (2006) conducted a study in the German Stock Market, assessing the market impacts of dividends news measuring abnormal returns, the variability of returns and abnormal trading volume. Regarding the trading volume, Gurgul et al. (2006) found statistically significant positive abnormal volume around the dividend announcement. Gurgul et al. (2006) also suggested that decreases in expected dividend payouts induce investors to negatively revise their expectations, concluding that investors react more strongly to bad news than to good news.

Dasilas and Leventis (2011), in a study performed in the Athens Stock Exchange that investigated the market reaction to cash dividend announcements, found that trading volume moves in the same direction as the dividend change signals, like stock prices. The authors found that the percentage dividend change and the dividend yield reveal significant explanatory power.

Felimban et al. (2018) conducted a study in the Gulf Cooperation Council (GCC) region (Kuwait, Bahrain, Saudi Arabia, Oman, Abu Dhabi, Qatar and the United Arab Emirates), and report significant trading volume reactions, supporting the hypothesis that dividend change announcements have an impact on the trading volume response due to different investors preferences. Felimban et al. (2018) findings confirm that GCC investors are irrational because of herding effect, investors heterogeneous, rumors and noise traders effect, because the investors react regardless the dividend change.

2.1.2. Short Selling

According to the U.S. Securities and Exchanges Commission (SEC) "A short sale is the sale of a security that the seller does not own or that the seller owns but does not deliver. In order to deliver the security to the purchaser, the short seller will borrow the security, typically from a broker-dealer or an institutional investor. The short seller later closes out the position by returning the security to the lender, typically by purchasing equivalent securities on the open market. In general, short selling is utilized to profit from an expected downward price movement, or to hedge the risk of a long position in the same security or in a related security."[1] It is also explained that short selling provides pricing efficiency and market liquidity of the equities markets.

Miller (1977) claims that the presence of short selling constraints inhibits pessimistic traders from short selling without limiting the optimistic traders from buying, which causes the stock prices to rise, due to divergences of opinion. So, short-sale constraints can prevent negative information from being expressed in stock prices (Miller (1977)). Boehme, Danielsen, and Sorescu (2006) tested Miller (1977) theory, by examining the valuation effects of the interaction between differences of opinion and short sale constraints and find robust evidence that the overvaluation of stocks exists only when these two conditions are met simultaneously.

Berkman, Dimitrov, Jain, Koch, and Tice (2009) provide evidence that stocks with high differences of opinion among investors and more binding short-sales constraints earn lower returns around earnings announcements than other stocks, consistent with Miller (1977) theory.

On the other hand, Diamond and Verrecchia (1987) suggest that, although constraints eliminate some informative trades, they do not bias prices upward, they only reduce the speed of price adjustment to private information. Also, in the presence of short selling constraints, periods of absence of trade indicate bad news, because the informed traders are prevented from short selling.

[1]("Securities and Exchange Commission. SEC Concept Release: Short Sales,"), in https://www.sec.gov/rules/concept/34-42037.htm.

In a study conducted in 46 equity markets around the world by Bris, Goetzmann, and Zhu (2007), the authors found evidence that prices incorporate negative information faster in countries where short sales are allowed.

Boehmer, Jones, and Zhang (2008) and Bai and Qin (2015) results indicate that short sellers are important contributors to efficient stock prices, and that short sales restrictions reduce the efficiency of stock markets.

There are some empirical studies that use market capitalization as a proxy for short selling constraints (like Chen, Hong, and Stein (2002), Diether, Malloy, and Scherbina (2002) and Reed (2002)) arguing that the costs of short selling for low capitalized firms are higher. Jacobsen, Potters, Schram, van Winden, and Wit (2000) indicate that short selling constraints cause undervaluation of high capitalized stocks and overvaluation of low capitalized stocks. Since high capitalized stocks are easier to short sell, pessimistic investors can have a higher impact on the share price than optimistic investors. In low capitalized stocks, since investors cannot go short, the optimistic investors will set the price above the median expectation. Hauser and Huber (2012) findings are consistent with Jacobsen et al. (2000), stocks with high (low) capitalization are traded at lower (higher) prices than their fundamental value.

Most studies relate the return premium due to unusually high volume, and the opposite relation has received less attention. Akbas (2016), to fill this research gap, investigates for the first time the association between unusually low trading volume and unfavorable earnings surprises for NYSE, NASQAD and Amex common stocks. Akbas (2016) provides evidence that stocks experiencing unusually low trading volume over the week prior to earnings announcements have more unfavorable earnings surprise, consistent with the arguments of Diamond and Verrecchia (1987). The author also refers that, in the presence of stronger short selling constraints, using as proxies the institutional ownership, company size and exchange-traded options, the results are more pronounced. It is also important to refer that this relation does not exist between high unusual volume shocks and future firm fundamentals.

Yin and Liu (2017) do a similar study using the stock market data of China (China Stock Market & Accounting Research Database), but they also analyze the earnings preannouncements. Consistent with Akbas (2016) results, the unusually low trading volume over the week

prior to earnings announcements signals upcoming negative information about changes in firm fundamentals, but only in the case of stocks without earnings preannouncements.

To my knowledge, there is only one study relating directly short selling volume around dividend announcements, but there are no studies about this topic in Europe. Blau, Fuller, and Van Ness (2011) examined short selling around dividend announcements and ex-dividend dates, using a sample composed by 777 NYSE-listed stocks with a total of 5,090 dividend payments between January 2005 and December 2006. Contrary to their initial expectations, Blau et al. (2011) did not found abnormally high short-selling activity prior to announced dividend decreases, and proposed that short sellers do not have the ability to acquire information before its public dissemination. They only found abnormal short selling around ex-dividend dates.

My study differs from Blau et al. (2011) since the authors did not consider short selling constraints, so they were expecting to find unusually high short selling prior to announced changes in dividends decreases (which they did not found).

2.2. Research Hypothesis

Miller and Modigliani (1961) proposed that dividends are irrelevant. However, there are numerous studies evidencing that dividends and dividend changes may convey information to the market. Diamond and Verrecchia (1987) suggest that periods of the absence of trade are bad news because they indicate an increased chance of informed traders with negative information who are constrained from selling short. Akbas (2016) provides evidence that stocks experiencing unusually low trading volume over the week prior to earnings announcements have more unfavorable earnings surprises.

We want to test if the assumptions of Akbas (2016) can be applied also when talking about dividend surprises instead of earnings surprises.

The research hypothesis proposed are as follows:

Considering that dividend announcements convey information to the market, short sellers can acquire private information, and stocks are submitted to short sale constraints, we expect to find unusually low trading volume prior to unfavorable dividend announcements. If short sellers know that dividends are going to decrease, thus, decreasing the stock price, the expected behavior is to short sell the stocks in order to make a profit. But, if short selling is

too costly, or difficult to do, short sellers stay by the sidelines, and thus, we should expect a decrease in the trading volume prior to the announcement of dividend decreases.

Hypothesis 1: Unusually low trading volume is expected to have a negative impact on dividend changes.

Diamond and Verrecchia (1987), Akbas (2016), Yin and Liu (2017) showed evidence that low volume shocks signal bad news when short sellers are forced to stay by the sidelines due to short-selling constraints.

Lower market capitalization is associated with more stock illiquidity, and so, stronger short selling constraints. Consequently, the effect of unusually low volume should be higher among stocks with lower market capitalization.

Hypothesis 2: The negative relation between unusually low trading volume and dividend changes should be more pronounced in the presence of stronger short selling restrictions.

3. Methodology and Data Description

3.1. Methodology

The aim of this study is to test if unusually low trading volume prior to dividends announcements can predict negative news, and ultimately, if this effect is more pronounced in the presence of stronger short selling constraints, using as a proxy for short selling constraints the market capitalization of the firms. For that purpose, we used a sample of 103 Portuguese and Spanish listed companies over the period of 2005-2018, using panel data methodology. Since some firms have missing years in the sample, our panel is unbalanced.

Panel data, also known as longitudinal data, combines both time series observations and cross-sectional data, and so, it allows to investigate individuals changes through the years.

The panel data methodology has many advantages over the use of cross-sectional data or time series. It allows to increase the number of observations, thus increasing the degrees of freedom, and to reduce the collinearity between the independent variables. This methodology also allows to control individual heterogeneity, due to missing or unobserved variables. Overall, the use of panel data allows to improve the efficiency of the econometric model (Hsiao, 2014).

The general form of the model is given by the following equation:

$$y_{it} = \alpha + \beta_x X'_{it} + c_i + \lambda_t + \mu_{it} \quad (4.1)$$

Where, $y_{i,t}$ is the dependent variable; α is the intercept; $X'_{i,t}$ represents the independent variables; β is the coefficient of the independent variables; c_i is the time constant variable that captures every individual-specific unobservable effects; λ_t captures the time-specific effects and μ_{it} is the idiosyncratic error term, it captures the unobserved effects that change over time.

When dealing with panel data, the most typical used methods are the pooled OLS, the random effects model and the fixed effects model.

The choice between the fixed effects model or the random effects falls on the behavior of c_i and/or λ_t. Regarding these parameters, in the presence of correlation with the independent variables, this estimator is considered a fixed effect. The fixed effects model allows for

correlation between the independent variables and the unobservable effects, whether they are time-specific, individual-specific or both. On the other hand, if there is no correlation between c_i/ λ_t and the independent variables, c_i/ λ_t is considered a random effect (Hsiao (2007); Wooldridge (2015)).

In our analysis, the regression model 1 is represented by equation (4.2), as follows:

$$Dividend\ Changes_{i,t} = \beta_0 + \beta_1 D_{LOW\ i,t} + \beta_2 D_{HIGH\ i,t} + \beta_3 IVOL_{i,t} + \beta_4 Ln_{Size_{i,t}} + \beta_5 Ln_{Turn50_{i,t}} + \beta_6 Return_{5_{i,t}} + \beta_7 Return_{50_{it}} + \beta_8 ROE_{i,t} + \beta_9 ROA_{i,t} + \beta_{10} Ln_{B/M\ i,t} + \mu_{i,t} \quad (4.2)$$

Where i refers to the stock, and t the year. Dividend Changes corresponds to $\Delta DC_{i,t}$ and $\Delta DY_{i,t}$. D_{LOW} and D_{HIGH} are two dummy variables, D_{LOW} is equal to 1 when there is unusually low volume and 0 otherwise and D_{HIGH} is equal to 1 when there is unusually high volume and 0 otherwise. In addition to the D_{LOW} and D_{HIGH} variables, we have added some control variables that can have an impact on dividends. IVOL is the standard deviation of daily returns of the 5 days before the dividend announcement, Ln_Size is the natural logarithm of equity market value, Ln_Turn50 is the natural logarithm of the average turnover of the 50 days before the dividend announcement, Return_5 and Return_50 are the stock returns of the 5/50 days before the dividend announcement, Roe is return on equity, ROA corresponds to return on assets, Ln_B/M is the natural logarithm of the book to market ratio and $\mu_{i,t}$ is the error term. The variables definition can also be seen in Table 1.

Additionally, to test hypothesis 2, another model was estimated. Model 2, represented by equation (4.3), includes all the variables presented in model 1, but incorporates one interactive variable, computed by multiplying the variable D_{LOW} with Ln_Size.

$$Dividend\ Changes_{i,t} = \beta_0 + \beta_1 D_{LOW\ i,t} + \beta_2 D_{HIGH\ i,t} + \beta_3 IVOL_{i,t} + \beta_4 Ln_{Size_{i,t}} + \beta_5 Ln_{Turn50_{i,t}} + \beta_6 Return_{5_{i,t}} + \beta_7 Return_{50_{it}} + \beta_8 ROE_{i,t} + \beta_9 ROA_{i,t} + \beta_{10} Ln_{B/M_{i,t}} + \beta_{11} D_{LOW\ i,t} Ln_{Size_{i,t}} + \mu_{i,t} \quad (4.3)$$

With this model, we intend to observe if, when controlling for the firm size, the relation between D_{LOW} and the Dividend Changes is more pronounced.

Table 1 - Variables definition

Source: Own elaboration

Table 1 presents the definition of all the variables used in the model.

Variable	Definition
Dchange	Dividend change
DY	Dividend Yield change
D_Low	Dummy = 1 when stock has unusually low volume prior to dividend announcements
D_High	Dummy = 1 when stock has unusually high volume prior to dividend announcements
IVOL	Standard deviation of daily returns over the 5-day window period prior to dividend announcements
Ln_Size	Natural logarithm of equity market value
Ln_Turn50	Average turnover over the 50-day window period prior to dividends announcements
Return_5	Return of the 5-day window prior to dividends announcements
Return_50	Return of the 50-day window prior to dividends announcements
ROE	Return on Equity
ROA	Return on Assets
Ln_B/M	Natural logarithm of Book to Market Ratio

In our regression, to see which model was more appropriate for our sample, we performed the Hausman test and the Likelihood ratio. In the Hausman test, under the null hypothesis, that is, when p-value>0.05, random effects is preferred. On the other hand, on the Likelihood ratio, when p-value<0.05, fixed effects is preferred.

The results of Hausman test rejected the null hypothesis, thus rejecting the random effects, and the Likelihood ratio results showed that our sample had period fixed effects, supporting the choice of fixed effects. The results of these tests can be found in Annex 1 and 2.

Relying on the results of the tests, Fixed period effects were used in all of our regression, as well as a robust estimator for the standard errors of the regression coefficient estimators (the Period SUR – PCSE).

In this method, the effect of year each year is "fixed" among the firms. This method includes year dummy variables that control the factors that change each year but are common to all firms.

3.2. Variables

3.2.1. Dependent Variable

The dependent variable is going to be dividend changes, and two different measures were used.

We assume that dividends follow a random walk, and so, the dividend changes are unexpected. One better way to capture the unexpected changes in dividends was to use the analyst's dividend forecasts, but we do not have access to that information, so, we can justify the use of this method with the reluctance of the managers to change the dividend policies unless it is really necessary, as it was previously explained.

Two predominant measures used in the literature are the dividend change, and the dividend yield change. Following Mikhail, Walther, and Willis (2003), Nissim (2003), Grullon, Michaely, Benartzi, and Thaler (2005) and Vieira (2008), we calculate both measures as follows:

The dividend yield change (eq. 4.4) is calculated as the difference between the announced dividend in year t and the prior year dividend, divided by the share price on the announcement day.

$$\Delta DY_{i,t} = \frac{D_{i,t} - D_{i,t-1}}{P_{i,0}} \tag{4.4}$$

The dividend change (eq. 4.5) is the quotient between the dividend variation and the dividend announced in year t-1, as the following expression shows. This expression measures the magnitude of the dividend variation.

$$\Delta DC_{i,t} = \frac{D_{i,t} - D_{i,t-1}}{D_{i,t-1}} \tag{4.5}$$

Where $D_{i,t}$ is the change of dividend per share i for year t; $D_{i,t-1}$ is change of dividend per share i for year t-1, and $P_{i,0}$ is the price of share i in the announcement day.

3.2.2. Independent Variables

In his study, Akbas (2016) and Yin and Liu (2017) used as control variables the firm size, book to market ratio, return_5 and return_50, standard deviation of daily returns, institutional ownership, and average turnover. In our dissertation, except for the institutional ownership, these variables are also used, among others that are usually used when studying changes in dividend policies. All variables are presented next.

- Unusual Volume

Following Gervais, Kaniel, and Mingelgrin (2001), Akbas (2016), and Yin and Liu (2017), the unusual volume was calculated comparing the stock's average daily turnover (total shares traded divided by the number of shares outstanding) over the week (event period [−6,−2]) prior to the dividend announcement date (day 0), and the previous 10 weeks of the stock turnover (reference period, [−61,−12]). The volume was then classified into low (if it is in the bottom 20% of the reference period), normal and high (if it is in the top 20%). This method allows to compare the event period volume with the trading volume history of the stock, and thus, captures the absolute change in its trading volume instead of a relative change (Gervais et al. (2001) and Akbas (2016)).

The unusual volume is used in the form of dummy variables, classified has D_{LOW} or D_{HIGH}, depending on whether the stock has unusually low or high volume. D_{LOW} (D_{HIGH}) is equal to 1 if the stock is classified as a low (high) volume stock in year t, and 0 otherwise. This allows to examine the effects of the unusual volume in a separate way.

In the presence of dividend decreases it is expected that $D_{LOW} = 1$ and $D_{HIGH} = 0$. For this study, the main variable of interest is D_{LOW}.

D_{LOW} is expected to be significant and to have a negative relationship with the dependent variables. Following Akbas (2016), we do not expect D_{HIGH} to have any impact on the dependent variables.

This study also includes several control variables that can have influence in the relation between the dividend changes and the trading volume, which are presented next:

- Size

The firm size is computed as the natural logarithm of equity market value.

Haw and Kim (1991) stated that public investors have less access to information on smaller firms, and thus, smaller firms are associated with more information asymmetry. They found evidence that the dividend increases and decreases have stronger information content for small firms than for large firms. Consequently, when dividends change, the market surprise is greater for smaller firms, and so, a larger reaction by the market is predicted for low cap firms. Vieira (2011) also suggested that the market reaction to dividend change announcements is negatively associated with firm size.

With this in mind, it is expected for smaller firms to be more reluctant to cut dividends, since dividend cuts are seen as a negative signal, and the market reacts more to changes in smaller firms.

Therefore, the size of the companies is expected to have a negative relation with the dependent variables.

- Return_50 and Return_5

The return of the 50 (-61 to -12 days) and 5 (-6 to -2 days) day window prior to dividends announcements. These variables measure the historical stock price performance (return_50) as well as the stock price performance right before the announcement (return_5). Daily stock returns are calculated as follows (eq. 4.6):

$$r_{i,t} = Ln(P_{i,t}) - Ln(P_{i,t-1}) = Ln\left(\frac{P_{i,0}}{P_{i,t-1}}\right) \quad (4.6)$$

Where $r_{i,t}$ is the log return, $P_{i,t}$ is the price of share i on day t, and $P_{i,t-1}$ is the price of share i for day t-1. After, to calculate the return of the 50 (5) days prior to the announcement, we used the "Average" formula of the 50 (5) days window returns.

Usually, dividend increases generate higher returns than dividend decreases. In fact, dividend decreases are associated with negative abnormal returns. Altiok-Yilmaz and Akben-Selcuk (2010) examined the market reaction to announcements of dividend change on the Istanbul Stock Exchange, and the results showed evidence that the market reacted positively to the increased dividend, and negatively to dividend decrease. Kurniasih, Siregar, Sembel, and

Achsani (2011) also found evidence of positive abnormal returns for increased dividends and negative abnormal returns for decreases in dividends.

Given this, a positive relation should be found between changes in dividends and returns, but, since the dividend changes are not expected, we do not know whether the returns prior to the dividends announcements can be a predictive sign of change.

- IVOL [-11, -2]

This variable corresponds to the standard deviation of daily returns for the 10 days window period prior to dividend announcement (day -2 to day -11), and it is widely used to capture the influence of return volatility. The formula for standard deviation (eq. 4.7) is the following:

$$S = \sqrt{\frac{\sum(r_{i,t} - \overline{r_{i,t}})^2}{n-1}} \tag{4.7}$$

Where $r_{i,t}$ is the (log) price return, $\overline{r_{i,t}}$ is the average (log) price return of the sample and n is the number of observations. This variable was calculated on Excel using the "STDEV" formula for the returns over the days -2 to -11.

According to Schwert (2011), the standard deviation of returns is the most commonly used measure for stock return volatility. Higher standard deviations have more chances of larger positive or negative returns.

Breen and Lerner (1973) found a negative impact of dividend payout on systematic risk. Hoberg and Prabhala (2008) found evidence that higher dividend yields are associated with lower risk, and that dividend changes lead to changes in risk. The negative impact of dividends on the risk is because investors see an increase in dividends as a positive signal, and it also reduces the agency costs (caused by information asymmetry). On the other hand, a decrease in dividends is perceived as a bad signal and thus, lead to an increased return volatility.

A negative relation should be found between changes in dividends and return volatility, but, just like returns, we assume that the dividend changes are not expected, so we do not know whether the volatility prior to the dividends announcements can be a predictive sign of change.

- Turnover [-61, -12] – Ln_Turn50

The average turnover is calculated as the daily traded volume divided by the number of shares outstanding over the period -61 to -12 prior to dividends announcements. The natural logarithm of this variable is used, in order to reduce the skewness.

Schwert (1990) and Wang (1994) found evidence of a relation between trading volume and stock return volatility. What is still under discussion is whether the high volatility is due to high volume or if they both result from new information.

We do not expect any particular sign on this variable.

To Nissim (2003), firm specific measures of profitability are likely to contain information about the change in dividends. So, to represent profitability measures, Book to Market Ratio, Return on Assets and Return on Equity are used. Profitability measures are commonly used as indicators of the capacity for the firms to pay dividends. DeAngelo, DeAngelo, and Stulz (2006) state that mature firms, identified by being larger, with higher profitability and lower growth prospects are more likely to pay dividends.

- Return on Assets - ROA

ROA corresponds to the ratio of net income to total assets.

Jensen, Solberg, and Zorn (1992), Fama and French (2001), Grullon et al. (2005), DeAngelo et al. (2006), among others, found evidence that firms that increase dividends are more profitable than those who do not.

Therefore, ROA is expected to have a positive impact on dividend changes.

- Return on Equity - ROE

ROE is defined as the ratio of net income to shareholder's equity value.

Like ROA, ROE is expected to have a positive impact on dividend changes.

- Book to Market Ratio – Ln_B/M

Market to Book ratio is considered by many authors a proxy of investments/growth opportunities and firm maturity. According to DeAngelo et al. (2006) and Vieira and Raposo (2007) it is expected that firms with lower investment opportunities have more free cash-flow, and thus, can afford to pay higher dividends.

In our study, following Akbas (2016), instead of Market to Book ratio, Book to Market is going to be used.

Book to market ratio is calculated by dividing the book value at the end of the year before the dividend change year by the market value of equity on the announcement date. The natural logarithm of this variable is used, in order to reduce the skewness. Only firms with positive book values were included in the sample.

A positive relationship is expected between Ln_B/M and dividend changes.

- D_{LOW}*Ln_Size

Firm size is also used as a proxy for short selling constraints. Lower market capitalization is associated with more stock illiquidity, and so, stronger short selling constraints. As it was previously mentioned, there are numerous studies that use the firm size as a proxy for short selling constraints, proving that the costs of short selling for low capitalized firms are higher.

The effect of unusually low volume should be higher among stocks with lower market capitalization. If short selling restrictions amplify the relation between D_{LOW} and dividend changes, we should find a positive coefficient between the interactive variable and the dependent variables.

If observed, this positive coefficient between D_{LOW} and Ln_Size suggest that the information content of D_{LOW} with respect to dividend surprises decreases as short-selling constraints are reduced as captured by higher sizes (Akbas, 2016).

3.3. Sample

3.3.1. Data

The annual dividend announcements were retrieved from *Thomson Reuters Eikon*, in the period between 2005-2018. The remaining variables were retrieved from *DataStream.* For the purpose of this study, panel data methodology is used.

The final sample is an unbalanced panel data composed by 880 observations, corresponding to 103 listed companies from Portugal (24 companies) and Spain (79 companies), excluding financial institutions, given that these types of institutions have different accounting rules. Annex 3 presents a list of the firms included in the study.

All companies in which it was not possible to collect financial data were removed from the sample, as well as companies with negative book value and companies where the dividend announced was consecutively (or only) zero. The initial sample was composed by 231 companies, and 128 were removed. The companies that were not used in the sample can be found in Annex 4.

Table 2 - Sample Description

Source: Own elaboration.

Table 2 presents the number of events by company and by type (decreases, increases and constants).

	Dividend Decrease (DD)	Dividend Increase (DI)	Constant (DC)	Total
Portugal	39	114	56	209
Spain	185	352	134	671
Total	224	466	190	880
%	25%	53%	22%	100%

As we can notice from Table 2, we have 224 dividend decreases, which correspond to 25% of the sample, 190 constant dividends, corresponding to 22% of the sample, and 466 increases, which correspond to more than half of the sample. These values are in line with the literature, managers are reluctant to reduce dividends, although we were expecting a larger percentage of constant dividends, since there is a consensus that dividends tend to be sticky.

Figure 1 represents the variation of the dividend payments. Compared to the previous years, in the years of 2009 and 2010 we can observe a large increase (40%) in the number of companies that decreased the dividends. 2009 was the year when more companies decreased their dividends (50%), followed by 2010 (40%). This can be explained due to the 2008 financial crisis.

Through all the sample, the tendency observed is for companies to increase their dividend payments, but we can observe some exceptions, like in 2009/2010, where the number of companies that decreased the dividends outnumbered the companies that increased them. In 2012 and 2013, these numbers almost match.

Figure 1 - Evolution of Dividend Payments between 2005-2018

Source: Own elaboration.

Figure 1 shows, in percentage, the proportion of companies that increased, decreased, or maintained the dividend levels, each year, between 2005-2018. The sample contains 880 observations of 103 Portuguese and Spanish companies over the period of 2005-2018.

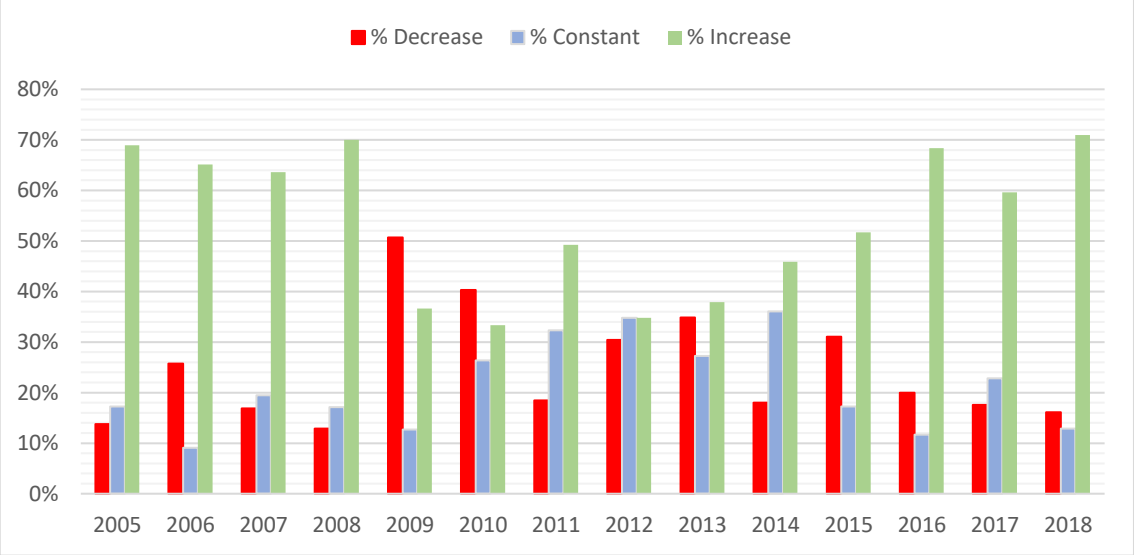
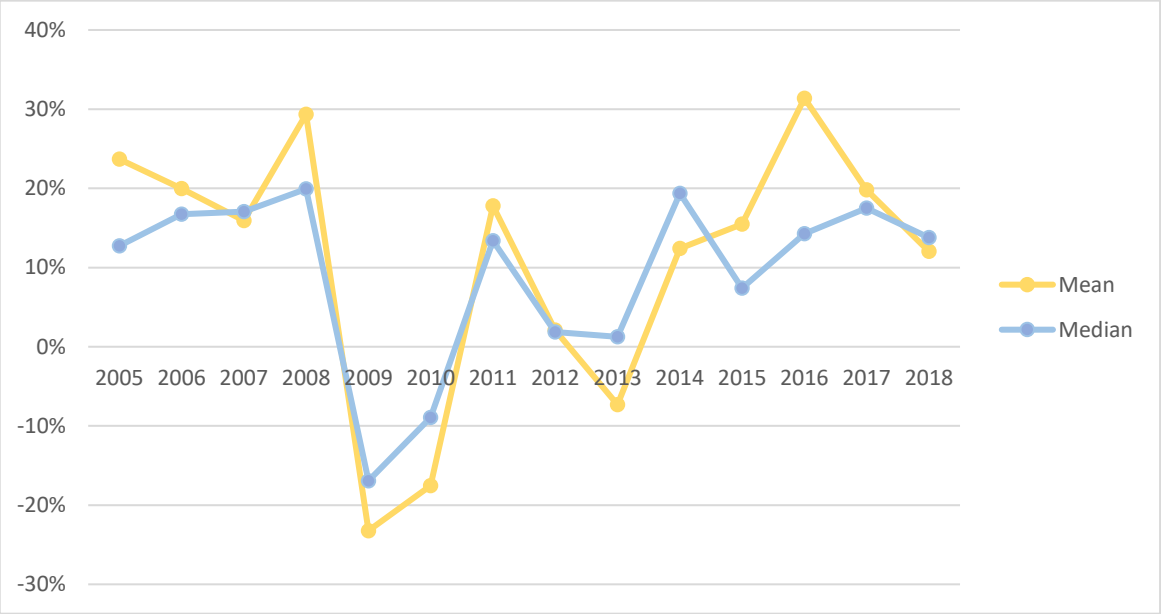


Figure 2 shows the evolution of the average and median percentage of dividend increases/decreases per year. In agreement with Figure 1, we can observe that in the years 2009, 2010, 2012 and 2013, in general, the value of the dividends paid decreased, and the mean and median of the dividends changes in the years of 2009, 2010 and 2013 was negative.

Figure 2 - Evolution of the Dividend Change between 2005-2018

Source: Own elaboration.

Figure 2 shows the mean and median of the evolution of the variable DCHANGE, between the years 2005-2018. The sample contains 880 observations of 103 Portuguese and Spanish companies over the period of 2005-2018.



We can observe a huge decline in 2009, possibly because of the financial crisis. After that, it is possible to observe an upward trending until 2011, followed by another decline, although not so pronounced. Until 2018, 2013 was the last year that presented a negative average dividend change.

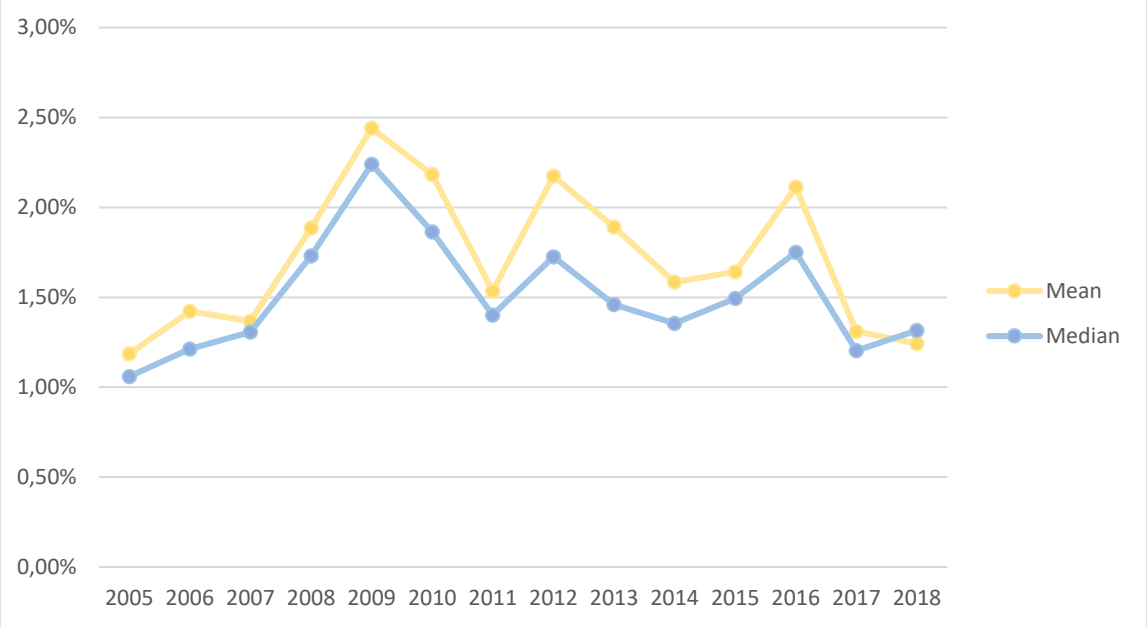
In Figure 3 is presented the mean and median for the standard deviation of stock returns between 2005 and 2018. The years that present higher volatility are 2009, 2010, 2012, 2013 and 2016. Excepting for the year 2016, the other years are associated with more decreases in dividend payments.

Moreover, 2009 is the year with higher stock volatility, it is also the year when more companies decreased their dividends and the year where the dividend changes present the highest negative dividend variation in all of the sample. In the literature, dividend decreases are associated with higher volatility, due to the negative market response.

Figure 3 - Evolution of Standard Deviation between 2005-2018

Source: Own elaboration.

Figure 3 shows the mean and median of the evolution of the variable IVOL, between the years 2005-2018. The sample contains 880 observations of 103 Portuguese and Spanish companies over the period of 2005-2018.



3.3.2. Descriptive Statistics

Descriptive statistics are presented in Table 3, and show the value of the mean, median, standard deviation, minimum and maximum of each variable. The descriptive statistics refers to 880 observations of 103 Portuguese and Spanish companies over a period of 14 years (2005-2018).

Table 3 - Descriptive Statistics of all sample

Source: Own elaboration.

Table 3 presents the statistic results. The sample contains 880 observations of 103 Portuguese and Spanish companies over the period of 2005-2018. Definition of the variables are presented in Table 1.

Variable	Mean	Minimum	Median	Maximum	Std. Dev.
Dchange	0.101	-1.000	0.029	3.926	0.614
DY	-0.002	-0.319	0.000	0.202	0.033
Dividend	0.363	0.000	0.150	10.500	0.984
Size	4510.300	21.107	1267.103	97765.050	10595.620
D_Low	0.097	0.000	0.000	1.000	0.296
D_High	0.219	0.000	0.000	1.000	0.414
IVOL	0.017	-0.016	0.014	0.100	0.011

Turn50	0.003	0.000	0.002	0.029	0.003
Return5	0.000	-0.066	0.001	0.045	0.008
Return50	0.000	-0.090	0.000	0.011	0.004
ROE	0.138	-3.068	0.135	2.903	0.263
ROA	0.046	-0.347	0.040	0.393	0.062
B/M	0.664	0.025	0.504	7.051	0.604

Regarding the dependent variables, Dchange and DY, both medians are positive, although, in the DY case, the mean is negative. The minimum value for the Dchange is -1, meaning that there were companies that stopped paying dividends (even if only 1 year), which is in agreement with the minimum dividend value (0€). The results for variable DY are a lot smaller than the results for DChange due to the fact that in DY case the denominator was the price of the stock.

In the case of the Dividend, the highest value paid was 10.5€, but, on average, the dividend value per share paid by companies was around 0.36€.

Size is the variable that present the highest standard deviation (10595.62€), but this is due the fact that in Table 3, the variable Size is presented in millions of euros. Our sample includes both micro and large firms. In this case, the smallest company has a size of 21 million euros, while the largest company has a size of 97,765 thousand million euros.

For returns, overall, return5 is larger than return50, both in terms of maximum value and in terms of the mean. This means that stock returns were typically higher in the 5 days before the announcement than in the [-61, -12] period. On Akbas (2016) study, the results show the opposite.

Finally, concerning the B/M ratio, both its mean and median are below 1, which indicates that, in the period of 2005-2018, on average, the company's stocks were overvalued.

For comparison purposes, below, we present two tables with the descriptive statistics for the sample divided by negative and positive dividend changes. Despite the results, we need to take into account the fact that the positive sample has more than the double of the observations of the negative sample. This goes in accordance with the theories that suggest that managers are reluctant to decrease the dividends, unless is strictly necessary.

Table 4 - Descriptive Statistics of the divided sample

Source: Own elaboration.

The first table presents the statistic results for the negative dividend changes, while the second table presents the statistics results for the positive dividend changes. The negative sample contains 224 observations from 91 companies, and the positive sample contains 466 observations from 92 companies. Definition of the variables are presented in Table 1.

Negative					
Variable	Mean	Minimum	Median	Maximum	Std. Dev.
Dchange	-0.518	-1.000	-0.454	-0.001	0.340
DY	-0.029	-0.319	-0.012	0.000	0.046
Dividend	0.185	0.000	0.100	5.250	0.422
Size	3632.000	23.227	806.841	77918.830	9856.392
D_Low	0.116	0.000	0.000	1.000	0.321
D_High	0.210	0.000	0.000	1.000	0.408
IVOL	0.020	-0.016	0.017	0.100	0.013
Turn50	0.002	0.000	0.001	0.029	0.003
Return5	0.000	-0.028	0.000	0.038	0.009
Return50	-0.001	-0.090	0.000	0.011	0.007
ROE	0.092	-1.503	0.105	0.880	0.258
ROA	0.035	-0.246	0.029	0.368	0.077
B/M	0.774	0.049	0.567	5.280	0.717
Positive					
Variable	Mean	Minimum	Median	Maximum	Std. Dev.
Dchange	0.440	0.006	0.200	3.926	0.594
DY	0.012	0.000	0.004	0.258	0.024
Dividend	0.434	0.012	0.202	10.500	0.870
Size	5061.795	21.428	1808.633	93145.510	10317.980
D_Low	0.090	0.000	0.000	1.000	0.286
D_High	0.236	0.000	0.000	1.000	0.425
IVOL	0.016	0.001	0.014	0.090	0.008
Turn50	0.003	0.000	0.002	0.020	0.003
Return5	0.000	-0.022	0.001	0.022	0.007
Return50	0.001	-0.011	0.001	0.011	0.003
ROE	0.176	-1.429	0.161	2.468	0.199
ROA	0.058	-0.113	0.050	0.393	0.049
B/M	0.566	0.025	0.452	3.546	0.425

In Table 4 it is interesting to observe that, regarding the dividend value, both the mean and the median of the negative sample are half the value of the positive sample. This can indicate that, usually, lower dividends are more prone to be decreased than higher dividends.

The size of the companies also differs in both samples. The negative sample shows lower values for the company's size. If we look at the median, we can see that between the two

samples, the median company size for positive sample is much higher than in the negative sample (1,808 million euros vs 806 million euros). Although there is a big difference regarding this variable, we need to take into account the number of observations in both samples, since the positive sample has more than the double of observations, and some of the companies that do not appear on the negative sample are the ones with greater market capitalization.

Concerning the returns, both 5 and 50, the mean and median are negative in the negative sample, thing that does not happen in the positive sample. This shows that, when dividends decrease, usually, the returns of the stocks before the dividend decrease announcement are negative.

The same happens with the profitability measures, namely, the ROE, ROA and B/M. They all have higher values in the positive sample (except for the B/M ratio, where lower values, between 0 and 1, are preferred instead of values higher than 1). According to Grullon et al. (2005) and Fama and French (2001), larger and more profitable firms pay higher dividends and are more likely to increase them.

3.3.3. Correlation Matrix

In Table 5 we can examine the correlation between all the variables presented in the model.

Both of the two dependent variables (DChange and DY) show a negative correlation with D_{LOW}, and a positive correlation with D_{HIGH}, as expected. It is interesting to notice that the correlation with the variable D_{LOW} is stronger than with D_{HIGH}, for both dependent variables.

It is also important to notice that both DChange and DY show the same signal with the other variables, except with Ln_Turn50, where DChange shows a positive correlation and DY shows a negative correlation.

Table 5 - Correlation Matrix

Source: Own elaboration

Table 5 presents the correlation between all the variables used in the model. The sample contains 880 observations of 103 Portuguese and Spanish companies over the period of 2005-2018. D_{LOW} (D_{HIGH}) is a dummy variable that is 1 when there is unusually low (high) volume prior to the dividend announcement and 0 otherwise, IVOL is the standard deviation of daily returns of the 5 days before the dividend announcement, Ln_Size is the natural logarithm of equity market value, Ln_Turn50 is the natural logarithm of the average turnover of the 50 days before the dividend announcement, Return_5 and Return_50 are the stock returns of the 5/50 days before the dividend announcement, ROE is return on equity, ROA is return on assets and Ln_B/M is the natural logarithm of the book to market ratio.

	DCHANGE	DY	D_Low	D_High	IVOL	Ln_Size	Ln_Turn50	Return_5	Return50	ROE	ROA	Ln_B/M
DCHANGE	1											
DY	0.5844	1										
D_Low	-0.0570	-0.0288	1									
D_High	0.0510	0.0162	-0.1731	1								
IVOL	-0.1013	-0.1470	-0.0350	0.1770	1							
Ln_Size	0.0429	0.0535	0.0127	-0.0444	-0.2608	1						
Ln_Turn50	0.0650	-0.0083	0.0521	-0.0444	0.0282	0.4244	1					
Return_5	0.0559	0.0363	-0.0359	0.0453	-0.0341	0.0263	-0.0107	1				
Return_50	0.0797	0.0902	-0.1121	0.0170	-0.0428	0.0639	0.0382	0.0152	1			
ROE	0.1028	0.1038	-0.0459	-0.0224	-0.1661	0.2643	0.0679	0.0620	0.2531	1		
ROA	0.1657	0.1183	-0.0527	-0.0160	-0.2103	0.2350	-0.0096	0.0732	0.2266	0.6190	1	
Ln_B/M	-0.0692	-0.0297	-0.0008	0.0630	0.2196	-0.3675	-0.2816	-0.1056	-0.1352	-0.4375	-0.5321	1

According to Table 5, none of the variables show high correlation, being the strongest correlation between ROE and ROA, with a value of 0.619, followed by the two dependent variables, DChange and DY, equal to 0.5844. The correlation between the two dependent variables was expected to be higher. There is only one value that is slightly above 0.6, indicating that we do not have a multi-collinearity problem in the model.

The high correlation between ROE and ROA is normal and expected, because these two variables can be seen as substitutes for each other.

4. Results and Discussion

In this section, we present the results for both Model 1 and Model 2. As it was mentioned before, given the tests results, Fixed Effects Model was preferred, but we present the results using both Pooled OLS and Fixed Effects Model, for comparison reasons. The results are presented next, on Table 6. EViews outputs of the performed tests can be consulted on Annex 5 to 12.

The obtained results and the conclusions about the relation between the independent variables and the dividend changes are also discussed in this section.

Table 6 - Estimation Output for Equation 1 and 2

Source: Own elaboration

Table 6 presents the outcomes of the Pooled OLS and Fixed Effects Model for equation 1 and 2, and for both dependent variables, that is, DChange and DY. D_{LOW} (D_{HIGH}) is a dummy variable that is 1 when there is unusually low (high) volume prior to the dividend announcement and 0 otherwise, IVOL is the standard deviation of daily returns of the 5 days before the dividend announcement, Ln_Size is the natural logarithm of equity market value, Ln_Turn50 is the natural logarithm of the average turnover of the 50 days before the dividend announcement, Return_5 and Return_50 are the stock returns of the 5/50 days before the dividend announcement, ROE is return on equity, ROA is return on assets and Ln_B/M is the natural logarithm of the book to market ratio. Definition of the variables are presented in Table 1. Standard errors with a robust estimator are reported in parenthesis. Symbols ***, ** and * represent statistical significance at 1%, 5% and 10%, respectively.

Dep. Variable	Pooled OLS				Fixed Effects			
	Dchange (1)	DY (1)	Dchange (2)	DY (2)	Dchange (1)	DY (1)	Dchange (2)	DY (2)
CONSTANT	**0.87248*** **	0.00479	**0.97512*** **	0.00450	**0.82672*** **	0.01168	**0.90014*** **	0.00045
	(0.33322)	(0.01824)	(0.34135)	(0.01869)	(0.32622)	(0.01831)	(0.33393)	(0.01876)
D_Low	-0.08377	-0.00156	-1.22971	0.00172	-0.11141	-0.00298	-0.93585	0.01090
	(0.07067)	(0.00374)	(0.92789)	(0.05120)	(0.06912)	(0.00370)	(0.91318)	(0.05113)
D_High	**0.09043***	0.00272	**0.08960***	0.00272	**0.08638***	0.00261	**0.08558***	0.00262
	(0.05135)	(0.00266)	(0.05131)	(0.00266)	(0.049724)	(0.00263)	(0.04970)	(0.00273)
IVOL	**-5.74650*** **	**-0.41493*** **	**-5.67420*** **	**-0.41514*** **	**-3.30271***	**-0.34480*** **	**-3.23892***	**-0.34587*** **
	(1.86637)	(0.10815)	(1.86488)	(0.10814)	(1.88932)	(0.11150)	(1.88841)	(0.11147)
Ln_Size	-0.01769	0.00011	**-0.02248***	0.00012	-0.01902	0.00012	**-0.02246***	0.00018
	(0.01264)	(0.00068)	(0.01313)	(0.00070)	(0.01231)	(0.00068)	(0.01277)	(0.00071)
Ln_Turn50	**0.05516*** **	0.00038	**0.05596*** **	0.00038	**0.04863*** **	0.00004	**0.04923*** **	0.00003
	(0.01674)	(0.00094)	(0.01671)	(0.00094)	(0.01643)	(0.00095)	(0.01642)	(0.00095)
Return_5	3.41640	0.11460	3.46767	0.11445	2.93929	0.11767	2.95680	0.11737
	(2.53209)	(0.14087)	(2.52774)	(0.14088)	(2.45887)	(0.13996)	(2.45623)	(0.14001)
Return_50	5.49707	**0.48520** **	4.95175	**0.48677** **	6.32217	**0.56783*** **	5.87253	**0.57539*** **
	(4.09677)	(0.207081)	(4.12823)	(0.20879)	(4.11071)	(0.20938)	(4.14495)	(0.21110)
ROE	-0.01211	0.00516	-0.01131	0.00515	0.02989	0.00554	0.03106	0.00552
	(0.09390)	(0.00507)	(0.09383)	(0.00507)	(0.09331)	(0.00509)	(0.09327)	(0.00509)

ROA	**1.82641*** **	**0.04721** **	**1.81931*** **	**0.04723** **	**1.60876*** **	**0.04146***	**1.60462*** **	**0.04153***
	(0.41313)	(0.02266)	(0.41307)	(0.02269)	(0.39916)	(0.02265)	(0.39916)	(0.02267)
Ln_B/M	**0.049293***	**0.00313***	**0.04659***	**0.00313***	**0.05469** **	**0.00337** **	**0.05272** **	**0.00340** **
	(0.02784)	(0.00163)	(0.02785)	(0.00163)	(0.02734)	(0.00169)	(0.02734)	(0.00170)
D_Low*Ln_Size	-	-	0.05471	-0.00016	-	-	0.03937	-0.00066
			(0.04422)	(0.00242)			(0.04351)	(0.00241)
R-Squared	0.05191	0.04089	0.05358	0.040896	0.11223	0.0724	0.11308	0.07249
Adj. R-Squared	0.04100	0.02985	0.04159	0.028741	0.08838	0.04748	0.08818	0.04645
F-Statistic	**4.75792*** **	**3.70493*** **	**4.46741*** **	**3.36466*** **	**4.70504*** **	**2.90484*** **	**4.54211*** **	**2.78407*** **

Firstly, we can observe, by comparing the Pooled OLS and the Fixed Effects Model, that when using the Fixed Effects, the explanatory power of the model improves. Secondly, we can also notice that the models that have as dependent variable DChange have a better fit than DY.

Overall, contrary to what we were expecting, the variable D_{LOW}, although it has a negative coefficient, is not statistically significant in any model. But, when using Fixed Effects in model 1, for DChange, the variable D_{LOW} has a p-value of 10.74%, just slightly outside the normal range of significance.

Therefore, **we reject hypothesis 1,** that there is unusually low volume prior to dividend decreases.

On the contrary, D_{HIGH} is positively correlated with DChange with significance at 10% level. This suggests that high volume shocks signal positive upcoming information about changes in dividends. Therefore, our findings are asymmetric to Akbas (2016) and Yin and Liu (2017) findings. For our sample, the results suggest that higher transaction volume is a better predictive of good news than the capacity of unusually low volume to predict bad news.

The variable IVOL has a negative impact and is statistically significant in all models. In the models that have as dependent variable DChange, IVOL loses significance when using the Fixed Effects Model instead of the Pooled OLS, it goes from statistically significant at 1% level to 10% level. In the models that have as dependent variable DY, IVOL is statistically significant at 1%. The impact that IVOL has on DChange is almost 10 times higher than the impact that it has on DY.

We can observe that higher stock volatility is associated with dividend decreases with higher amplitudes. For example, we can see in Pooled OLS, model 1, that a 1 p.p. increase of volatility will cause a 5.7 p.p. decrease on the Dchange, *ceteris paribus*.

This goes in accordance with Hoberg and Prabhala (2008) findings, that higher dividend yields are associated with lower risk, and that dividend changes lead to changes in risk.

The size of the company, as predicted, has a negative impact on DChange at 10% significance, in Model 2, when controlling for the interaction between D_{LOW} and Ln_Size. The larger the company size, the lower the dividend changes in the positive side, and higher on the negative side. Larger companies have dividend decreases with higher amplitudes than smaller companies.

Studies like Haw and Kim (1991) state that, when the dividends change, a larger reaction by the market is predicted for low cap firms, due to more asymmetric information, and dividend decreases are seen as a negative sign by the market, so, smaller firms are more unlikely to make big changes on its dividends.

The variable Ln_Turn50 (the turnover over the 50-day window period prior to dividends announcements) has a positive impact on DChange and is statistically significant at 1% level. Higher levels of trading seem to predict better upcoming news. This positive and significant impact makes sense, since the variable D_{HIGH} also has a positive and significant impact on dividend changes. We can conclude that, for our sample, higher transaction volume is a better predictive of good news than the capacity of unusually low volume to predict bad news.

The return of the stocks on the 50-day window period prior to dividend announcements (Return_50) has also a positive impact on DY at 1% level on model 1, and at 10% level on model 2. Regarding the dependent variable DChange, on the fixed effects model Return_50 has a p-value of 12% and 16%, for the Fixed Effects model 1 and 2, respectively. As dividend changes are not expected, we were not sure what to expect about the relationship between returns and dividend changes.

Relatively to the profitability measures, ROE, ROA and Ln_B/M, the measure ROE presents the worst results, it has no impact on the dividend changes, with p-values ranging from 28% to 91%.

On the other hand, ROA has a positive impact and it is statistically significant in every model, for both measures of dividend changes. It has an impact at the 1% level on DChange and 10% level on DY. Companies with higher ROA's tend to increase more their dividends, as expected. As seen previously, authors like Jensen et al. (1992) Fama and French (2001) and Grullon et al. (2005) state that companies with higher profitability pay higher dividends and are also more prone to increase them.

The Ln_BM, although it does not have as much impact as ROA, given the lower coefficient and the level of significance (5% maximum), also has a positive impact on both variables, as expected. Higher ratios are associated with lower growth prospects and investment opportunities, and so, higher probability of increasing the dividend payments.

Last, but not least, we have the interactive variable D_{LOW}*Ln_Size. Despite having a positive coefficient, this variable does not have impact on any model (with p-values ranging from 21.63% to 94.82%). Therefore, we also **reject hypothesis 2.**

Also, as it was referred previously, when using Fixed Effects in model 1, for DChange, the variable D_{LOW} has a p-value of 10.74%, but, on model 2, p-value loses even more significance, by changing to 0.3057%. Although it does not have impact on the dependent variables, D_{LOW}*Ln_Size improves Ln_Size, making it statistically significant at 10% level for DChange, when using the Fixed Effects model. This results are also in agreement with the results found by Akbas (2016), who justified this finding by saying that firm size can capture other market frictions such as stock illiquidity that also deter the entry of short sellers into the market and increase the information content of unusually low volume.

5. Conclusions

In this dissertation, our main goal was to test if there was any relation between unusually low trading volume and subsequent dividends announcements, and if this effect was more pronounced in the presence of short selling constraints.

Our sample was composed by 103 Portuguese and Spanish listed companies, in the period between 2005-2018 and panel data methodology was used.

Contrary to our expectations, we did not found evidences to support our hypothesis, and Akbas (2016) main results.

Instead, we found evidence that unusually high volume prior to dividend announcements is positively related at 10% level with dividend surprises. In addition, the turnover over the 50-day window period prior to dividends announcements has also a positive impact on DChange. Higher levels of trading seem to predict better upcoming news.

We can conclude that, for our sample, higher transaction volume is a better predictive of good news than the capacity of unusually low volume to predict bad news. These differences in the results can be justified by the fact that the markets under study are very different (US/China vs Europe). Also, we cannot forget the fact that Akbas (2016) and Yin and Liu (2017) study was related to earnings announcements instead of dividends announcements.

The return of the stocks on the 50-day window period prior to dividend announcements also has a positive impact on DY. Previously, we mentioned some studies that suggested that dividend increases generate higher returns than dividend decreases, and that dividend decreases are associated with negative abnormal returns.

Stock volatility showed a negative relation with dividend changes, implying that higher stock volatility is associated with dividend decreases with higher amplitudes. The size of the company had also a negative impact on DChange, showing that larger companies have dividend decreases with higher amplitudes than smaller companies.

Relatively to the profitability measures, except for ROE, both ROA and Book to Market ratio showed a positive and significant impact in every model, for both measures of dividend changes. Companies with higher ROA's and Book to Market ratios tend to increase more their dividends.

Our results also show evidence that managers are reluctant to decrease dividends, as we could see by the number of events in the study, the decreases correspond to only 25% of the sample.

Our findings are important to investors as it enables them to improve their dividend forecasting capabilities. When stocks have an abnormally high trading volume, the dividend change (Dchange) is expected to increase by 0.09 percentage points, when compared to stocks that do not show abnormally high trading volume, *ceteris paribus*.

We had some limitations, due to the fact that there are no studies exactly like ours, so it became a challenge when choosing the right control variables, the expected signs and interpretation of the coefficients. Another limitation in this study is the number of missing values in the dataset. For future research, the time horizon could be expanded, in order to increase the number of firm-year observations.

We did not had access to the short selling volumes, which would be interesting to use in future studies, instead of just using one proxy for short selling constraints, that can capture other market frictions. It would also be interesting to test other proxies of short selling constraints like institutional ownership and the availability, or not, of exchange-traded options.

Bibliography

Akbas, F. (2016). The Calm before the Storm. *The Journal of Finance, 71*(1), 225-266. doi:10.1111/jofi.12377

Altiok-Yilmaz, A., & Akben-Selcuk, E. (2010). Information content of dividends: Evidence from Istanbul stock exchange. *International Business Research, 3*(3), 126.

Ambarish, R., John, K., & Williams, J. (1987). Efficient signalling with dividends and investments. *The Journal of Finance, 42*(2), 321-343.

Bai, M., & Qin, Y. (2015). Short sales constraints and price adjustments to earnings announcements: Evidence from the Hong Kong market. *International Review of Financial Analysis, 42*, 304-315.

Beaver, W. H. (1968). The information content of annual earnings announcements. *Journal of Accounting Research*, 67-92.

Berkman, H., Dimitrov, V., Jain, P. C., Koch, P. D., & Tice, S. (2009). Sell on the news: Differences of opinion, short-sales constraints, and returns around earnings announcements. *Journal of Financial Economics, 92*(3), 376-399.

Bhattacharya, S. (1979). Imperfect information, dividend policy, and "the bird in the hand" fallacy. *Bell Journal of Economics, 10*(1), 259-270.

Black, F., & Scholes, M. (1974). The effects of dividend yield and dividend policy on common stock prices and returns. *Journal of Financial Economics, 1*(1), 1-22.

Blau, B. M., Fuller, K. P., & Van Ness, R. A. (2011). Short selling around dividend announcements and ex-dividend days. *Journal of Corporate Finance, 17*(3), 628-639.

Boehme, R. D., Danielsen, B. R., & Sorescu, S. M. (2006). Short-sale constraints, differences of opinion, and overvaluation. *Journal of Financial and Quantitative analysis, 41*(2), 455-487.

Boehmer, E., Jones, C. M., & Zhang, X. (2008). Which shorts are informed? *The Journal of Finance, 63*(2), 491-527.

Brav, A., Graham, J. R., Harvey, C. R., & Michaely, R. (2005). Payout policy in the 21st century. *Journal of Financial Economics, 77*(3), 483-527.

Breen, W. J., & Lerner, E. M. (1973). Corporate financial strategies and market measures of risk and return. *The Journal of Finance, 28*(2), 339-351.

Bris, A., Goetzmann, W. N., & Zhu, N. (2007). Efficiency and the bear: Short sales and markets around the world. *The Journal of Finance, 62*(3), 1029-1079.

Chen, J., Hong, H., & Stein, J. C. (2002). Breadth of ownership and stock returns. *Journal of*

Financial Economics, 66(2-3), 171-205.

Conroy, R. M., Eades, K. M., & Harris, R. S. (2000). A test of the relative pricing effects of dividends and earnings: Evidence from simultaneous announcements in Japan. *The Journal of Finance, 55*(3), 1199-1227.

Dasilas, A., & Leventis, S. (2011). Stock market reaction to dividend announcements: Evidence from the Greek stock market. *International Review of Economics & Finance, 20*(2), 302-311.

DeAngelo, H., DeAngelo, L., & Skinner, D. J. (1992). Dividends and losses. *The Journal of Finance, 47*(5), 1837-1863.

DeAngelo, H., DeAngelo, L., & Stulz, R. M. (2006). Dividend policy and the earned/contributed capital mix: a test of the life-cycle theory. *Journal of Financial Economics, 81*(2), 227-254.

Diamond, D. W., & Verrecchia, R. E. (1987). Constraints on short-selling and asset price adjustment to private information. *Journal of Financial Economics, 18*(2), 277-311.

Diether, K. B., Malloy, C. J., & Scherbina, A. (2002). Differences of opinion and the cross section of stock returns. *The Journal of Finance, 57*(5), 2113-2141.

Elton, E. J., & Gruber, M. J. (1970). Marginal stockholder tax rates and the clientele effect. *The Review of Economics and Statistics*, 68-74.

Fama, E. F., & French, K. R. (2001). Disappearing dividends: changing firm characteristics or lower propensity to pay? *Journal of Financial Economics, 60*(1), 3-43.

Felimban, R., Floros, C., & Nguyen, A.-N. (2018). The impact of dividend announcements on share price and trading volume: Empirical evidence from the Gulf Cooperation Council (GCC) countries. *Journal of Economic Studies, 45*(2), 210-230.

Gervais, S., Kaniel, R., & Mingelgrin, D. H. (2001). The high-volume return premium. *The Journal of Finance, 56*(3), 877-919.

Gordon, M. J. (1959). Dividends, earnings, and stock prices. *The Review of Economics and Statistics*, 99-105.

Gordon, M. J. (1963). Optimal investment and financing policy. *The Journal of Finance, 18*(2), 264-272.

Grullon, G., Michaely, R., Benartzi, S., & Thaler, R. H. (2005). Dividend changes do not signal changes in future profitability. *The Journal of Business, 78*(5), 1659-1682.

Gurgul, H., Majdosz, P., & Mestel, R. (2006). Implications of dividend announcements for the stock prices and trading volumes of DAX companies. *Czech Journal of*

Economics and Finance, 56(1-2), 58-68.

Hauser, F., & Huber, J. (2012). Short-selling constraints as cause for price distortions: An experimental study. *Journal of International Money and Finance, 31*(5), 1279-1298.

Haw, I.-M., & Kim, W.-S. (1991). Firm size and dividend announcement effect. *Journal of Accounting, Auditing & Finance, 6*(3), 325-344.

Hoberg, G., & Prabhala, N. R. (2008). Disappearing dividends, catering, and risk. *The Review of Financial Studies, 22*(1), 79-116.

Hotchkiss, E., & Lawrence, S. (2007). Empirical evidence on the existence of dividend clienteles. *Boston College*.

Hsiao, C. (2007). Panel data analysis—advantages and challenges. *Test, 16*(1), 1-22.

Hsiao, C. (2014). *Analysis of panel data*: Cambridge university press.

Jacobsen, B., Potters, J., Schram, A., van Winden, F., & Wit, J. (2000). (In) accuracy of a European political stock market: The influence of common value structures. *European Economic Review, 44*(2), 205-230.

Jensen, G. R., Solberg, D. P., & Zorn, T. S. (1992). Simultaneous determination of insider ownership, debt, and dividend policies. *Journal of Financial and Quantitative analysis, 27*(2), 247-263.

John, K., & Williams, J. (1985). Dividends, dilution, and taxes: A signalling equilibrium. *The Journal of Finance, 40*(4), 1053-1070.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica, 47*(2), 363-391.

Karpoff, J. M. (1986). A theory of trading volume. *The Journal of Finance, 41*(5), 1069-1087.

Kim, O., & Verrecchia, R. E. (1991). Market reaction to anticipated announcements. *Journal of Financial Economics, 30*(2), 273-309.

Kurniasih, A., Siregar, H., Sembel, R., & Achsani, N. A. (2011). Market Reaction to the Cash Dividend Announcement: An Empirical Study from the Indonesia Stock Exchange 2004–2009. *European Journal of Economics, Finance and Administrative Sciences, 40*, 92-100.

Lintner, J. (1956). Distribution of incomes of corporations among dividends, retained earnings, and taxes. *The American Economic Review, 46*(2), 97-113.

Mikhail, M. B., Walther, B. R., & Willis, R. H. (2003). Reactions to dividend changes conditional on earnings quality. *Journal of Accounting, Auditing & Finance, 18*(1), 121-152.

Miller, M. H. (1977). Risk, uncertainty, and divergence of opinion. *The Journal of Finance, 32*(4), 1151-1168.

Miller, M. H., & Modigliani, F. (1961). Dividend policy, growth, and the valuation of shares. *The Journal of Business, 34*(4), 411-433.

Miller, M. H., & Rock, K. (1985). Dividend policy under asymmetric information. *The Journal of Finance, 40*(4), 1031-1051.

Nissim, D. (2003). Discussion—Reactions to Dividend Changes Conditional on Earnings Quality. *Journal of Accounting, Auditing & Finance, 18*(1), 153-162.

Reed, A. V. (2002). Costly short-selling and stock price adjustment to earnings announcements. Citeseer.

Ross, S. A. (1977). The determination of financial structure: the incentive-signalling approach. *Bell Journal of Economics*, 23-40.

Schwert, G. W. (1990). Stock market volatility. *Financial Analysts Journal, 46*(3), 23-34.

Schwert, G. W. (2011). Stock volatility during the recent financial crisis. *European Financial Management, 17*(5), 789-805.

Securities and Exchange Commission. SEC Concept Release: Short Sales. *Retrieved from https://www.sec.gov/rules/concept/34-42037.htm*.

Shefrin, H. M., & Statman, M. (1984). Explaining investor preference for cash dividends. *Journal of Financial Economics, 13*(2), 253-282.

Thaler, R. H., & Shefrin, H. M. (1981). An economic theory of self-control. *Journal of Political Economy, 89*(2), 392-406.

Vieira, E. S. (2008). *Signalling with Dividends? New Evidence from Europe* (1 ed.): Editorial Novembro.

Vieira, E. S. (2011). Firm-Specific Factors and the Market Reaction to Dividend Change Announcements: Evidence from Europe. *Marmara Journal of European Studies, 19*(1).

Vieira, E. S., & Raposo, C. C. (2007). The Effect of Firm-Specific Factors on the Market Reaction to Dividend Change Announcements: New Evidence from Europe. *Available at SSRN 955779*.

Walter, J. E. (1963). Dividend policy: its influence on the value of the enterprise. *The Journal of Finance, 18*(2), 280-291.

Wang, J. (1994). A model of competitive stock trading volume. *Journal of Political Economy, 102*(1), 127-168.

Wooldridge, J. M. (2015). Introductory econometrics: A modern approach. *Nelson Education.*

Yin, Y., & Liu, Y. (2017). Information of Unusual Trading Volume. *Emerging Markets Finance and Trade, 54*(11), 2409-2432. doi:10.1080/1540496x.2017.1399355

6. Annexes

Annex 1 - Results of Hausman Test and Likelihood Ratio for the variable DC

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	21.569940	10	0.0175

** WARNING: estimated cross-section random effects variance is zero.

Correlated Random Effects - Hausman Test
Equation: Untitled
Test period random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	34.700632	10	0.0001

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	0.895007	(102,767)	0.7565
Cross-section Chi-square	98.961371	102	0.5667

Redundant Fixed Effects Tests
Equation: Untitled
Test period fixed effects

Effects Test	Statistic	d.f.	Prob.
Period F	4.474147	(13,856)	0.0000
Period Chi-square	57.850768	13	0.0000

Annex 2 - Results of Hausman Test and Likelihood Ratio for the variable DY

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	15.050616	10	0.1302

** WARNING: estimated cross-section random effects variance is zero.

Correlated Random Effects - Hausman Test
Equation: Untitled
Test period random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	0.000000	10	1.0000

* Period test variance is invalid. Hausman statistic set to zero.

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	0.676930	(102,767)	0.9929
Cross-section Chi-square	75.854069	102	0.9755

Redundant Fixed Effects Tests
Equation: Untitled
Test period fixed effects

Effects Test	Statistic	d.f.	Prob.
Period F	2.091667	(13,856)	0.0127
Period Chi-square	27.519242	13	0.0106

Annex 3 - Companies present on final sample

	Companies	Country
1	Abertis Infraestructuras SA	Spain
2	Acciona SA	Spain
3	Acerinox SA	Spain
4	ACS Actividades de Construccion y Servicios SA	Spain
5	Adolfo Dominguez SA	Spain
6	Adveo Group International SA	Spain
7	Airtificial Intelligence Structures SA	Spain
8	Almirall SA	Spain
9	Altia Consultores SA	Spain
10	Altri SGPS SA	Portugal
11	Amadeus IT Group SA	Spain
12	Amper SA	Spain
13	Applus Services SA	Spain
14	Atresmedia Corporacion de Medios de Comunicacion SA	Spain
15	Audax Renovables SA	Spain
16	Azkoyen SA	Spain
17	Befesa Medio Ambiente SA	Spain
18	Bodegas Riojanas SA	Spain
19	Campofrio Food Group SA	Spain
20	Cementos Portland Valderrivas SA	Spain
21	Cie Automotive SA	Spain
22	Cimpor Cimentos de Portugal SGPS SA	Portugal
23	Clinica Baviera SA	Spain
24	Compania Espanola de Petroleos SAU	Spain
25	Compania Levantina de Edificacion y Obras Publicas SA	Spain
26	Construcciones y Auxiliar de Ferrocarriles SA	Spain
27	Corporacion Empresarial de Materiales de Construccion SA	Spain
28	Corticeira Amorim SGPS SA	Portugal
29	CTT Correios de Portugal SA	Portugal
30	Damm SA	Spain
31	Deoleo SA	Spain
32	Duro Felguera SA	Spain
33	Ebro Foods SA	Spain
34	EDP Energias de Portugal SA	Portugal
35	EDP Renovaveis SA	Portugal
36	Elecnor SA	Spain
37	Enagas SA	Spain
38	Ence Energia y Celulosa SA	Spain
39	Endesa SA	Spain
40	Faes Farma SA	Spain
41	Ferrovial SA	Spain
42	Fluidra SA	Spain

43	Fomento de Construcciones y Contratas SA	Spain
44	Funespana SA	Spain
45	Galp Energia SGPS SA	Portugal
46	Grifols SA	Spain
47	Hullas del Coto Cortes SA	Spain
48	Iberdrola SA	Spain
49	Iberia Lineas Aereas de Espana SA	Spain
50	Iberpapel Gestion SA	Spain
51	Ibersol SGPS SA	Portugal
52	Indra Sistemas SA	Spain
53	Industria de Diseno Textil SA	Spain
54	Inmobiliaria del Sur SA	Spain
55	Itinere Infraestructuras SA	Spain
56	Jeronimo Martins SGPS SA	Portugal
57	Laboratorio Reig Jofre SA	Spain
58	Laboratorios Farmaceuticos ROVI SA	Spain
59	Let's Gowex SA	Spain
60	Lingotes Especiales SA	Spain
61	Mediaset Espana Comunicacion SA	Spain
62	Melia Hotels International SA	Spain
63	Miquel y Costas & Miquel SA	Spain
64	Mota Engil SGPS SA	Portugal
65	Natra SA	Spain
66	Naturgy Energy Group SA	Spain
67	Navigator Company SA	Portugal
68	NH Hotel Group SA	Spain
69	Nos SGPS SA	Portugal
70	Novabase SGPS SA	Portugal
71	Obrascon Huarte Lain SA	Spain
72	Papeles y Cartones de Europa SA	Spain
73	Pharol SGPS SA	Portugal
74	Prim SA	Spain
75	Promotora de Informaciones SA	Spain
76	Prosegur Compania de Seguridad SA	Spain
77	Red Electrica Corporacion SA	Spain
78	REN Redes Energeticas Nacionais SGPS SA	Portugal
79	Repsol SA	Spain
80	Sacyr SA	Spain
81	SAG Gest Solucoes Automovel Globais SGPS SA	Portugal
82	SDC Investimentos SA	Portugal
83	Semapa Sociedade de Investimento e Gestao SGPS SA	Portugal
84	Service Point Solutions SA	Spain
85	Siemens Gamesa Renewable Energy SA	Spain
86	Sociedad General de Aguas de Barcelona SA	Spain
87	Solaria Energia y Medio Ambiente SA	Spain

88	Sonae Capital SGPS SA	Portugal
89	Sonaecom SGPS SA	Portugal
90	Sonae Industria SGPS SA	Portugal
91	Sonae SGPS SA	Portugal
92	Sotogrande SA	Spain
93	Tecnicas Reunidas SA	Spain
94	Tecnocom Telecomunicaciones y Energia SA	Spain
95	Teixeira Duarte Engenharia e Construcoes SA	Portugal
96	Teixeira Duarte SA	Portugal
97	Telefonica SA	Spain
98	Tubacex SA	Spain
99	Tubos Reunidos SA	Spain
100	Union Fenosa SA	Spain
101	Vidrala SA	Spain
102	Viscofan SA	Spain
103	Zardoya Otis SA	Spain

Annex 4 - Companies Deleted from sample

	Companies	Country
1	Ab-Biotics SA	Spain
2	Abengoa SA	Spain
3	ADL Bionatur Solutions SA	Spain
4	Aena SME SA	Spain
5	Altadis SA	Spain
6	Amrest Holdings SE	Spain
7	Antevenio SA	Spain
8	Baron de Ley SA	Spain
9	Biosearch SA	Spain
10	Bodegas Bilbainas SA	Spain
11	Borges Agricultural & Industrial Nuts SA	Spain
12	Brisa Auto Estradas de Portugal SA	Portugal
13	Carbures Europe SA	Spain
14	Catenon SA	Spain
15	Cellnex Telecom SA	Spain
16	Cementos Lemona SA	Spain
17	Cementos Molins SA	Spain
18	CEMEX Latam Holdings SA	Spain
19	Centros Comerciales Carrefour SA	Spain
20	CIN Corporacao Industrial do Norte SA	Portugal
21	Cipan Companhia Industrial Produtora de Antibioticos SA	Portugal
22	Codere SA	Spain
23	Cofaco Comercial e Fabril de Conservas SA	Portugal
24	Cofina SGPS SA	Portugal
25	CommCenter SA	Spain
26	Companhia Industrial de Resinas Sinteticas Cires Lda	Portugal
27	Companhia Nacional de Fiacao e Tecidos de Torres Novas SA	Portugal
28	Compania de Distribucion Integral Logista SA	Spain
29	Compania Espanola para la Fabricacion Mecanica del Vidrio Procedimiento Libbey Owens SA	Spain
30	Compania Logistica de Hidrocarburos CLH SA	Spain
31	Compania Vinicola del Norte de Espana SA	Spain
32	Companyia d Aigues de Sabadell SA	Spain
33	Compta Equipamentos e Servicos de Informatica SA	Portugal
34	Conduril Engenharia SA	Portugal
35	Conesa Portugal SA	Portugal
36	COPAM Companhia Portuguesa de Amidos SA	Portugal
37	Corporacion Dermoestetica SA	Spain
38	Desarrollos Especiales de Sistemas de Anclajes SA	Spain
39	Distribuidora Internacional de Alimentacion SA	Spain
40	Efacec Capital SGPS SA	Portugal
41	Emetals Plc	Spain
42	Ercros SA	Spain
43	Espanola del Zinc SA	Spain

44	Estoril Sol SGPS SA	Portugal
45	Euroespes SA	Spain
46	Euskaltel SA	Spain
47	Exide Technologies SL	Spain
48	Federico Paternina SA	Spain
49	Fisipe Fibras Sinteticas de Portugal SA	Portugal
50	Fitor Companhia Portuguesa de Texteis SA	Portugal
51	Fletamentos Maritimos SA	Spain
52	Futebol Clube do Porto Futebol SAD	Portugal
53	General de Alquiler de Maquinaria SA	Spain
54	Gestamp Automocion SA	Spain
55	Glintt Global Intelligent Technologies SA	Portugal
56	Global Steel Wire SA	Spain
57	Grino Ecologic SA	Spain
58	Grupo Empresarial San Jose SA	Spain
59	Grupo Ezentis SA	Spain
60	Grupo Media Capital SGPS SA	Portugal
61	Grupo Tavex SA	Spain
62	GYG PLC	Spain
63	Highfield Resources Ltd	Spain
64	Hullera Vasco Leonesa SA	Spain
65	Iberdrola Renovables SA	Spain
66	Imobiliaria Construtora Grao Para SA	Spain
67	Impresa Sociedade Gestora de Participacoes Sociais SA	Spain
68	Inapa Investimentos Participacoes e Gestao SA	Portugal
69	Indo Internacional SA	Spain
70	Industrias Del Acetato De Celulosa SA	Spain
71	Industrias del Curtido SA	Spain
72	Inmobiliaria Colonial SA	Spain
73	Joaquim Alberti SA	Spain
74	Lisgrafica Impressao e Artes Graficas SA	Portugal
75	Litho Formas SA	Portugal
76	Liwe Espanola SA	Spain
77	Lusomundo Media Sgps Sa	Portugal
78	Mecalux SA	Spain
79	Medcom Tech SA	Spain
80	Minerales y Productos Derivados SA	Spain
81	Naturhouse Health SA	Spain
82	Nicolas Correa SA	Spain
83	Nueva Expresion Textil SA	Spain
84	OLI Sistemas Sanitarios SA	Portugal
85	Paginas Amarillas Soluciones Digitales SA	Spain
86	Papelaria Fernandes Industria e Comercio SA	Portugal
87	Pescanova SA	Spain
88	Pharma Mar SA	Spain
89	Prisa Television SAU	Spain

90	Progado Sociedade Produtora de Racoes SA	Portugal
91	Prosegur Cash SA	Spain
92	Quabit Inmobiliaria SA	Spain
93	Quadpack Industries SA	Spain
94	Racoes Progado Centro Sul SA	Portugal
95	Ramada Investimentos e Industria SA	Portugal
96	Recoletos Grupo de Comunicacion SA	Spain
97	Reditus Sociedade Gestora de Participacoes Sociais SA	Portugal
98	Saeta Yield SA	Spain
99	Seafood Global Processor SA	Spain
100	Secuoya Grupo de Comunicacion SA	Spain
101	Sniace SA	Spain
102	Sociedade das Aguas da Curia SA	Portugal
103	Sociedade Turistica da Penina SA	Portugal
104	Solverde Sociedade de Invest. Turisticos da Costa Verde SA	Portugal
105	Somague Sociedade Gestora de Participacoes Sociais SA	Portugal
106	Sonae Arauco SA	Portugal
107	Sotave Sociedade Textil Dos Amieiros Verdes SA	Portugal
108	Sport Lisboa e Benfica Futebol SAD	Portugal
109	Sporting Clube de Portugal Futebol SAD	Portugal
110	Tele Pizza SAU	Spain
111	Telefonica Moviles SA	Spain
112	Telvent Git SA	Spain
113	Tendam Retail SA	Spain
114	Ternor Sociedade de Exploracao de Terminais SA	Portugal
115	Terra Networks SA	Spain
116	Tertir Terminais de Portugal SA	Portugal
117	Toyota Caetano Portugal SA	Portugal
118	Transinsular Transportes Maritimos Insulares SA	Portugal
119	Transportes Azkar SA	Spain
120	Urbar Ingenieros SA	Spain
121	Urbas Grupo Financiero SA	Spain
122	VAA Vista Alegre Atlantis SGPS SA	Portugal
123	VA Grupo Vista Alegre Participacoes SA	Portugal
124	Vertice Trescientos Sesenta Grados SA	Spain
125	Vocento SA	Spain
126	Vueling Airlines SA	Spain
127	Zeltia SA	Spain
128	Zinkia Entertainment SA	Spain

Annex 5 - EViews Results for Eq. 4.2, Pooled OLS, DChange

Dependent Variable: DCHANGE
Method: Panel Least Squares
Date: 07/10/19 Time: 14:30
Sample: 2005 2018
Periods included: 14
Cross-sections included: 103
Total panel (unbalanced) observations: 880
Period SUR (PCSE) standard errors & covariance (no d.f. correction)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.872483	0.333216	2.618366	0.0090
DUMMIE_LOW	-0.083765	0.070669	-1.185313	0.2362
DUMMIE_HIGH	0.090425	0.051353	1.760865	0.0786
IVOL	-5.746497	1.866368	-3.078974	0.0021
LN_SIZE	-0.017686	0.012643	-1.398894	0.1622
LN_TURN50	0.055158	0.016740	3.294893	0.0010
RETURN_5	3.416399	2.532091	1.349240	0.1776
RETURN_50	5.497069	4.096768	1.341806	0.1800
ROE	-0.012109	0.093904	-0.128955	0.8974
ROA___NI_TA	1.826414	0.413131	4.420910	0.0000
LN_BM	0.049293	0.027843	1.770403	0.0770

R-squared	0.051910	Mean dependent var	0.101350
Adjusted R-squared	0.040999	S.D. dependent var	0.614358
S.E. of regression	0.601632	Akaike info criterion	1.834079
Sum squared resid	314.5440	Schwarz criterion	1.893828
Log likelihood	-795.9949	Hannan-Quinn criter.	1.856928
F-statistic	4.757920	Durbin-Watson stat	2.278352
Prob(F-statistic)	0.000001		

Annex 6 - EViews Results for Eq. 4.2, Pooled OLS, DY

Dependent Variable: DY
Method: Panel Least Squares
Date: 07/10/19 Time: 14:36
Sample: 2005 2018
Periods included: 14
Cross-sections included: 103
Total panel (unbalanced) observations: 880
Period SUR (PCSE) standard errors & covariance (no d.f. correction)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004790	0.018241	0.262577	0.7929
DUMMIE_LOW	-0.001563	0.003738	-0.418190	0.6759
DUMMIE_HIGH	0.002718	0.002659	1.022036	0.3070
IVOL	-0.414934	0.108147	-3.836745	0.0001
LN_SIZE	0.000107	0.000679	0.157915	0.8746
LN_TURN50	0.000378	0.000942	0.401677	0.6880
RETURN_5	0.114599	0.140870	0.813513	0.4161
RETURN_50	0.485203	0.207077	2.343107	0.0193
ROE	0.005155	0.005069	1.016833	0.3095
ROA___NI_TA	0.047212	0.022660	2.083476	0.0375
LN_BM	0.003125	0.001626	1.921256	0.0550

R-squared	0.040891	Mean dependent var	-0.001557
Adjusted R-squared	0.029854	S.D. dependent var	0.032670
S.E. of regression	0.032178	Akaike info criterion	-4.022633
Sum squared resid	0.899795	Schwarz criterion	-3.962884
Log likelihood	1780.959	Hannan-Quinn criter.	-3.999784
F-statistic	3.704931	Durbin-Watson stat	2.112305
Prob(F-statistic)	0.000070		

Annex 7 - EViews Results for Eq.4.3, Pooled OLS, DChange

Dependent Variable: DCHANGE
Method: Panel Least Squares
Date: 07/10/19 Time: 14:23
Sample: 2005 2018
Periods included: 14
Cross-sections included: 103
Total panel (unbalanced) observations: 880
Period SUR (PCSE) standard errors & covariance (no d.f. correction)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.975120	0.341350	2.856656	0.0044
DUMMIE_LOW	-1.229707	0.927888	-1.325275	0.1854
DUMMIE_HIGH	0.089600	0.051306	1.746381	0.0811
IVOL	-5.674197	1.864876	-3.042668	0.0024
LN_SIZE	-0.022483	0.013126	-1.712857	0.0871
LN_TURN50	0.055961	0.016714	3.348212	0.0008
RETURN_5	3.467666	2.527740	1.371845	0.1705
RETURN_50	4.951747	4.128230	1.199484	0.2307
ROE	-0.011311	0.093827	-0.120554	0.9041
ROA___NI_TA	1.819305	0.413066	4.404393	0.0000
LN_BM	0.046590	0.027851	1.672826	0.0947
DUMMIE_LOW*LN_SIZE	0.054711	0.044218	1.237291	0.2163

R-squared	0.053581	Mean dependent var	0.101350
Adjusted R-squared	0.041587	S.D. dependent var	0.614358
S.E. of regression	0.601447	Akaike info criterion	1.834587
Sum squared resid	313.9894	Schwarz criterion	1.899768
Log likelihood	-795.2184	Hannan-Quinn criter.	1.859514
F-statistic	4.467414	Durbin-Watson stat	2.280966
Prob(F-statistic)	0.000001		

Annex 8 - EViews Results for Eq. 4.3, Pooled OLS, DY

Dependent Variable: DY
Method: Panel Least Squares
Date: 07/10/19 Time: 14:43
Sample: 2005 2018
Periods included: 14
Cross-sections included: 103
Total panel (unbalanced) observations: 880
Period SUR (PCSE) standard errors & covariance (no d.f. correction)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004496	0.018689	0.240546	0.8100
DUMMIE_LOW	0.001722	0.051197	0.033643	0.9732
DUMMIE_HIGH	0.002720	0.002660	1.022855	0.3067
IVOL	-0.415141	0.108141	-3.838901	0.0001
LN_SIZE	0.000121	0.000703	0.171925	0.8635
LN_TURN50	0.000376	0.000943	0.398924	0.6900
RETURN_5	0.114452	0.140880	0.812408	0.4168
RETURN_50	0.486767	0.208786	2.331416	0.0200
ROE	0.005152	0.005071	1.016153	0.3098
ROA___NI_TA	0.047233	0.022685	2.082142	0.0376
LN_BM	0.003132	0.001633	1.918190	0.0554
DUMMIE_LOW*LN_SIZE	-0.000157	0.002416	-0.064930	0.9482

R-squared	0.040896	Mean dependent var	-0.001557
Adjusted R-squared	0.028741	S.D. dependent var	0.032670
S.E. of regression	0.032197	Akaike info criterion	-4.020366
Sum squared resid	0.899790	Schwarz criterion	-3.955185
Log likelihood	1780.961	Hannan-Quinn criter.	-3.995439
F-statistic	3.364660	Durbin-Watson stat	2.112062
Prob(F-statistic)	0.000143		

Annex 9 - EViews Results for Eq. 4.2, Fixed Effects, DChange

Dependent Variable: DCHANGE
Method: Panel Least Squares
Date: 06/27/19 Time: 17:14
Sample: 2005 2018
Periods included: 14
Cross-sections included: 103
Total panel (unbalanced) observations: 880
Period SUR (PCSE) standard errors & covariance (no d.f. correction)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.826721	0.326221	2.534238	0.0114
DUMMIE_LOW	-0.111414	0.069120	-1.611899	0.1074
DUMMIE_HIGH	0.086382	0.049724	1.737230	0.0827
IVOL	-3.302713	1.889319	-1.748097	0.0808
LN_SIZE	-0.019024	0.012314	-1.544937	0.1227
LN_TURN50	0.048629	0.016433	2.959184	0.0032
RETURN_5	2.939292	2.458868	1.195384	0.2323
RETURN_50	6.322174	4.110709	1.537977	0.1244
ROE	0.029891	0.093309	0.320348	0.7488
ROA___NI_TA	1.608761	0.399162	4.030341	0.0001
LN_BM	0.054693	0.027338	2.000591	0.0458

Effects Specification

Period fixed (dummy variables)

R-squared	0.112232	Mean dependent var	0.101350
Adjusted R-squared	0.088378	S.D. dependent var	0.614358
S.E. of regression	0.586582	Akaike info criterion	1.797885
Sum squared resid	294.5311	Schwarz criterion	1.928247
Log likelihood	-767.0695	Hannan-Quinn criter.	1.847738
F-statistic	4.705039	Durbin-Watson stat	2.281253
Prob(F-statistic)	0.000000		

Annex 10 - EViews Results for Eq. 4.2, Fixed Effects, DY

Dependent Variable: DY
Method: Panel Least Squares
Date: 07/08/19 Time: 10:35
Sample: 2005 2018
Periods included: 14
Cross-sections included: 103
Total panel (unbalanced) observations: 880
Period SUR (PCSE) standard errors & covariance (no d.f. correction)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001682	0.018309	0.091888	0.9268
DUMMIE_LOW	-0.002976	0.003702	-0.803827	0.4217
DUMMIE_HIGH	0.002610	0.002634	0.991159	0.3219
IVOL	-0.344799	0.111497	-3.092454	0.0020
LN_SIZE	0.000117	0.000680	0.171794	0.8636
LN_TURN50	3.97E-05	0.000953	0.041638	0.9668
RETURN_5	0.117666	0.139960	0.840713	0.4007
RETURN_50	0.567829	0.209384	2.711901	0.0068
ROE	0.005538	0.005093	1.087418	0.2772
ROA___NI_TA	0.041461	0.022649	1.830590	0.0675
LN_BM	0.003368	0.001688	1.994884	0.0464

Effects Specification

Period fixed (dummy variables)

R-squared	0.072400	Mean dependent var	-0.001557
Adjusted R-squared	0.047476	S.D. dependent var	0.032670
S.E. of regression	0.031885	Akaike info criterion	-4.026492
Sum squared resid	0.870235	Schwarz criterion	-3.896130
Log likelihood	1795.656	Hannan-Quinn criter.	-3.976639
F-statistic	2.904837	Durbin-Watson stat	2.099668
Prob(F-statistic)	0.000007		

Annex 11- EViews Results for Eq. 4.3, Fixed Effects, DChange

Dependent Variable: DCHANGE
Method: Panel Least Squares
Date: 06/27/19 Time: 17:08
Sample: 2005 2018
Periods included: 14
Cross-sections included: 103
Total panel (unbalanced) observations: 880
Period SUR (PCSE) standard errors & covariance (no d.f. correction)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.900135	0.333927	2.695602	0.0072
DUMMIE_LOW	-0.935851	0.913180	-1.024826	0.3057
DUMMIE_HIGH	0.085579	0.049699	1.721961	0.0854
IVOL	-3.238919	1.888411	-1.715156	0.0867
LN_SIZE	-0.022462	0.012766	-1.759588	0.0788
LN_TURN50	0.049230	0.016417	2.998661	0.0028
RETURN_5	2.956798	2.456229	1.203796	0.2290
RETURN_50	5.872534	4.144952	1.416792	0.1569
ROE	0.031061	0.093268	0.333031	0.7392
ROA___NI_TA	1.604619	0.399155	4.020045	0.0001
LN_BM	0.052717	0.027335	1.928573	0.0541
DUMMIE_LOW*LN_SIZE	0.039371	0.043513	0.904820	0.3658

Effects Specification

Period fixed (dummy variables)

R-squared	0.113080	Mean dependent var	0.101350
Adjusted R-squared	0.088184	S.D. dependent var	0.614358
S.E. of regression	0.586644	Akaike info criterion	1.799202
Sum squared resid	294.2497	Schwarz criterion	1.934995
Log likelihood	-766.6489	Hannan-Quinn criter.	1.851132
F-statistic	4.542107	Durbin-Watson stat	2.283854
Prob(F-statistic)	0.000000		

Annex 12- EViews Results for Eq. 4.3, Fixed Effects, DY

Dependent Variable: DY
Method: Panel Least Squares
Date: 07/08/19 Time: 10:43
Sample: 2005 2018
Periods included: 14
Cross-sections included: 103
Total panel (unbalanced) observations: 880
Period SUR (PCSE) standard errors & covariance (no d.f. correction)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000447	0.018761	0.023834	0.9810
DUMMIE_LOW	0.010896	0.051128	0.213110	0.8313
DUMMIE_HIGH	0.002624	0.002634	0.996327	0.3194
IVOL	-0.345872	0.111465	-3.102969	0.0020
LN_SIZE	0.000175	0.000705	0.247949	0.8042
LN_TURN50	2.96E-05	0.000954	0.030989	0.9753
RETURN_5	0.117372	0.140008	0.838319	0.4021
RETURN_50	0.575394	0.211098	2.725725	0.0065
ROE	0.005518	0.005094	1.083190	0.2790
ROA___NI_TA	0.041531	0.022667	1.832257	0.0673
LN_BM	0.003401	0.001696	2.005282	0.0452
DUMMIE_LOW*LN_SIZE	-0.000662	0.002413	-0.274571	0.7837

Effects Specification

Period fixed (dummy variables)

R-squared	0.072485	Mean dependent var	-0.001557
Adjusted R-squared	0.046449	S.D. dependent var	0.032670
S.E. of regression	0.031902	Akaike info criterion	-4.024311
Sum squared resid	0.870155	Schwarz criterion	-3.888517
Log likelihood	1795.697	Hannan-Quinn criter.	-3.972381
F-statistic	2.784066	Durbin-Watson stat	2.098640
Prob(F-statistic)	0.000012		