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ΘΕΜΑ ΔΙΑΤΡΙΒΗΣ:'' MACROECONOMIC ANNOUNCEMENTS AND BOND MARKET VOLATILITY''

ΦΟΙΤΗΤΗΣ: ΔΟΥΛΓΕΡΑΚΗΣ ΓΙΩΡΓΟΣ

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ABSTRACT

This paper examines the interaction between announcements and volatility in European bond markets, and to what extent conditional volatility is triggered by macroeconomic announcements. As volatility is usually associated with large shocks, which are in turn connected with macroeconomic announcements, it is obvious to test the relation between announcements and asymmetries. Most of the announcements affect market volatility. Results show that macroeconomic news reduces volatility and stabilizes yields. Also, the impact of macroeconomic announcements on bond yields depends on the general state of the economy, for example whether an economy is in an expansion or a recession. In subsamples, macroeconomic releases have the tendency to matter less for more stable economies. Finally, individual macroeconomic news does not have a systematic effect on the daily change in yields and among the most significant macro releases are producer price index, industrial production and unemployment rate.

CONTENTS

1. REVIEW OF LITERATURE

Asset prices are volatile, and this volatility is predictable over time. There is a general consensus in this literature that macroeconomic announcements have important effects on financial markets, both in terms of asset return and their volatility. Also, the efficient market hypothesis implies that asset price change reflects the arrival and processing of relevant macroeconomic news information. While news itself is unpredictable, the release dates of many macroeconomic announcements are known. Financial economists agree about these facts, but they disagree on their implications. A large percentage of the variation in prices appears unpredictable, and identifiable macroeconomic news does not appear to drive much of the volatility of prices. The impact of news releases on volatility is generally ambiguous. If an announcement reveals new information not incorporated in asset prices, volatility has the tendency to rise on the announcement day, as markets adjust their position in response. The basic feature of these announcements is that they represent new information for global market investors. Thus, as regard the aforementioned this paper examines whether the volatility of asset prices and movements in risk premium correspond to the unknown property of this news. More specifically, we test the reaction of bond yields to the release of macroeconomic news. So, our aim is to examine how public information about macro fundamentals influence bond prices.

One article which stands out and its contribution is regarded one of the greatest in the field is Ederington and Lee's (1993). It tests the impact of scheduled macroeconomic news announcement on foreign exchange futures markets and interest rate. It also focuses mainly on the Eurodollar, Deutsche mark futures market and Treasury bond because they opened before 8:30 and provided tick by tick prices. Furthermore, it deems that futures and spot instruments are close substitutes, so their results are generalizable to spot exchange rate markets and interest too. It, at the same time, examines the speed at which the markets adjust to these news releases focusing on both market volatility and efficiency. The conclusions of their report are of paramount importance. First and foremost, they find that the direction of the price adjustments is basically independent of the first minute's price change and the main price adjustment occurs within one minute of the release. Secondly, the examined intraday and day of the week volatility patterns in exchange rate futures market and interest rate are due to the timing of major macroeconomic news. Thirdly, the employment report, the PPI, the CPI, and durable goods orders were the macroeconomic releases with the greatest impact on the interest rates in the 1988 to 1991 period. The employment report, the PPI, the GNP, the merchandise trade deficit and durable goods orders were those with the biggest impact on the dollar-deutsche mark exchange rate.

In the similar vein is the article of Kent G. Becker, Joseph E. Finnerty and Kennety J. Kopecky(1996). So, as Ederington and Lee (1993) focus on the Eurodolllar, Treasury bond and Deutsche mark futures market, the article of Kent G. Becker et al.(1996) focuses on Eurodollar and Treasury bond. They examine the intraday efficiency of Eurodollar and Treasury bond prices to the news content of U.S. macroeconomic releases in which the news is resolved to use MMS (money market services) expectations data. Their empirical analysis differs from that of Ederington and Lee (1993). In their work, market expectations are never

used, and price deviations are defined in terms of the difference between the current market price and its average sample value. As a result, these deviations are not conditioned on available information and can only be used to deduce estimates of the relationship between the releases and the unconditional volatility of returns. As we said before, this study uses MMS forecasts to deduce the news content of the alternative macroeconomic releases. However, in many cases MMS forecasts may be biased and inefficient and thus not in agreement with rational expectations. So for these cases, they constructed tests in order to throw out from the analysis all the forecasts which violate the principles of rationality. The news derived from the remaining forecasts is supposed to represent information available to market participants as of the exact time of the release. As regards their empirical findings, they conclude that the prices of the Eurodollar and T-bond contracts behave anomalously over the course of the trading day with respect to several of the macroeconomic releases. additionally, if markets are efficient, the news should be impounded in market prices quickly but in their analysis it does not occur. So, there are no rational explanations for the failure of future markets to exploit all available information quickly. Possibly the MMS expectations data are biased in some unspecified manner and thus generate spurious response patterns over the course of the day.

Now, another important contribution is given by Suk-Joong Kim and Jeffrey Sheen(2000) examining the impact of scheduled releases of Australian informations on the 10 year Australian government bond futures contract traded on the Sydney Futures Exchange from January 1993 to July 1997. The most significant fact is that most of the market reactions (of volatility and price) to new information were occurred within the first minute following the news release. More specifically, the effects of news on the bond futures price and volatility were short-lived with the most of the volatility focused in the first minute. On the other hand, the news had a sustained effect of raising trade volume throughout the first hour of the release. Furthermore, the releases of higher than expected macroeconomic announcement on the CPI, CAD and the GDP had ejected the bond futures price to fell significantly, whereas an unexpected rise in unemployment rate raised it. They attribute the positive price response to the retail sales news, the CPI and the GDP to higher inflation expectations triggering the bond futures price down and the price response to the unemployment rate to the market's expectation of monetary policy. The article of Tim Bollerslev, Jun Cai and Frank M Song (2000) is in the same direction by offering a detailed study of the intraday patterns in conditional volatility for the US Treasury bond futures contracts that absolutely incorporate all the different volatility components in a coherent framework. Their empirical results are based on a 4-year sample of 5-minute yields from 1994 to 1997. Their analysis shows that public information in the form of regularly scheduled macroeconomic announcement is a significant source of volatility at the intraday level. The announcements having the biggest impact are the Humphrey-Hawkins testimony, retail sales, PPI, the employment rate, the employment cost and the NAPM survey. Their main conclusions are as follow, first they report that the biggest returns in the US treasury bond market have a linkage with the release of macroeconomic announcement. The announcements have the highest marginal explanatory power for the volatility among the three components (calendar, announcements and ARCH effects) at both the intraday and daily frequencies. Second, the existence of two spikes in the intraday volatility at 08:30 and

10:00 (EST), respectively, leading to the regularly scheduled macroeconomic news in the US at these times. This intraday periodicity in the volatility gives rise to a strong daily pattern in the autocorrelation of the five minute returns.

The article of Alessandro Beber and Michael W. Brandt (2003) is in a similar vein. They use data on 30-year US treasury bond futures options to examine the impact of macroeconomic news releases on bond market expectations. So, they investigate the effect of regularly scheduled macroeconomic announcements on the preferences and beliefs of participants in the U.S. Treasury market by comparing the option-implied state-price densities (SPDs) of bond prices shortly before and after the announcements. In their analysis they extracted state-price densities(SPDs) for U.S. Treasury bond futures prices at several times during non-announcement and announcement days using transactions data on bond options traded on the Chicago Board of Trade over a five-year sample period. The SPD, which can be derived from option prices, is different from the objective probability density function (PDF) due to the fact that it embodies the beliefs of market participants about the likelihood of future states with their preferences toward these states. A high value of the SPD for a specific state shows that market participants regard the state to be relatively likely to happen, that they dislike the state, or both. The changes in the SPD associated with the macroeconomic announcements can therefore occur because of changes in beliefs and/or changes in preferences. So they compare SPDs of bond option prices shortly before and after the announcement in order to examine how it changes in reply to the information contained in macroeconomic announcement.

Their findings indicate that the changes in higher-order moments of the SPD depend on whether the news is bad or good. Specifically, bad news has a greater impact on the higher-order moments. Also, the announcements reduce the uncertainty implicit in the second moment of the SPD, regardless of the content of the news. Finally, they report some alternative interpretations for their findings. They consider that the changes in the higher-order moments of the SPD cannot be assigned to variation in the physical price process. In fact, the effect of the announcements on the higher-order moments of the PDF is often precisely opposite to the effect on the higher-order moments of the SPD. They illustrate that the changes in the higher-order moments are in accordance with time-varying risk aversion. Also, an alternative thought is that the changes in the higher-order moments of the SPD are impossible to be explained by mispricing because of trading pressure in the options market. Although, there is some evidence of an effect of buying pressure on the shape of the SPD, this effect is not enough to repel or even to reduce the magnitude of their empirical findings.

Initially, Beber and Brandt (2003) have the idea of incorporating option-implied volatility distribution and macroeconomic news in order to examine the behavior of market expectations around specific events, such as financial crisis. After that, Sami Vahamaa, Sebastian Watzka and Janne Aijo(2004) make a try to extend this idea by examining the impact of macroeconomic news announcements on bond market expectations, as gauged by option-implied probability distribution of future bond returns. Particularly, they try to extend the literature by examining the impact of surprises in scheduled macroeconomic news announcements on volatility, skewness and kurtosis of option-implied probability distribution of future bond returns. Previous studies focus only on the impact of the arrival of scheduled macroeconomic news, and suffer from a possible inadequacy as the actual content of the

announcement is ignored. For example, Ederington and Lee (1993) report that regardless of the contents of the announcement, implied bond market volatility should diminish after the macro news. Sami Vahamaa et al. (2004) use data on futures options on 2-year and 10-year German government bonds. Furthermore, they make an effort to extend the work of Beber and Brandt (2003) by installing two different methods to extract implied distribution. The first method refers to the Gram-Charlier expanded model and the second one is a mixture of lognormal distributions. It is crucial that the German government bond futures and futures options are the most widely traded derivatives in the word, so the impact of macro news on these instruments is a significant example. Now as regards the empirical results, it is extracted that higher-than-expected inflation announcements trigger option-implied bond return distributions to become more negatively skewed or less positively skewed, implying a shift in market participants' perceptions toward future increases in interest rates. Moreover, the results show that expected bond market volatility increases in reply to higher-than-expected inflation and unemployment report, and market expectations of future extreme movements in bond prices are almost unaffected by macro news releases due to the fact that after extreme surprises in inflation announcements investors indicate higher possibilities for extreme movements in bond prices.

As we talk about economic derivatives and the linkage to the release of macroeconomic announcement, there is a working paper of European Central Bank written by Magnus Andersson, Lars Jul Hansen and Szabolcs Sebestyen(2006) which has given a great contribution to this issue. This paper reports the outcomes of macroeconomic data releases and the ECB's monetary policy statements on the German long-term bond futures, a theme having received little attention in the empirical literature. The sample period is from January 1999 to December 2005. In general, the most important findings are that bond prices appear to adjust quickly to new information while macroeconomic news have a stronger and long-lasting effect on volatility. Also, German bond futures market have the tendency to react more strongly to the surprise component in US macro releases compared to domestic and euro area releases, and the strength of those reactions to US macro releases has increased over the period evaluated. A probable explanation is that the euro area data releases are published after the euro area member states have published their data releases, and so the added value of these releases is considered small. In continuation, Arjun Chatrath, Rohan Christie-David and William T. Moore (2006) have given a different approach. They begin with the examination of the behavior of return volatility and trading at 5-minute intervals in the Treasury bond futures market in the context of the monthly macro news cycle. They examine the suppositions that volatility and trading volume are higher in the first half of the month. Their suppositions are supported by two key features of the news release cycle. The first one is that news releases in the first half of the month provide data used in estimating statistics released in later announcements and the second one is that announcements issued in the first half of the month, especially in the first week, yield the first new informations on different sectors of the economy. For example, the employment report is issued on the first Friday of each month and provides statistics for the prior month. Their findings show that bond future prices are more sensitive to trading activity during periods of increased liquidity, especially in the first half of the month. Also, as hypothesized, volatility and trading volume

are more pronounced in the first half of the month, following the release of announcements, compared with the second half.

At this point, having examined the effects of macroeconomic data releases on the bond future markets, now we will examine how public informations about macroeconomic news influences bond market. One of the first extensive surveys of the literature on the effects of macroeconomic announcements on bond markets is given by Michael J.Fleming and Eli M. Remolona (1997). The comparative advantage of their empirical analysis is based on the use of high frequency data on market movements and accurate release times for a comprehensive set of economic announcements. In their analysis they take a close look at a single year in the US treasury market and endeavor to make an explanation of the sharpest price changes and the most active trading episodes. More specifically, they investigate the period during the August 1993 to August 1994 and highlight how many of the market events can attribute to various announcements. They attribute the 25 largest price movements and 25 greatest trading surges to just-released announcements. The occurring surge in trading activity shows the existence of lack of consensus among market participants and that the initial price change is the appropriate adjustment to the new information. Further analysis shows that the greater the magnitude of the surprise in the announcements the stronger the market's reaction. Also, the market regards that the most significant reports, for price movements and trading activity, are the employment, PPI, and CPI. Generally, the results show that the trading and price reactions are not arbitrary reactions but they are reactions that show the differences of information content in the different announcements under different market conditions.

Great contribution has given in this field by Charles M Jones, Owen Lamont and Robin L. Lumsdaine(1998) with their article "Macroeconomic news and bond market volatility". In general, they investigate the reaction of daily Treasury bond prices to the release of US macroeconomic news. In their analysis they focus on a kind of macroeconomic news and risk that is known, and check whether the volatility of asset prices and movements in risk premiums lead to the known properties of this news and risk. More specifically, they examine the response of Treasury bond prices to regularly scheduled US government releases of the employment report and producer price index (PPI) data. The most important features of these macroeconomic announcements are that they are not gathered in time but are exogenously released on preannounced and periodic dates, and they are known to trigger substantial bond market volatility. The first aim of their article is to find how public information about macroeconomic news moves asset prices and the second one is to check whether Treasury bonds earn higher expected returns when exposed to bigger macroeconomic risks. For their results they concentrate on a subset of asset price movements that are connected with observable news about macroeconomic conditions. Standard asset pricing theory predicts that a one-time shock of public news about macroeconomic news should cause a one-time movement in asset prices. When the volatility of macro news is absolutely uncorrelated, the volatility of returns should also be absolutely uncorrelated. Also, standard theory foresees that if an increase in macroeconomic risk exists at a predictable time, assets exposed to the risk should earn higher expected returns at the time of higher expected risk. At this point, they refer that these predictions are confirmed by their data.

Furthermore, their results confirm the idea that expected returns are predictable due to the fact that fundamental risk is predictable.

A framework similar to Charles M Jones, Owen Lamont and Robin L. Lumsdaine(1998), Charlotte Christiansen (2000) examines the effects of macroeconomic announcement on the covariance structure of US government bond returns for six different maturities. Particularly, the author scrutinizes the results that releases of the employment and the PPI reports, published by the bureau of labor statistics, have on the conditional covariance of daily excess returns of 2, 3, 5, 7, 10, and 30-year government bonds during the period 1983 to 1998. Until the analysis of Christiansen(2000), no empirical analysis have investigated the effects of macroeconomic announcements on the covariance structure of government bond returns. Hence, the goal of this investigation is to present an improvement of the univariate analysis of responses to risk, which according to Charles M Jones et al.(1998) is a possible limitation of the existing literature. The interest is based on the fact that macroeconomic news effects on the covariance structure of government bonds exert influence to the capital requirements of a commercial bank holding government bonds and also might alter the optimal weights of an investor's portfolio. The empirical results are of great interest, too. Initially, the correlation coefficients are relatively large and are greater the closer the bonds are to the time to maturity. Furthermore, the conditional covariance, conditional variances and correlations coefficient are greater on announcement days than on non-announcement days. Negative announcements shocks typically have a greater impact on the subsequent volatility than positive announcement shocks. Additionally, the conditional covariance of government bonds with not similar maturities is enhancing with the time to maturity of either of the bonds. The last one, maturity dependency is considerably dampened on announcement days and, thus, releases of macro news cause common movement in the government bond market that make the correlation stronger.

As regard the aforesaid, an article which is very close in spirit to the previous, is the "Economic news and the yield curve: Evidence from the U.S. treasury market" written by Pierluigi Balduzzi, Edwin J Elton and T Clifton Green(1997). They explore the impact of 27 different economic news announcements on the bond market using intra-day data. In their paper, the surprise components of macroeconomic announcements are considered, where expectations of the variables are taken from surveys of money market managers. They report a total of seventeen economic announcements to have an important impact on the price of at least one of the following instruments: a two and ten-year note, a three-month bill, and a thirty-year bond. The most important results of their empirical analysis are the following: the price of the ten-year note reacts to 16 announcements, the price of the two-year note reacts to 15 announcements, and the thirty-year bond reacts to 10 announcements. In contrast, the tree-month bill price is importantly affected only by three announcements. Also, the most important announcement is the Non-farm Payroll(which is published in the employment situation report), and the second most important variable is the PPI figure. Of great interest is the incorporation of economic announcement in bond prices within one minute of the announcement. It highlights that the inner market for US government bonds is highly efficient. Furthermore, the ten-year note shows a strong association between news releases and trading volume. This effect is not so strong for the three-month bill, though trading in this instrument is considerably high in reply to changes in monetary policy. The last one refers the

fact that the bid-ask spreads on the ten-year note and the three month bill widen at the time of the announcement, but immediately after the release they revert to their usual magnitude.

The article of Peter de Goeij and Wessel Marquering(2004) is in the same direction. They investigate the impact of pre-scheduled macroeconomic news on the conditional volatility of bond returns. More specifically, they examine to what extend asymmetric volatility is explained by macroeconomic announcements, whether scheduled news differs from non-scheduled news, and the linkage between announcement and volatility. In their empirical analysis, they use daily data from January 1982 to September 2004 on 1, 3, 5 and 10 year US treasury bonds and two corporate indices. Their results are of great interest. Initially, after distinguishing between types of macro announcements they find that releases of monetary policy seem to affect short-term bond volatility, while employment report and PPI are particularly influential at the intermediate and long end of the yield curve. Furthermore, their empirical results show that the bond market integrates the hints of macroeconomic news faster than other information. This analysis is different from previous empirical research in the subsequent ways. First, they use a wide variety of announcements dataset of sixteen types of announcements. With this manner, the effects of announcements are possibly gauged in a better way. Second, they interrelate the effects of announcements on volatility and the asymmetric volatility phenomenon. Thus, while Balduzzi et al.(1997) and Beber and Brandt (2003) regard many announcements in the bond market, they do not investigate their effect on bond market volatility. Third, this article is the first that examines announcements of Federal Open Market Committee(FOMC) together with PPI and EMP report. The results show that EMP and PPI announcements are the most significant for long-term bonds, whereas FOMC news are important for short-term bonds. Fourth, Christiansen (2000) measures the effect of news by generating a dummy variable for announcements, whereas Goeij and Marquering regard the surprise element in the macro news by using survey forecasts. This might gauge news better, because some announcements are expected and will not exert influence to returns and volatility.

Now, We will expand our review of literature with the article of T. Clifton Green(2004). The author studies the influence of macro news releases on the informational role of trading in the US government bond market and how this role varies around news releases and with characteristics of the announcement. Generally, government bond markets provide a chance to make clear the relation between information asymmetry and the informational role of trading. US treasury securities have fixed and nearly riskless cash flows. Does order flow reveal information in a market with no private information about cash flows? If so, what is the source of the informational asymmetry? These are two question which the author make an effort to illustrate by studying the impact of trading on government bond prices surrounding the release of macro news. The empirical results are of great importance. The author reports that the sensitivity of prices to order flow is lower than usual before economic announcements. The informational role of trading goes up following announcements, illustrating that the release of public information increases the level of government bond market. Furthermore, macro announcements lead to high liquidity as well as raised trade impact, showing that the release of economic information produces uncertainty about the appropriate level of riskless rates. The results illustrate that information asymmetry in the government bond market does not derive from the absence of public

information, but from the differences in the ability of market participants to interpret the information.

Compared to mature bond markets, few studies have examined the role of macroeconomic surprises on financial markets in emerging countries. This is a notable gap in the literature, especially given the growing importance of emerging bond markets. So, Jochen R. Andritzky, Geoffrey J . Bannister and Natalia T. Tamirisa(2007) investigate how emerging market bonds react to macro announcements. They make an effort to expand the literature by investigating announcement effects in the global emerging bond market, providing a point of comparison with the findings for mature markets. In their empirical analysis they estimate the effects of various types of macroeconomic and policy announcement on the daily change in emerging market bond spreads and their volatility. They use a GARCH model for their analysis which covers announcements of industrial production, GDP, the trade balance, consumer prices, the fiscal balance, local interest rate announcements and country rating actions for 12 emerging market countries from January 1998 to July 2004. Additionally, they take a close look at the effects of U.S. policy interest rate announcements to measure the significance of changes in the international financial market. The empirical results are widely consistent with, and in some cases stronger, than those for mature markets. Their analysis reports that announcement effects in emerging markets vary in relation to the characteristics of the country. Both individual announcements and ratings actions have the tendency to matter less for countries with great trasparency, while for countries whose bonds have investment grade ratings, individual announcements tend to matter less, but rating actions remain important. Also, in a crisis, rating actions become less significant probably due to the fact that it becomes more difficult to interpret and investors turn their attention to other types of higher frequency news, for example, political news. In addition, while most domestic macroeconomic data releases do not appear to exert influence to global spreads directly, they are found to have a significant, and most of the times negative, effect on volatility. To the contrary, country rating actions and U.S. interest rate changes affect both the daily change in spreads and their volatility. These effects are observed even without manipulating for the surprise content of announcements, showing that most announcements represent new information for emerging market investors.

The previous article was the standpoint of Natalia T. Tamirisa et al.(2007) but in a similar spirit is the examination of Tamirisa and other three Sylwia Nowak, Jochen Andritzky and Andreas Jobst(2011). They provide evidence of the volatility dynamics of emerging bond markets and the role of regional, local, and global macroeconomic and monetary policy announcements in the price discovery process in these markets. They model 10-min returns and volatility using intraday data on the most liquid external emerging market bonds (Brazilian, Russian, and Turkish) for the period from October 2006 to February 2008. When analyzing market reaction to news, they distinguish two types of adjustment: repricing and repositioning. Repricing includes a shift in asset prices as traders perceive the implications of public news for the fair value of a bond and repositioning includes an increase in trading activity, as investors rebalance their portfolios in light of new information to fit their risk preferences. Their empirical results are consistent with theoretical predictions, while showing similarities and differences in responses of emerging and advanced market bonds to news. Firstly, the results show that the absorption of new information is existing much more slowly

in emerging markets than in mature ones. Secondly, as in studies of mature bond markets (Fleming and Remolona, 1997; Balduzzi et al., 1997), Tamirisa et al.(2011) find that the initial price adjustment upon the arrival of new information is small and disappears within minutes of the announcement. The magnitude and direction of the response are broadly similar for emerging and US bonds at high frequencies. A useful and basic result is that market reaction weakens when indicators are released at random during the day or do not follow a pre-scheduled release.

Now, the report of Einari Jalonen, Sami Vahamaa and Janne Aijo(2010) is of great importance in this field but not exactly in the same framework. They concentrate on the turn-on-the month and intramonth effects in government bond returns. The turn-on-the month and intramonth effects are two well-known anomalies that have been reported in the existing literature. So, they use data on 2-year and 10-year US treasury notes and German government bonds, and try to examine whether these anomalies are related to the clustered release of macroeconomic news. Their empirical results show that the turn-of-the-month effect is not triggered by the clustered release of macro news and that the origin of the turn-of-the-month(TOM) impact is not the same across asset classes. Also, they report a modest TOM effect with positive bond returns on the last trading day of the month. Finally, they document no evidence of intramonth effects in government bond returns.

At this point, we wiil study the comovement between stock and bond, and attempt to explain the economic driving forces behind this relationship. The correlation of stock and bond plays a pivotal role in investors' diversification and asset allocation decisions. So, We will start with the article of Eli M Remolona (1991). The author examines almost two decades of market experience in the United Kingdom, Japan and the United States. The discussion first based on the degree to which macroeconomic fundamentals and foreign market movements explain domestic market movements. It then examines whether a hypothesis counting on market movements, conveys information about fundamentals, which can make clear the strong international reactions markets have to one another. In addition, this article investigates one probable source of volatility: a tendency of market participants to react excessively to developments in other markets. The empirical analysis yields some evidence that bond and stock markets move together to an extend not easily explained by changes in macro fundamentals. So, the evidence shows that the participant in the Japanese and U.S. stock markets and in the U.K., Japanese and U.S. bond markets react excessively to one another's market movement. However, the author illustrates that stock markets move together more closely than would be expected from the links between domestic and foreign real activity. The evidence on bond markets is less consistent, but the three markets appear to move together more closely than would be expected from the links between domestic and foreign inflation. Furthermore, of the domestic fundamentals, future inflation is found to be the main force manipulating the bond market, and future real activity, the main force manipulating the stock markets.

The paper of Lingfeng Li(2002) is in the same direction. The author tests the link between macroeconomic factors and the stock-bond correlation. They expand the usual scope of this literature from U.S. to all G7 markets, which increases the significance of the conclusions. Furthermore, they illustrate the economic importance of this link from the perspective of a risk-averse investor. This paper focuses on the stock-bond correlation at

monthly frequency. The main empirical results are, firstly, the author reports forecasting stock-bond correlations based on macroeconomic factors assist improve investors' asset allocation decisions. Secondly, uncertainty about long-term expected inflation plays a significant role in resolving the major trends of stock-bond correlations. Greater concerns for future inflation are possibly to result in stronger comovement between stock and bond returns. Finally, they show that the uncertainty about other macro factors, such as the unexpected inflation and real interest rate, also influences the comovement of stock-bond returns, but to a lesser degree.

More recently, a literature is beginning to emerge which considers the impact of macroeconomic announcements across financial markets rather than for individual markets in isolation. Suk-Joong Kim, Michael D. McKenzie and Robert W. Faff (2004) examine the impact of scheduled government announcements relating to six different macroeconomic variables on the risk and return of U.S. stock, bond and foreign exchange markets. They concentrate on the announcement event only without consider for the actual information revealed to the market by that announcement. However, one main feature of scheduled news arrivals is that the market makes expectations regarding the upcoming scheduled information release. To the extent that traders take positions relied on their expectations of future events, the anticipated measure for the upcoming scheduled news announcement will be significant in determining the reaction of the market. Hence, the significant fact is to what extent the actual announcement differs from the expected which determines the response of the market to the new information.

The key contributions are three. Firstly, the main goal is to acknowledge the role of market expectations in deciding the market's reply to macro announcements. The testing of both the release of informations to the market as well as the news content of that informations will provide significant evidence into what ejects market responses to the release of macroeconomic news. Secondly, this paper will regard a wide range of announcements across a number of financial markets. So, the conclusions will give a thorough knowledge into the complex way in which different financial markets interact and into the differential dynamics of various markets. Thirdly, the paper provides informations on the reply of financial markets to macroeconomic news announcements. The empirical results are of great interest. First and foremost, this paper suggests that it is not the act of releasing macroeconomic informations which the market regards to be significant, but rather the 'news' content of each announcement. Also, an interesting but largely unexplained aspect of the current research is that the arrival of positively signed and negatively signed news does not necessarily enhance volatility as is often hypothesized. For some markets, informations was found of a volatility dampening effect on the arrival of certain types of announcements. It is crucial that little evidence could be found of returns replying to non-price news about the state of the economy which may illustrate that trading in these markets is dominated by short term traders with little interest in a company's real value. Finally, for the three markets examined, balance of trade news was found to have the greatest impact on the foreign exchange market. In the bond market, news related to the internal economy was found to be important and in the stock market, producer and consumer were important.

In continuation, Bala Arshanapalli, Edmond d'Ouville, Frank Fabozzi and Lorne Switzer(2006) make an attempt to model stocks and bonds jointly in order to examine the

impact of macroeconomic announcements on the evolution of the volatility structure. So, They investigate the effects of macroeconomic news on time-varying covariance as well as time-varying volatility, and whether such news causes time-varying risk premia in the U.S. stock and bond markets. In their empirical analysis, they use a simple theoretical derivation that lets them to set up a GARCH-in-mean model of stock and bond returns in terms of both conditional covariances and variances. Second, they investigate empirically how major macro news reports, exactly the employment report, the industrial production, and Producer Price Index (PPI) releases, influence the conditional covariance and conditional volatility of stocks and bonds. As regard their empirical findings, they reveal that the macroeconomic announcements of the PPI and employment influence both stock and bond volatility and the conditional covariance of stocks and bonds. Also, they highlight that conditional second moments of excess returns in stocks and bonds vary with time in response to macroeconomic factors. Finally, the results illustrate that both stock and bond premia are positively related to conditional variance and covariance.

Chronologically, the article having shown great interest is written by Alessandro Beber and Michael W. Brandt(2008). The main aim of this paper is to investigate how and to what extent the ex-post resolution of uncertainty in financial markets is related to the ex-ante uncertainty of market participants about the state of the economy. They measure macroeconomic uncertainty by using prices of economic derivatives and link this measure to changes in implied volatilities of stock and bond options when the macroeconomic data is released. Macroeconomic uncertainty is unobserved and therefore innately difficult to quantify. So, they gauge macroeconomic uncertainty using prices of economic derivatives traded in a new auction-based market launched in 2002 jointly by Goldman Sachs and Deutsche Bank. These economic derivatives embody explicit bets on news about macro fundamentals and their option-implied second moments therefore provide a direct hint of how unsure market participants are about the news release. Their empirical analysis has three levels. Firstly, they reassure that that stock and bond markets react to macroeconomic announcements in their sample period. Secondly, they extract a model-free measure of macroeconomic uncertainty from the observed prices of economic derivatives. Thirdly, they relate macroeconomic uncertainty to the changes in model-free implied variances of stock and bond options when the macroeconomic data is released in addition to the changes in transacted activity and open interest in bond and stock option markets.

The empirical results show that higher ex-ante uncertainty about macroeconomic fundamentals is connected with greater reduction in the implied volatility of stock and bond options when the macroeconomic data are released. The results are more noticeable for bonds than for stocks, and the effect does not appear to be temporary. Furthermore, they found that the bonds relationship between macroeconomic uncertainty and changes in implied variance is economically and statistically highly important. Finally, as regards the link between macroeconomic uncertainty and trading behavior, they find indications that the degree of uncertainty affects the trading strategies used by market participants for both options written on cyclical stocks and on treasury bond futures significantly.

In this paper, we seek to extend the literature by examining macroeconomic announcement effects in weak and strong European bond markets such as PIIGS (Portugal, Ireland, Italy, Greece and Spain) and Germany, respectively. Thus, we investigate the

interaction between announcements and volatility, and to what extent conditional volatility is triggered by macroeconomic announcements. As asymmetry is usually associated with large shocks, which are in turn connected with macroeconomic announcements, it is obvious to test the relation between announcements and asymmetries. More specifically, we investigate the response of Treasury bond yields to new releases of macroeconomic announcements including PPI, CPI, Industrial Production, Unemployment Rate, Trade Balance and GDP. We use daily data from March 1998 to November 2013 on 10 year European Treasury bonds, providing a total of 4092 observations. Also, this paper differs from previous empirical papers in the following ways. Firstly, whereas all studies, as far as we know, testing announcement effects on bond volatility use few types of announcements (usually one or two), we examined all the previous relevant studies and chose the macroeconomic announcements which had the greatest impact on bond yields. This way, the effects of announcements are probably gauged in a better way. Secondly, while the articles more close in spirit to our research, Fleming and Remolona (1997) and T.Clifton Green(2004), gauge the surprise element of releases by using survey forecasts, we regard the effects of macroeconomic releases by introducing a dummy variable for announcements. This might gauge news better because we focus only on the actual date of the announcement and not to the expected releases. Thirdly, knowing that the global economic crisis, which has disturbed the global markets, has started since 2007 from US and also accepting the economic importance having for researchers we decided to include this event to our event study. So, we broke the sample in two pieces, the first one is from March 1998 to December 2006 and the second one is from January 2007 to November 2013. This way assists us to explore the attitude of the markets before and during the crisis and if this attitude expands further the impact of macroeconomic releases on bond yields.

The next sections report the relevant empirical studies on the effects of macroeconomic releases and policy announcements on financial markets. Section 2 quotes our data sources and presents the preliminary analysis. Section 3 describes our empirical approach and methodology, section 4 presents empirical results for our ARCH and GARCH estimations and measurements over subsamples of the data. Section 5 sums up the conclusions.

2. DATA AND PRELIMINARY ANALYSIS

In our study we examine daily returns on ten-year Treasury Bonds of PIIGS(Portugal, Ireland, Italy, Greece and Spain) and Germany. So, our dependent variable is the daily percentage change in bond yields. We focus on the relative change in yields to provide a uniform scaling and allow comparison across countries and time. We chose the ten-year treasury bonds, because first they are the most usable and second are of our interest in macroeconomic releases. The data time period is from March 1998 to November 2013 due to our mere need for a large amount of data in order to maximize the probability to estimate

models with conditional heteroskedasticity. Furthermore, we wish to run our sample for more years but our source of data (Bloomberg) has yields for Greek treasury bonds only from 23 of March 1998 and on, so we forced to remain to this date for all the other countries.

The main independent variables are dummy variables for six different types of policy or macroeconomic announcements. These types are CPI(consumer price index), PPI(producer price index), IP(industrial production), GDP(gross domestic product), Tr.Balance(trade balance) and Un.RATE(unemployment rate). We collected data from Bloomberg's calendars of events. More specifically, we checked all the data and when we saw an announcement of the above we put the price "1" at this date, otherwise we put '0'. In this way, we create our Dummy variables. At this point we wish to highlight that each type of announcement(CPI, PPI, GDP, ….) had two and more different types of announcement in some cases, as an example GDP mom, GDP yoy, CPI mom, CPI yoy and many others. In this case, we measure all the announcements with dummy variables, irrespective of the fact that the announcements were not exactly the same with the ones we were looking for. Of paramount importance is the fact that in Greece we do not have announcements for Tr.Balance and PPI altogether, and for Portugal Tr.Balance announcements start from 2003. Furthermore, Spain has a gap from 2003-2007 to the Tr.Balance announcements. In Table 1 we report the number of announcements for each one of the countries for the whole sample.

Table 1

	Portugal	Italy	Ireland	Greece	Spain	Germany
CPI	187	437	188	161	239	610
PPI	177	185	188	0	130	183
IP	175	176	158	126	188	271
Tr.Balance	120	278	162	0	144	188
Un.Rate	57	99	183	120	132	189
GDP	81	147	51	73	96	117

Source: Bloomberg
Period: 23/3/1998 to 29/11/2013
The table shows the total number of announcements per country.

Now, regarding the dependent variables we collected data from the database of Bloomberg and processed them in order to be suitable for GARCH and ARCH models. Initially, it is common to test if the time series (bond yields) are stationary. A series is said to be (weakly or covariance) stationary if the mean and autocovariances of the series do not depend on time. Any series that is not stationary is said to be non-stationary. There is a major problem with regressions that involve non-stationary variables as the standard errors

produced are biased. The bias means that conventional criteria used to judge whether there is a casual relationship between the variables are unreliable, so non-stationary variables can give misleading parameter estimates of the relationships between variables.

A common example of a non-stationary series is the random walk:

$$y_t = y_{t-1} + \varepsilon_t,$$

where ε_t is a stationary random disturbance term. The y_t series has a constant forecast value, conditional on **t** and the variance is increasing over time. The random walk is a difference stationary series since the first difference of y_t is stationary:

$$y_t - y_{t-1} = (1-L)\, y_t = \varepsilon_t$$

A difference stationary series is said to be integrated and is denoted as **I(d)** where **d** is the order of integration. The order of integration is the number of unit roots contained in the series, or the number of differencing operations it takes to make the series stationary. For the random walk above, there is one unit root, so it is an I(1) series. Similarly, a stationary series is I(0). Standard inference procedures do not apply to regressions which contain an integrated dependent variable or integrated regressors. Therefore, it is important to check whether a series is stationary or not before using it in a regression. The formal method to test the stationarity of a series is the unit root test. E-Views provides us with a variety of powerful tools for testing a series (or the first or second difference of the series) for the presence of a unit root. The most usable tests are Augmented Dickey-Fuller (1979) and Phillips-Perron (1988).

Table 2

Unit root tests	Germany	Greece	Italy	Ireland	Portugal	Spain
ADF	0,8016	0,3551	0,0427	0,3341	0,5060	0,1028
PP	0,8091	0,3061	0,0630	0,3203	0,3629	0,0892

ADF: Augmented Dickey-Fuller test
PP: Phillips perron test
Null hypothesis: bond spreads has a unit root
Alternative hypothesis: bond spreads are stationary
Significance level 5%

So, we had to do unit root tests in order to see if our time series are not stationary. The results of our tests are represented in Table 2 and we can see that p-values are all above significance level apart from ADF test of Italy which is in the limit. This fact means that we accept null hypothesis. Hence, our time series are non-stationary and we have to take the first differences in order to make the series stationary.

Table 3

Unit root tests	Germany	Greece	Italy	Ireland	Portugal	Spain
ADF	0,0001	0,0001	0,0001	0,0001	0	0
PP	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001

ADF: Augmented Dickey-Fuller test
PP: Phillips perron test
Null hypothesis: bond spreads has a unit root
Alternative hypothesis: bond spreads are stationary
Significance level 5%

Taking the first differences and doing again the same unit root tests we end to the results of table 3. These results show us that taking into consideration the significance level of 5% we have to reject the null hypothesis and accept the alternative which says that the time series are stationary. Having ensured stationarity, we can use our variables in order to estimate the regression of interest.

3. METHODOLOGICAL APPROACH

Based on the literature of mature markets, we will investigate the effects of macroeconomic announcement on daily treasury bonds yields by employing a GARCH(1,1) model of Bollerslev (1986). Perhaps, this is the most commonly used model of financial asset return volatility. Though it is not absolutely the correct specification of the return-generating process, it is an important benchmark, because the same model has been estimated across a number of asset classes and sampling frequencies. Furthermore, it gives the chance to us to assess the long memory effects detectable in most financial variables by conditioning the variance of the daily change in spreads on past events. Initially, we will explain some basic features of ARCH and GARCH regression models.

3.1 ARCH AND GARCH MODELS

While conventional time series and econometric models operate under an assumption of constant variance, the ARCH (Autoregressive Conditional Heteroskedasticity) process introduced in Engle (1982) allows the conditional variance to change over time as a function of past errors leaving the unconditional variance constant. An ARCH process can be defined in a variety of contexts. We will define it in terms of distribution of the errors of a dynamic linear regression model. The dependent variable $\boldsymbol{R_t}$ is assumed to be generated by

$$\boldsymbol{R_t = X_t\xi+\varepsilon_t} \qquad \textbf{t=1,…….,T} \qquad \textbf{(3,1,1)}$$

Where $\boldsymbol{X_t}$ is a λ×1 vector of exogenous variables, which may contain lagged values of the dependent variable, and ξ is a λ×1 vector of regression parameters. The ARCH model characterizes the distribution of the stochastic error $\boldsymbol{\varepsilon_t}$ conditional on the realized values of the set of variables $\boldsymbol{\psi_{t-1}=\{R_{t-1}, X_{t-1}, R_{t-2}, X_{t-2},……..\}}$. Specifically, Engle's (1982) original ARCH model assumes

$$\boldsymbol{\varepsilon_t |\ \psi_{t-1} \sim N(0, h_t)} \qquad \textbf{(3,1,2)}$$

Where

$$\boldsymbol{h_t = a_0 + a_1 \varepsilon_{t-1}^2 + \ldots\ldots\ldots\ldots\ldots + a_q \varepsilon_{t-q}^2} \qquad \textbf{(3,1,3)}$$

with $\boldsymbol{a_0>0}$ and $\boldsymbol{a_i \geq 0,\ i=1,……..,q}$ to reassure that the conditional variance is positive. Note that since $\boldsymbol{\varepsilon_{t-i}=R_{t-i} - X_{t-i}\xi}$, $\boldsymbol{i=1,……q,}$ $\boldsymbol{h_t}$ is clearly a function of the elements of $\boldsymbol{\psi_{t-1}}$.

The distinguishing feature of the model **(3,1,2)** and **(3,1,3)** is not simply that the conditional variance $\boldsymbol{h_t}$ is a function of the conditioning set $\boldsymbol{\psi_{t-1}}$, but rather it is the particular functional form that is specified. Episodes of volatility are generally characterized as the gathering of large shocks to the dependent variable. The conditional variance function **(3,1,3)** is created to mimic this phenomena. In the regression model, a large shock is represented by a large deviation of $\boldsymbol{R_t}$ from its conditional mean $\boldsymbol{X_t\xi}$, or equivalently, a large positive or negative value of $\boldsymbol{\varepsilon_t}$. In the ARCH regression model, the variance of the current error $\boldsymbol{\varepsilon_t}$, conditional on the realized values of the lagged errors $\boldsymbol{\varepsilon_{t-i}}$, $\boldsymbol{i=1,……q,}$ is an increasing function of the magnitude of the lagged errors, irrespectively of the signs. Thus, large errors of either sign tend to be followed by a large error of either sign. Similarly, small errors of either sign tend to be followed by a small error of either sign. The order of the lag "q" decides the length of time for which a shock persists in conditioning the variance of subsequent errors. The larger the value of "q", the longer the episodes of volatility will tend to be.

Regarding the ARCH regression models, we understand that this process introduced by Engle (1982) explicitly recognizes the difference between the unconditional and the conditional variance allowing the latter to change over time as a function of past errors. After further research, in empirical applications of the ARCH model a respectively long lag in the conditional variance equation is often called for, and to avoid problems with negative

variance parameter estimates a fixed lag structure is typically imposed. In this way it appears of immediate practical interest to extend the ARCH class of models to allow both a longer memory and a more flexible lag structure. This expansion in the literature has been made by Bollerslev (1986).

Let $\boldsymbol{\varepsilon_t}$ denote a real-valued discrete-time stochastic process, and $\boldsymbol{\psi_t}$ the information set of all information through time t. The GARCH(p, q) process (Generalized Autoregressive Conditional Heteroskedasticity) is then given by

$$\boldsymbol{\varepsilon_t | \ \psi_{t-1} \sim N(0, h_t)} \qquad \textbf{(3,1,2)}$$

$$\boldsymbol{h_t = a_0 + \sum_{i=1}^{q} a_i \ \varepsilon_{t-i}^2 + \sum_{i=1}^{p} \beta_i \ h_{t-i}} \qquad \textbf{(3,1,4)}$$

Where

$\boldsymbol{p \geq 0}$, $\boldsymbol{q > 0}$

$\boldsymbol{a_0 > 0}$, $\boldsymbol{a_i \geq 0}$, $\boldsymbol{i = 1, \ldots\ldots, q}$

$\boldsymbol{\beta_i \geq 0}$, $\boldsymbol{i = 1, \ldots\ldots, p}$

The GARCH(p,q) regression model is obtained by letting the $\boldsymbol{\varepsilon_t}$**'s** be innovations in a linear regression,

$$\boldsymbol{\varepsilon_t = R_t - X_t \xi} \qquad \textbf{(3,1,5)}$$

Where $\boldsymbol{R_t}$ is the dependent variable, $\boldsymbol{X_t}$, a vector of exogenous variables, and ξ a vector of regression parameters. So, the **(3,1,4)** regression exists in order to cover and improve the drawbacks of ARCH regression models.

3.2 MAIN METHODOLOGY

Now, knowing little about the features and meaning of ARCH and GARCH regression models, we will represent our adjusted regression models. We begin by estimating a univariate GARCH(1,1) model of daily treasury bond returns adjusted for announcement-day effects. Also, We use an AR(1) process to model excess returns and having in mind to

minimize the possibility of finding asymmetric effects in variances due to misspecification in the mean we include a dummy variable which captures the effects of announcements on bond returns.

$$R_{i,t+1} = c_i + \gamma_i R_{i,t} + \sum_{\kappa=CPI}^{GDP} \delta_{j,\kappa} D_{j,\kappa,t+1} + u_{i,t+1}\varepsilon \quad \textbf{(3,2,1)}$$

$$\mathrm{E}(u_{i,t+1}) = 0 \quad \textbf{and} \quad \mathrm{E}(u_{i,t+1}^2) = h_{i,t+1} \quad \textbf{(3,2,2)}$$

$$h_{i,t+1} = \lambda_{i,0} + \lambda_{i,1} u_{i,t}^2 + \lambda_{i,2} h_{i,t} + \sum_{\kappa=CPI}^{GDP} \mu_{j,\kappa} D_{j,\kappa,t+1} + \varepsilon_{i,t+1} \quad \textbf{(3,2,3)}$$

In this set up, the mean equation **(3,2,1)** includes a constant c_i and an autoregressive term $R_{i,t}$ in addition to the announcement dummies. $D_{j,\kappa,t+1}$**=1,** if there is macroeconomic news at time t and 0 otherwise, and $u_{i,t+1}$ denotes the unexpected excess return. The timing of macroeconomic news announcements is known by the economic agents. The coefficient $\delta_{j,\kappa}$ is typically larger than zero, as news arrivals are connected with higher risk. Thus, $\delta_{j,\kappa}$ could be interpreted as a premium for bearing the news arrival risk, **j=Germany, Greece, Ireland, Italy, Portugal, Spain**. Moreover, we estimate an autoregressive model for the first moment because most of the times we find small but highly significant autocorrelation in Treasury bond returns. We also estimate a model with higher-order autoregressive terms, but the higher-order terms are insignificant and thus are excluded. The residual variance **(3,2,3)** is modeled explicitly, using a constant $\lambda_{i,0}$ and the ARCH and GARCH coefficients, $\lambda_{i,1}$ and $\lambda_{i,2}$ for which $\lambda_{i,1}, \lambda_{i,2}$**>0** and$\lambda_{i,1} + \lambda_{i,2}$**<0** to ensure positive and stationary residual variance. Also, we have to refer that **i=Germany, Greece, Ireland, Italy, Portugal, Spain** and **k=CPI,……..,GDP** represent the countries and macroeconomic announcements, respectively.

At this point, we want to highlight the fact that our methodology has three significant points. First and foremost, we run the whole sample together, meaning that we take the bonds yields of Germany and regress them separately with each country's announcements. After Germany, we take all other countries' bond yields doing the same. This one was the first stage, for the second and third, we break the sample to two pieces. The first one is from 1998 to 2007 and the second one from 2007 to 2013. At the second and third stage, we do exactly the same thing as the first stage in order to examine the impact of macroeconomic announcements on treasury bond yields before and during the global economic crisis.

4. EMPIRICAL RESULTS

Initially, we have to refer once again that the most commonly used model of financial asset return volatility is the GARCH(1,1) model proposed by Bollerslev (1986). Although, it is not absolutely the correct specification of the return-generating process, it is an important benchmark, because the same model has been estimated across a number of sampling frequencies and asset classes. So, generally speaking we find that individual macroeconomic releases do not have a systematic effect on the daily change in yields, but they often have a significant effect on the volatility of yields. Data releases tend to lower volatility of Eurozone market bond yields. European policy announcements have the tendency to increase yields and lower volatility of bond markets. Also, bonds earn higher returns when they are more exposed to macroeconomic risk. Hence, in this section we try to find ways of modeling volatility, which allow us to estimate jointly both the pattern of conditional heteroskedasticity and the size of the risk premium. With respect to risk premium, we mean that the greater the risk premium the bigger the coefficients of our multivariate GARCH(1,1) and AR(1) models.

Furthermore, the time to maturity and the expansion of maturity of the European bonds is an issue of great importance in accordance with Christiansen (2000). They said that the coefficients of the GARCH model are relatively large and are greater the closer the bonds are with respect to the time to maturity. So, the reconstruction of the public debt and the expansion of maturity of treasury bonds, for weak economies such as Greece, Ireland and Portugal, have an impact to the conditional volatility during the global and by extension the European financial crisis.

In our examination we find results for bond yields of six different countries. Although, all the results are significant, we will give close attention to three countries. These countries are Greece, Ireland and Portugal. As regards the results of Germany, Italy and Spain, they are in Appendix. We choose Greece, Ireland and Portugal for two reasons, first because of the close correlation between them and second due to the fact that these three have the biggest financial problems in the Eurozone. Also, we know that Greece's crisis, which has started since 2010, has numerous broader policy implications. There is concern that Greece's crisis could spill over to other European countries in difficult economic positions, including Portugal and Ireland.

At this point, we will present our empirical results. Results are separated in three sections. In Section 4,1 we will presents our empirical results for full sample. In section 4,2 we will present our results before global crisis and in section 4,3 during global crisis.

4.1 EMPIRICAL RESULTS FOR ENTIRE SAMPLE

We will start analyzing the reactions of bond yields for whole sample. The first country is Greece and follows Ireland, Portugal. We will try to see the differences which are significant and assist us to make an interesting conclusion for bond movements.

Table (4,1,1)
Dependent variable: Greek Bonds (full sample)

Variables	Germany	Greece	Ireland	Italy	Portugal	Spain
Panel A:Mean						
Rt	*0,04402*	0,23758***	0,03653	0,03494	0,47761***	0,16057***
	(0,3609)	(0,000)	(0,5228)	(0,5328)	*(0,000)*	(0,0027)
CPI_j	-	0,13425***	-	-	-	-
		(0,000)				
PPI_j	-	-	-	-	-	-
IP_j	-	-	-	-	-	-
$TrBalance_j$	-	-	-	-	-	-
$UnRate_j$	-	0,01756***	-	-	-	-
		(0,000)				
GDP_j	-	-	-	-	-	-
Panel B: Variance						
GARCH(-1)	*0,59981***	0,56951***	0,59977***	0,15157***	0,35961***	0,59836***
	(0,000)	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*
CPI_j	*-0,02093***	-	-0,10972***	-0,09741***	0,11109***	-0,14857***
	(0,0037)		*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*
PPI_j	-0,14065***	-	-0,10262***	-	-0,00551**	-0,12317***
	(0,000)		*(0,000)*		(0,0351)	*(0,000)*
IP_j	-	-0,00675***	-0,06135***	-	-0,00865**	-0,11187***
		(0,000)	(0,0044)		(0,0295)	*(0,000)*
$TrBalance_j$	-	-	-0,10744***	*-0,16017***	0,30852***	-0,11983***
			(0,000)	*(0,000)*	*(0,000)*	*(0,000)*
$UnRate_j$	-0,17481***	-0,01068***	-0,074662**	-	-0,03783***	-0,11739***
	(0,000)	(0,000)	(0,0104)		*(0,000)*	*(0,000)*
GDP_j	-0,14026***	0,59139***	-0,09376***	-	-	-0,14287***
	(0,000)	(0,000)	*(0,000)*			*(0,000)*

***,**,* indicates significance on the 1%, 5%, and 10% level
Only statistical significant coefficients are reported.
The table presents coefficients and the respective p-values for AR(1) and GARCH(1,1) models.
The independent variable is measured as a 0/1 dummy variable.

In table (4,1,1), we could see the impact of macroeconomic announcements of PIIGS and Germany on the daily treasury bond yields of Greece. With regard to autocorrelation, we have to highlight the fact that there is no autocorrelation except for CPI and Unrate of Greece which has positive autocorrelation with bond yields. A possible economic meaning is that the above table refers to the entire sample. So, it includes the global economic crisis which has started since 2007. Thus, Unrate of Greece incurs an amazing upturn from 2007 and on, this fact shows not so good signs for the Greek economy and creates a sense of uncertainty for domestic and European investors. This uncertainty ejects bond yields of Greece to go up. Now, with respect to CPI, we can see that releases of CPI increase bond yields with coefficient equal to 0,1342. So, we consider that it seems to be the same thing as Unrate. We mean that domestically the inflation incurs an upturn and this upturn creates a sense of bias against Greek bonds, but at the same time this bias triggers Greek bond yields to go up.

Of great importance is the fact that, most of the times, volatility is statistical significant and decreases. Thus, countries such as Ireland, Portugal and Spain appear to have great impact on conditional volatility of Greek bonds yields. More specifically, we note that macro releases of Germany such as CPI, PPI, Unrate and GDP lower conditional volatility. IP and trbalance of Germany are not statistical significant, so we ignore them. Also, we know from section 2 "data and preliminary analysis" that there are not announcements for Trbalance and PPI of Greece, thus we do not have results for these two. Nevertheless, we see that IP and Unrate of Greece lower volatility of Greek bonds with coefficients equal to -0,0067 and -0,0106, respectively. It is common knowledge that GDP is a picture of the economic situation of a country. So, having in mind the downturn of GDP of Greece from 2009 and on, we could explain the increase of volatility when we have announcements for GDP of Greece. Generally, if an announcement reveals new information not incorporated in asset prices, volatility has the tendency to rise on the announcement day.

Macro releases of Ireland have great impact on volatility of Greek bonds. We can see that all the macro releases of Ireland lower conditional volatility of bonds and also a significant point is the magnitude of coefficients showing the great impact on volatility. The same thing is presented with Spanish macro releases. All the macro releases of Spain reduce volatility and the impact is great due to the magnitude of coefficients. Furthermore, we can see that PPI, IP, GDP and Unrate of Italy are not statistical significant, but CPI and Trbalance news reduce volatility. The last country where we can see the same results is Portugal. CPI, PPI, IP and Unrate of Portugal reduce volatility, but there is an exception with Trbalance which increases volatility with coefficient equal to 0,30852.

A possible explanation for the outcome of Trbalance has given by Andritzky, Bannister and Tamirisa(2007). They said that if the implication of an announcement for country risk is ambiguous, as it is possibly to be the case with trade balance announcements, volatility is likely to rise as investors rebalance their portfolios in reply to the announcement and to private information that emerges subsequently through order flow.

Moreover, we focus on the fact that most of the times macro announcements reduce volatility. It may mean that when European markets wait for an announcement then it is created a sense of bias and uncertainty which reduces when the announcement is known. From this point of view, a negative coefficient for a given release can be interpreted as an announcement which contributes to the formation of a consensus view on the country and makes the trading environment more stable.

The results of the next table are of great importance. In table(4,1,2), we will display the results of the reactions of Ireland bond. Generally, gathering information about the economic situation of Ireland for our research we keep in mind that the economic adjustment program for Ireland was formally agreed in December 2010. It includes a joint financing package of €85 billion and covers the period 2010-2013.

Table (4,1,2)
Dependent variable: Irish Bonds (full sample)

Variables	Germany	Greece	Ireland	Italy	Portugal	Spain
Panel A:Mean						
Rt	*0,20191***	0,04170**	0,13926***	0,12569***	0,47761***	0,13121***
	(0,000)	(0,0147)	(0,0022)	(0,0002)	*(0,000)*	(0,0002)
CPI_j	-	-	-	-	-	-
PPI_j	-	-	-	-	-0,01269*	-
					(0,0509)	
IP_j	-	-	-	-	-	-
$TrBalance_j$	-	-	-	-	-	-
$UnRate_j$	-	-	-	-	-	-
GDP_j	-	-	-	-	-	-
Panel B: Variance						
GARCH(-1)	*0,63518****	0,63930***	0,59910***	0,67146***	0,54552***	0,56149 ***
	(0,000)	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*
CPI_j	*-0,00317****	-0,00065***	-	-0,00715***	0,00819***	0,01476***
	(0,000)	*(0,000)*		*(0,000)*	(0,000)	*(0,000)*
PPI_j	-0.00967***	-	-0,01012***	-	-0,00357***	-0,00987***
	(0,000)		*(0,000)*		*(0,000)*	*(0,000)*
IP_j	-0,00172***	-0,00072***	-0,00319**	-0,01018***	-0,00459***	-0,00779***
	(0,000)	(0,000)	(0,0450)	*(0,000)*	*(0,000)*	*(0,000)*
$TrBalance_j$	-0,00177*	-	-	-0,00685***	0,06331***	-0,00578***
	(0,0745)			*(0,000)*	*(0,000)*	*(0,000)*
$UnRate_j$	-0,01201***	0,03268***	-0,00794***	-0,00629***	-0,00621***	-0,00472***
	(0,000)	*(0,000)*	(0,000)	*(0,000)*	*(0,000)*	*(0,000)*
GDP_j	-0,00533***	-0,00045***	-0,01142***	-	-0,00387***	-0,01066***
	(0,000)	(0,0017)	*(0,000)*		*(0,000)*	(0,000)

***,**,* indicates significance on the 1%, 5%, and 10% level
Only statistical significant coefficients are reported.
The table presents coefficients and the respective p-values for AR(1) and GARCH(1,1) models.
The independent variable is measured as a 0/1 dummy variable.

In table (4,1,2), we could see the impact of macroeconomic announcements of PIIGS and Germany on the daily treasury bond yields of Ireland. The above results provide evidence that releases of macro news are not associated with risk premier in the sense of higher returns on announcement day. The only statistical significant fact is the negative autocorrelation between bonds of Ireland and PPI with coefficient equal to -0,0126 and p-value (0,0509). Looking at actual prices of PPI announcements from Bloomberg's calendar of events, we make an interesting conclusion. We note that releases of PPI have mild fluctuations in comparison with CPI and GDP. We make our comparison with CPI and GDP because we have eyed that these announcements have the biggest impact among all macro releases. So, a possible explanation of the negative autocorrelation is the fact that for investors the PPI do not convey information which is not incorporated in the prices and also many times it becomes more difficult for them to interpret. Hence, investors turn their attention to other

types of macroeconomic news such as CPI and GDP. An exception is CPI releases, which investors seem to react more in times of crisis. This may be due to CPI releases are viewed as easy to interpret and giving an indication of the likely depth of the crisis and the possible timing of the recovery.

As regards volatility, we can claim that volatility seems to decrease in the hearing of macro news, except for Unrate of Greece, CPI of spain, CPI and Trbalance of Portugal which show the opposite. More specifically, macro releases of Germany and Ireland reduce volatility of bond yields, and also the magnitudes of coefficients are not so high. The biggest coefficient, from the two countries announcements, is Unrate of Germany which is equal to -0,0120. Now, macro releases of Greece such as CPI, IP and GDP lower volatility, whereas Unrate with coefficient equal to 0,0326 increases it. Reduction of volatility is caused by macro announcements of Italy, by the exception of PPI and GDP which are not statistical significant. Furthermore, PPI, IP, Unrate and GDP of Portugal lower volatility, whereas CPI and Trbalance increase it. The last country is Spain and their announcements reduce volatility except for CPI which increases it.

One possible explanation for the increase of volatility by Unrate of Greece, CPI of Portugal and CPI of Spain is the fact that these three variables increase rapidly in relation to all the other announcements. Also, the economic information which conveys for markets and investors is important. It is well-known that Portugal and Greece are among the minority of countries having the biggest unemployment rates in the Eurozone. Also, we should not forget that the sample contains the European economic crisis where the upturn of Unrate and CPI is the focal point. So, this upturn increases the uncertainty and by extension volatility of bond yields.

At this point, we will make a comparison of table(4,1,2) and table(4,1,1). An overwhelming percent of the announcements of table(4,1,1) have coefficients by large greater than these in table(4,1,2). This means that the impact of macro releases on Greek bond volatility is away larger than these on Ireland bonds. A possible economic explanation is that Greece has big fiscal and budget deficits, and also a consecutively increasing public debt. These facts contribute to a weak and easily affected country. On the other hand, Ireland has a much expanded banking system in contrast to the size of the economy, and a great percent of non-performing loans. Also, we have to refer that Ireland has fiscal deficits and a big public debt, but the magnitude of these two is not as high as that of Greece. Generally, based on our review of literature, Ireland is a more stable, economically, country than Greece, and so Ireland incurs effects from macro releases at smaller grade than Greece does.

The next table shows the reactions of Portuguese bonds. Having global informations about Portugal, we have to report that the economic adjustment program for Portugal was agreed in May 2011. It includes a joint financing package of €78 billion and covers the period 2011 to mid-2014

Table (4,1,3)
Dependent variable: Portuguese Bonds (full sample)

Variables	Germany	Greece	Ireland	Italy	Portugal	Spain
Panel A:Mean						
Rt	*0,18286***	0,17470***	0,15803***	0,20081***	0,17869***	0,17802***
	(0,000)	(0,000)	(0,000)	(0,000)	*(0,000)*	(0,000)
CPI_j	-	-	-	-	-	-
PPI_j	-	-	-	-	-	-
IP_j	-	-	-	-	-	-
$TrBalance_j$	-	-	-	-	-	-
$UnRate_j$	-	-	-	-	-	-
GDP_j	-	-	-	-	-	-
Panel B: Variance						
GARCH(-1)	*0,43487****	0,16371***	0,58105***	0,57683***	0,58983***	0,58385 ***
	(0,000)	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*
CPI_j	*0,00212****	-0,00447***	-0,00750***	-0,09741**	-0,00793***	-0,010307***
	(0,000)	*(0,000)*	*(0,000)*	*(0,0152)*	(0,0002)	*(0,000)*
PPI_j	-0.00590***	-	-0,10262***	-0,01279***	-0,01664***	-0,01691***
	(0,000)		*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*
IP_j	-0,00115***	-0,00289**	-0,00925***	-	-0,01234***	-
	(0,000)	(0,0244)	(0,000)		*(0,000)*	
$TrBalance_j$	-0,00132***	-	-0,01205***	-0,01246***	-	-0,00580***
	(0,000)		*(0,000)*	*(0,000)*		*(0,000)*
$UnRate_j$	-0,00486***	-0,00381***	-0,01201***	-0,00472***	-0,01074***	-0,01154***
	(0,000)	*(0,0007)*	(0,000)	*(0,0079)*	*(0,000)*	*(0,000)*
GDP_j	-0,00256***	-0,02191***	-	-0,01207**	-0,01102***	-0,01644***
	(0,000)	(0,000)		*(0,000)*	*(0,000)*	(0,000)

***,**,* indicates significance on the 1%, 5%, and 10% level
Only statistical significant coefficients are reported.
The table presents coefficients and the respective p-values for AR(1) and GARCH(1,1) models.
The independent variable is measured as a 0/1 dummy variable

Table(4,1,3) includes the reactions of Portuguese bond yields to macroeconomic announcements of PIIGS and Germany. Initially, there is no autocorrelation, completely. This fact may triggers many questions about the movement of Portuguese yields, but it may be at level of statistical error. Regarding volatility, macro releases of Germany lower volatility of Portuguese bonds. All the coefficients are statistical significant, but the magnitude of them is not so high. Releases of Greece decrease conditional volatility except for PPI and Trbalance for which we don't have observations, altogether. At this point, we have to refer that the coefficient of GDP is equal to -0,0219, and higher than the other releases of Greece. This fact shows the great impact and the great amount of informations which contain the releases of GDP. Taking into consideration all the previous comments we conclude that GDP

announcements, either positive or negative, are very significant and convey great amount of information to the investors.

Furthermore, Irish releases reduce volatility except for GDP which is not statistical significant. PPI and Unrate, with coefficients equal to -0,1026 and -0,0120 respectively, have bigger impact at Portuguese yields than the other releases of Ireland. Also, we note that coefficients of Italian news are negative and bigger than coefficients of Germany and Greece. So, the impact of Italian releases on volatility is bigger than the other two. Moreover, looking at macro releases of Portugal we can see that these releases have great impact on bond yields volatility. The last in turn country is Spain, Spain shows the same impact on volatility as the other European countries. All macroeconomic releases of Spain reduce volatility of Portuguese bonds and coefficients are somewhat high in relation to the other countries.

At this point, looking the above tables (4,1,1), (4,1,2) and (4,1,3) simultaneously and making comparisons, we can exclude interesting conclusions. We can definitely say that Greece is the weakest economy of the three due to the impact of macro releases to their bond yields. This means that the uncertainty, which is created before the releases, is far bigger than the other two. Also, Ireland shows a more stable economy than Portugal because looking at Portugal releases, table(4,1,3), the coefficients are higher than these of Ireland. So, the uncertainty about the movement of Portuguese bonds is bigger.

Now, at the next section, we will study the sample from March 1998 to December 2006. Our aim is to examine the reactions of Treasury bond yields of Ireland, Greece and Portugal before the global economic crisis. Furthermore, we have to highlight the fact that before global crisis, these three countries had mild economic growth. Also, unemployment rate was at good levels and the banking sector was more stable. The most significant is that these three countries had budget deficits, but they were in low levels in comparison with levels from 2007 and on.

4.2 EMPIRICAL RESULTS BEFORE GLOBAL CRISIS

We will start analyzing the reactions of bond yields before global crisis. The first country is Ireland and follows Greece and Portugal. We will try to see the differences which are significant and assist us to make an interesting conclusion for bond movements. At this point, it is interesting to know for Ireland that until about 2000, the growth had been on a safe export-led basis, underpinned by wage restraint. Nevertheless, from about 2000 the character of the growth changed: a property price and construction bubble took hold. This boom sustained employment and output growth until 2007 despite a loss of wage competitiveness. The banks fuelled the boom, especially from 2003, exposing themselves both to funding and solvency pressures. So, the period from 1998 to 2007 was a good period in real numbers but day by the day the construction bubble became bigger and threatened the Irish economy.

Table (4,2,1)
Dependent variable: Irish Bonds (sample from 24/03/1998 to 31/12/2006)

Variables	Germany	Greece	Ireland	Italy	Portugal	Spain
Panel A:Mean						
Rt	*0,02419*	0,02706	0,02622	0,02355	0,02749	0,02423
	(0,2794)	(0,4770)	(0,2375)	(0,3000)	*(0,2301)*	(0,2851)
CPI_j	-	-0,01154**	-	-	-	-
		(0,0129)				
PPI_j	-	-	0,00571*	-	-	-
			(0,0780)			
IP_j	-	0,01041*	-	-	-	-
		(0,0698)				
$TrBalance_j$	-	-	-	-	-	-
$UnRate_j$	-	-	-0,00883***	-	-	-
			(0,0038)			
GDP_j	-	-	-	-	-	-
Panel B: Variance						
GARCH(-1)	*0,95883***	0,53602***	0,96113***	0,95979***	0,94821 ***	0,95304 ***
	(0,000)	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*
CPI_j	*0,00006**	-0,00153***	-	-	-0,00044***	-
	(0,0728)	(0,000)			(0,000)	
PPI_j	-	-	-0,00043***	-	-	-
			(0,000)			
IP_j	0,00020***	-0,00125***	-	-0,00032***	-0,00024***	-
	(0,0035)	(0,0007)		(0,0001)	(0,0039)	
$TrBalance_j$	-	-	0,00019***	-	-0,00013*	0,00018***
			(0,0059)		*(0,000)*	*(0,0032)*
$UnRate_j$	-	-0,00107**	-	-0,00019*	-	-
		(0,0380)		(0,0567)		
GDP_j	0,00018**	-0,00111***	-0,00055***	0,00032***	0,00071***	-
	(0,0422)	(0,0018)	*(0,000)*	(0,000)	*(0,000)*	

***,**,* indicates significance on the 1%, 5%, and 10% level
Only statistical significant coefficients are reported.
The table presents coefficients and the respective p-values for AR(1) and GARCH(1,1) models.
The independent variable is measured as a 0/1 dummy variable

Table (4,2,1) includes the reactions of Irish bond yields to macroeconomic announcements of PIIGS and Germany from 1998 to 2007. Of paramount importance is the fact that there is no autocorrelation between macro announcements of Germany and Irish bonds, and the impact to volatility is not so significant too. The significant and intrigue point is that in comparison with table (4,1,2) macro news of Germany increases volatility of bonds. Nevertheless, we have to refer that coefficients are almost ‘’zero’’, so the impact is negligible. Now, results for Greece are interesting, too. We note that CPI of Greece displays negative autocorrelation with coefficient equal to -0,0115. However, positive autocorrelation shows the IP with coefficient equal to 0,0104. Making a thorough check to actual prices of IP and CPI from Bloomberg’s calendar of events, we end that CPI has smoother fluctuations than IP and the latter, most of the times, has negative prices. Hence, one possible explanation for the above

results is that the extreme prices of IP causes great concern for investors who rebalance their portfolios in order to hedge possible risk. This situation has negative effect for bond yields. On the other hand, the smooth movement of CPI does not raise concern and uncertainty, so the impact on the excess return of yields is positive. With respect to volatility, CPI, IP, Unrate and GDP of Greece reduce volatility and the respective p-values are below 1%, except for p-value of Unrate which is equal to 0,0380. At this point, making a comparison with the results of table (4,1,2), we see that at table (4,1,2) releases of Unrate increase volatility. The existence of this result is based on the fact that full sample includes global crisis.

Macroeconomic results for Ireland show that there is positive autocorrelation with PPI and negative with Unrate. Also, volatility has the tendency to reduce by the hearing of GDP and PPI announcements, and the most important fact is that making comparisons with table (4,1,2) we exclude interesting conclusions. Macro releases of Ireland have greater impact than these in the table(4,2,1). So, we know from data that macro announcements of PPI and GDP for period 1998 to 2007 do not have big fluctuations such as the whole sample. Hence, the uncertainty which creates the sample of table (4,2,1) is smaller than the whole sample in table(4,1,2). Furthermore, trade balance of Ireland increases the volatility of Irish bonds with coefficient equal to 0,00019.

The last three countries show no autocorrelation with Irish bonds, but volatility does not seem to do the same. IP and Unrate of Italy reduce volatility, but GDP increases it. Moreover, all the statistical significant releases of Portugal reduce volatility except for GDP increasing it and finally, Trbalance of Spain increases volatility of bonds.

Looking at tables (4,1,2) and (4,2,1), we can say with certainty that most of the coefficients of table (4,2,1) are smaller than table (4,1,2). It means that volatility is smoother and without big fluctuations. Generally, the most possible explanation is that table (4,1,2) contains the global economic crisis which was evolved to the European crisis and has started since 2007. Moreover, remarkable points are the switching sign of GDP and IP from negative to positive.

The next table (4,2,2) shows the reactions of Greek bond yields from 1998 to 2007. Between 2001–2007, the Greek economy, after the Irish, was the fastest growing Eurozone economy with an average GDP growth of 3.6% between 1994–2008. Nevertheless, throughout these years of consecutive growth, the country's huge macroeconomic imbalances and structural flaws were exacerbated by weaknesses in the political system. Also, public overspending combined with failure to ensure adequate revenues resulted in accumulating public debt and the outbreak of the Greek's sovereign crisis.

Table (4,2,2)
Dependent variable: Greek Bonds (sample from 24/03/1998 to 31/12/2006)

Variables	Germany	Greece	Ireland	Italy	Portugal	Spain
Panel A:Mean						
Rt	*0,04762***	0,06426*	0,04517**	0,04860**	0,7377**	0,04907**
	(0,0222)	(0,0965)	(0,0272)	(0,0191)	*(0,0379)*	(0,0173)
CPI_j	-	-0,13425***	-	-	-	-
		(0,0070)				
PPI_j	-	-	0,00541*	-0,00731*	-	-
			(0,0940)	(0,0620)		
IP_j	-	0,01233*	-	-	-	-0,00574*
		(0,0952)				(0,0721)
$TrBalance_j$	-	-	-	0,00533**	-	-
				(0,049)		
$UnRate_j$	-	-	-0,01070***	-	-	-
			(0,0002)			
GDP_j	-	-	-	-	-	-
Panel B: Variance						
GARCH(-1)	*0,94461****	0,53449***	0,95055***	0,94622***	0,52791***	0,94381***
	(0,000)	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*
CPI_j	*-0,00016****	-0,00166***	-0,00024**	-	-0,00141***	-0,00012**
	(0,000)	*(0,000)*	*(0,0108)*		*(0,000)*	*(0,0130)*
PPI_j	-0,00029***	-	-0,00021***	0,00033***	-0,00158***	-
	(0,000)		*(0,0350)*	(0,0009)	(0,000)	
IP_j	-	-0,00156***	0,00020***	-0,00014	-0,00175***	-
		(0,000)	(0,0073)	(0,1085)	(0,000)	
$TrBalance_j$	-0,00026**	-	-	-	-0,00209***	-
	(0,0127)				*(0,000)*	
$UnRate_j$	-0,00033***	-0,00210***	-0,00011*	-	-	-
	(0,0005)	(0,000)	(0,0996)			
GDP_j	-	-0,00141***	-0,00036***	-	-0,00076**	-
		(0,003)	*(0,0025)*		(0,0473)	

***,**,* indicates significance on the 1%, 5%, and 10% level
Only statistical significant coefficients are reported.
The table presents coefficients and the respective p-values for AR(1) and GARCH(1,1) models.
The independent variable is measured as a 0/1 dummy variable

In table (4,2,2) we could see the impact of macroeconomic announcements of PIIGS and Germany on the daily Treasury bond yields of Greece from 1998 to 2007. This sample may inform us for what is happening before the beginning of the global crisis. Initially, as regards with autocorrelation, CPI of Greece and Unrate of Ireland display negative autocorrelation with coefficients equal to -0,1342 and -0,0107, respectively. These two releases show the greatest impact on Greek bond returns with p-value below 1%. Macroeconomic announcements of Italian PPI and Spanish IP show negative autocorrelation with bonds, but the magnitude of impact is not so high due to the size of coefficients. Additionally, we note that IP of Greece, PPI of Ireland and Trbalance of Italy increase the excess return of bonds with coefficients equal to 0,0123, 0,0054 and 0,0053, respectively. Germany and Portugal

show to have no autocorrelation with Greek bonds. Now, there is a possible economic meaning for the positive autocorrelation between PPI of Ireland and Greek bond yields. Examining the actual prices of the announcements we can see strong fluctuations. So, such fluctuations raise the sentiment of bias, and investors have a doubt about the economic meaning of this release. Hence, they rebalance their portfolios in order to avoid a possible future risk.

Regarding volatility, we can see that macro announcements of Germany reduce volatility of Greek bonds, except for IP and GDP which are not statistical significant. Moreover, macro announcements of Ireland reduce volatility except for IP announcements which increase it. Thus, Germany and Ireland coefficients are all below 0,0003 meaning that their impact is negligible. In the same direction are coefficients of Italy and Spain with their impact not being important. More specifically, CPI, Trbalance, Unrate and GDP of Italy are not statistical significant. However, IP announcements reduce volatility and PPI increase it. The only statistical significant coefficient for Spain is that of CPI which decreases volatility. Furthermore, macro releases of Greece and Portugal lower volatility of Greek bond yields. Although, coefficients of Greece and Portugal have p-values below 1%, the size is not far bigger than these of Germany and Ireland. Thus, making comparisons with coefficients of table(4,1,1), we end to the conclusion that before global economic crisis the impact of macroeconomic announcements on volatility of Greek bonds is smaller than that with entire sample (table(4,1,1)).

Looking at tables (4,1,1) and (4,2,2), we can say with certainty that most of the coefficients of table (4,2,2) are smaller than table (4,1,1). This means that volatility is smoother and without big fluctuations. Generally, the most possible economic meaning is that table (4,1,1) contains the global economic crisis which evolved to European crisis and have started since 2007. Furthermore, looking at these two tables we note that table (4,1,1) contains more statistical significant coefficients. So, this possibly means that Greek bonds are more susceptible to macro releases because of global crisis. Generally, Greece borrowed heavily in international capital markets to fund current account and government budget deficits. The reliance on financing from international capital markets left Greece highly vulnerable to shifts in investor confidence.

The next table (4,2,3) shows the reactions of Portuguese bonds from 1998 to 2007. In similar economic conditions to Greece was Portugal. The accumulation of public debt has started since 2001, but until 2007 Portugal had anemic productivity and mild economic growth. The harsh economic conditions have started since 2009.

Table (4,2,3)
Dependent variable: Portuguese Bonds (sample from 24/03/1998 to 31/12/2006)

Variables	Germany	Greece	Ireland	Italy	Portugal	Spain
Panel A:Mean						
Rt	*0,00744*	0,01186	-0,00122	-0,00107	0,01146	-0,01322
	(0,7757)	(0,6224)	(0,9612)	(0,9786)	*(0,6457)*	(0,4418)
CPI_j	-	-0,00707	-	-	-	-
		(0,1088)				
PPI_j	-	-	-	-	-	-
IP_j	-	-	-	-	-	-0,00724*
						(0,0706)
$TrBalance_j$	-	-	-	-	-	-
$UnRate_j$	-	-	-	-	-	-
GDP_j	-	-	-	-	-	-
Panel B: Variance						
GARCH(-1)	*0,22117***	0,86418***	0,80131***	0,58780***	0,83849***	0,98745 ***
	(0,0002)	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*
CPI_j	*0,00159***	0,00017*	0,00112***	-0,00077***	-0,00052***	-0,00025***
	(0,000)	(0,0978)	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*
PPI_j	-0,00519***	-	-	-0,00150***	-0,00036***	0,00013 ***
	(0,000)			(0,000)	(0,000)	*(0,0013)*
IP_j	-	0,00180***	-	-	-0,00029***	0,00068 ***
		(0,000)			(0,0003)	*(0,000)*
$TrBalance_j$	-	-	-	*-0,00156****	0,00270***	0,00048***
				(0,000)	*(0,000)*	*(0,000)*
$UnRate_j$	0,00046***	0,00089***	-0,00010**	-0,00093***	-	-0,00040***
	(0,0035)	(0,0001)	(0,000)	(0,0071)		*(0,000)*
GDP_j	-0,00032*	-0,00074***	0,00404***	-0,00196***	-	-0,00027 ***
	(0,0554)	(0,000)	*(0,000)*	(0,000)		*(0,000)*

***,**,* indicates significance on the 1%, 5%, and 10% level
Only statistical significant coefficients are reported.
The table presents coefficients and the respective p-values for AR(1) and GARCH(1,1) models.
The independent variable is measured as a 0/1 dummy variable

Table(4,2,3) includes the reactions of Portuguese bond spreads to macroeconomic announcements of PIIGS and Germany from 1998 to 2007. As regard with autocorrelation, only CPI of Greece and IP of Spain eject bond yields to go down, and the coefficients are equal to -0,0070 and -0,0072, respectively. Looking at the actual prices of Greek CPI from 1998 to 2007 show normal distribution without big fluctuations from the mean, so such an index does not exert big influence on the sentiment of investors. We do the same consideration for IP announcements and we see that the distribution does not seem to convey great information for investors. Both distributions are smooth and without big fluctuations, so, these informations assist us to understand a little bit the negative autocorrelation between CPI, IP releases and bonds excess return.

With respect to volatility, most of the results have economic meaning. At first, CPI and Unrate of Germany increase volatility, whereas PPI and GDP lower it. Also, all the

statistical significant releases of Greece increase volatility with the exception of GDP which diminish it. Furthermore, CPI and GDP of Ireland increase volatility with coefficients equal to 0,0011 and 0,0040, respectively. On the opposite side, Unrate of Ireland decreases volatility with coefficient and p-value equal to -0,0001 and zero, respectively. Now, all the statistical significant macroeconomic announcements of Italy reduce volatility. Nevertheless, the magnitude of impact on the volatility of Italian bond yields is not so high as the magnitude of impact at entire sample, table (4,1,3). Furthermore, CPI, IP and PPI of Portugal show to lower volatility of Portuguese bonds, whereas Trbalance increases conditional volatility. Regarding Spain, three of the macro releases (CPI, Unrate, GDP) reduce volatility, whereas the other three(PPI, IP, Trbalance) have the opposite effect.

Looking at tables (4,1,3) and (4,2,3), we can say with certainty that most of the coefficients of table (4,2,3) are smaller than table (4,1,3). The most obvious explanation is that table (4,1,3) includes global crisis which creates great uncertainty among international investors. Furthermore, in table (4,2,3) there are fewer releases which exerts influence to volatility of Portuguese bond yields. This fact displays a more stable economy without big fluctuations.

4.3 EMPIRICAL RESULTS DURING GLOBAL CRISIS

It is common-knowledge that the severity and extent of the crisis that has affected so many European countries since 2009 has changed millions of human lives. Understanding what has been happening in Europe, and the European periphery in particular, is one of the biggest challenges macroeconomists face today. Portugal in the 2000s experienced neither a housing boom like Spain and Ireland, nor as uncontrollable an increase in public debt as Greece, nor does it suffer from Italy's chronic political instability. Yet since 2010 all five countries have been in a similar state of crisis. Hence, in this section we try to examine bond yields movements and investors' attitudes.

We will start by reactions of Greece bond yields to macro releases due to the fact that Greece is under the worst economic conditions in Eurozone. It is important to know that since May 2010, the euro area member states and the International Monetary Fund (IMF) have been providing financial support to Greece through an economic adjustment programme in the context of a sharp deterioration in its financing conditions. The aim is to support the Greek government's efforts to restore fiscal sustainability and to implement structural reforms in order to improve the competitiveness of the economy.

Table (4,3,1)
Dependent variable: Greek Bonds (sample from 01/01/2007 to 29/11/2013)

Variables	Germany	Greece	Ireland	Italy	Portugal	Spain
Panel A:Mean						
Rt	*0,02408**	0,20760***	0,08032	0,05957	0,07935	0,10677
	(0,0671)	(0,000)	(0,3904)	(0,4945)	*(0,3906)*	(0,1651)
CPI_j	-	0,06800***	-	-	-	-
		(0,000)				
PPI_j	-	-	-	-	-	-
IP_j	-	-0,08739***	-	-	-	-
		(0,000)				
$TrBalance_j$	0,66978***	-	-	-	-	-
	(0,000)					
$UnRate_j$	-	0,06501***	-	-	-	-
		(0,000)				
GDP_j	-	1,02724***	-	-	-	-
		(0,000)				
Panel B: Variance						
GARCH(-1)	*0,14983***	0,14314***	0,59945***	0,59896***	0,59901***	0,59967***
	(0,000)	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*
CPI_j	-	-0,03933***	-0,25568***	-0,24811***	-	-0,35814***
		(0,000)	*(0,0017)*	*(0,000)*		*(0,000)*
PPI_j	-0,00292***	-	-0,22934***	-	-0,35546***	-0,28759***
	(0,000)		*(0,0059)*		(0,000)	*(0,000)*
IP_j	-0,00539***	-0,00285***	-0,19162**	-	-0,45267***	-
		(0,0078)	(0,0151)		(0,000)	
$TrBalance_j$	0,46173***	-	-0,23653***	*-0,37633****	-	-0,28556***
	(0,0002)		*(0,0039)*	*(0,000)*		*(0,000)*
$UnRate_j$	-0,00257**	-0,03352***	-0,21204**	-0,22203***	-0,34652***	-0,24443***
	(0,0284)	(0,000)	(0,0102)	(0,0012)	*(0,000)*	*(0,000)*
GDP_j	-0,00381***	3,78995**	-0,21128**	-	-	-0,30402***
	(0,0002)	(0,0323)	*(0,0187)*			*(0,000)*

***,**,* indicates significance on the 1%, 5%, and 10% level
Only statistical significant coefficients are reported.
The table presents coefficients and the respective p-values for AR(1) and GARCH(1,1) models.
The independent variable is measured as a 0/1 dummy variable

Table(4,3,1) includes the reactions of Greek bond yields to macroeconomic announcements of PIIGS and Germany from 2007 to 2013. Regarding autocorrelation, the empirical results are obvious considering that we try to model global crisis. We note that Trbalance of Germany has positive autocorrelation with Greek bond yields. It is obvious because of the tight connection between Greece and Germany. Germany, as the mainstay of Eurozone, played a significant role to the negotiations with IMF for the economic adjustment programme for Greece. Furthermore, we note that CPI, Unrate and GDP of Greece have positive autocorrelation with Greek bond yields. We have to highlight the coefficient of GDP which is equal to 1,0272. This means that the announcements of GDP increase by far the Greek bond yields. Thus, this coefficient assists us to understand the loss of investors' confidence and their desire for bigger returns. The existence of bias and uncertainty against

Greek economy is obvious. The last but significant point is the negative autocorrelation between IP of Greece and bond yields. The coefficient is equal to -0,08739 and p-value 'zero'.

As regards volatility, the results are significant, too. Initially, PPI, IP, Unrate and GDP lower volatility, but the coefficients are not so great in comparison with the other countries. The result which makes the difference is Trbalance. Trbalance shows to increase volatility and the coefficient is equal to 0,4617. Of great importance are the results from Greece. Although, macro releases such as CPI, IP and Unrate lower volatility, the coefficients are not so big. A possible explanation has been given by Christiansen (2000), they said that the coefficients of the GARCH model are relatively large and are greater the closer the bonds are with respect to time to maturity. In our case, one of the terms of the Greek economic adjustment programme for the restructuring of public debt was the expansion of maturities for 15 more years. So, the expansion of maturities calms down capital markets for a while. Furthermore, we have to refer that releases of GDP increase volatility and the coefficient is 3,7899. This is the biggest coefficient in the whole empirical results and shows the greatest impact on bond yields volatility. GDP releases show that the actual price of the announcements instead of reducing the uncertainty increasing it with great pace.

Now, looking at the macro releases of Ireland we note that all of them lower volatility. The magnitude of coefficients displays tight connection between the two. Additionally, CPI, Trbalance and Unrate of Italy lower volatility of Greek bond yields. The same impact to volatility shows macro releases of Portugal such as PPI, IP and Unrate. With respect to macro releases of Spain, it is true that CPI, PPI, Trbalance, Unrate and GDP lower volatility of bond yields.

Looking at tables (4,1,1), (4,2,2) and (4,3,1), we can say with certainty that the greatest impact on Greek bond yields volatility is displayed in the table (4,3,1). It is obvious due to the fact that we talk about the period from 2007 to 2013 where the Greek's sovereign crisis was at a peak. This period for Greece is the hardest and their results are crushing for the Greek citizens.

The next table (4,3,2) shows the reactions of Irish bonds from 2007 to 2013. It is important to know that from late 2007, investor confidence in Ireland's property sector evaporated amid concerns about oversupply and a price bubble. This left Ireland confronting the twin problems of a sharp decline in cyclical construction-related revenues and the sudden appearance of very big losses in the domestic banking system. The global financial crisis and the severe worldwide recession which triggered exacerbated the problems. By the autumn of 2010 the loss of investor confidence in Ireland caused a vicious cycle. Deposit outflows from the banking sector accelerated and the cost of government borrowing reached unsustainable highs. As financing costs increased and renewed banking losses were revealed, investors were increasingly concerned about the capacity of the government to deal with the dual challenge of a large fiscal deficit and the state's commitment to finance the growing cost of supporting a severely damaged banking sector.

Table (4,3,2)
Dependent variable: Irish Bonds (sample from 01/01/2007 to 29/11/2013)

Variables	Germany	Greece	Ireland	Italy	Portugal	Spain
Panel A:Mean						
Rt	*0,21343***	-0,08162***	0,26826***	0,20200***	0,027105***	0,28614***
	(0,0006)	(0,000)	(0,0001)	(0,0009)	*(0,000)*	(0,000)
CPI_j	-	-	-	-	-	-
PPI_j	-	-	-	-	-	-
IP_j	-	-	-	-	-	-
$TrBalance_j$	-	-	-	-	-	-
$UnRate_j$	-	0,20034***	-	-	-	-
		(0,000)				
GDP_j	-	-	-	-	-	-
Panel B: Variance						
GARCH(-1)	*0,59798****	0,06612***	0,60871***	0,59898***	0,59298***	0,57182 ***
	(0,000)	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*
CPI_j	*-0,00514****	0,00433***	-	-0,01962***	-	0,02372***
	(0,000)	(0,000)		*(0,000)*		*(0,000)*
PPI_j	-0,02461***	-	-0,01885***	-0,00681***	-0,02162***	0,02107 ***
	(0,000)		(0,000)	(0,000)	(0,000)	*(0,000)*
IP_j	-0,00392***	-0,00120***	-0,02362***	-0,00625**	-0,02796***	-0,020486 ***
	(0,000)	(0,000)	(0,000)	(0,0127)	(0,0039)	*(0,000)*
$TrBalance_j$	-	-	-	*-0,01993****	-	-0,01144***
				(0,000)		*(0,000)*
$UnRate_j$	-0,02383***	0,03733***	-0,02035***	-0,01660***	-0,02100***	-0,00840***
	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)	*(0,000)*
GDP_j	-0,02167***	-	-0,02197***	-0,00455***	-	-0,02173 ***
	(0,000)		*(0,000)*	(0,0440)		*(0,000)*

***,**,* indicates significance on the 1%, 5%, and 10% level
Only statistical significant coefficients are reported.
The table presents coefficients and the respective p-values for AR(1) and GARCH(1,1) models.
The independent variable is measured as a 0/1 dummy variable

Table(4,3,2) includes the reactions of Irish bond yields to macroeconomic announcements of PIIGS and Germany from 2007 to 2013. Initially, we note that there is no autocorrelation with the exception of Unrate of Greece. Releases of Unrate increase the excess return of bond yields and the coefficient is equal to 0,2003. This seems to be obvious because of the sharp upturn of unemployment. Unemployment rate in Greece was 27.80 percent in October of 2013 and for ages from 20-29 was 57 percent the same period. Hence, the harsh economic conditions in Greece influence Ireland due to the exposition to Greek bonds and ejects investors to demand bigger returns in order to hedge the risk.

The empirical results for volatility raised our interest. Initially, macro releases of Germany, with the exception of Trbalance, lower volatility of Irish bonds. Nevertheless,

Greece displays quite different results. CPI and Unrate increase volatility, whereas IP lowers it. For one more time, we understand the great impact of unemployment rate of Greece to the investor sentiment. Now, how about Ireland macro releases? We see that PPI, IP, Unrate and GDP lower volatility with the magnitude of coefficients to be bigger than that of table (4,1,2). Of great importance is macro releases of Italy. We can see that all the announcements cause the volatility to go down. The releases of Portuguese macro news are in the same pattern where PPI, IP and Unrate seem to lower volatility. The last country is Spain and their results do not seem to appear slightly different with the exception of CPI which increases the volatility of Irish bond yields. All the other releases lower volatility of bond yields.

Looking at tables (4,1,2), (4,2,1), (4,3,2) the most significant remark is that the magnitude of coefficients are greater at table (4,3,2) because of the global crisis. Also, we have to refer that if we contrast tables (4,3,1) and (4,3,2), we reach the conclusion that international investors feel safer when they invest in Ireland than in Greece. It does not seem to be strange due to the fact the Irish authorities have done a successful implementation of the programme. The very good work done thus far in terms of fiscal consolidation and structural reforms are allowing Ireland to return to a path of sustainable growth and job creation, as evidenced by the nascent economic recovery, declining, although still high, unemployment and improving business confidence.

The next table (4,3,3) shows the reactions of Portuguese bonds from 2007 to 2013. It is important to know that Portugal has suffered from low GDP and productivity growth for more than five years before the outbreak of the recent crisis. Potential output growth has been on a steady downturn trend, with competitiveness being undermined by rising unit labor costs and deep structural problems. As a consequence of persistent current account deficits, Portugal has accumulated a high external debt, which is reflected in high household, corporate and fiscal debts. Thus, following a request by Portugal on 7 April 2011, the European Commission, ECB and IMF negotiated an economic adjustment programme, aimed at restoring confidence, enabling the return of the economy to sustainable growth, and safeguarding financial stability in Portugal, the euro area and the EU. The programme was agreed by the European Council on 17 May 2011. It covers the period 2011-2014. The programme foresees comprehensive action on three fronts: a credible and balanced fiscal consolidation strategy, efforts to safeguard the financial sector and deep and frontloaded structural reforms to boost potential growth.

Table (4,3,3)
Dependent variable: Portuguese Bonds (sample from 01/01/2007 to 29/11/2013)

Variables	Germany	Greece	Ireland	Italy	Portugal	Spain
Panel A:Mean						
Rt	*0,29231***	0,22474***	0,17496***	0,26913***	0,24996***	0,23456***
	(0,000)	(0,000)	(0,000)	(0,000)	*(0,000)*	(0,000)
CPI_j	-	-	-	-	-	-
PPI_j	-	-	-	-	-	-
IP_j	-	-	-	-	-	-
$TrBalance_j$	-	-	-	-	-	-
$UnRate_j$	-	-	-	-	-	-
GDP_j	-	-	-	-0,04232***	-	-
				(0,0002)		
Panel B: Variance						
GARCH(-1)	*0,55615***	0,57005***	0,79199***	0,39889***	0,58626***	0,50614***
	(0,000)	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*
CPI_j	-	-0,01165***	0,00052**	0,00508**	-0,01566*	-0,02163***
		(0,000)	*(0,0374)*	*(0,0240)*	*(0,0554)*	*(0,000)*
PPI_j	-0,02604***	-	0,00213***	-0,01999***	-0,03907***	-0,02780***
	(0,000)		(0,000)	(0,000)	(0,000)	*(0,000)*
IP_j	-	-	-0,00075***	-0,01469	-0,04010***	0,00465***
			(0,0005)	(0,000)	(0,000)	*(0,0447)*
$TrBalance_j$	-	-	-0,00090	*-0,01875****	-	-0,00961***
			(0,000)	*(0,000)*		*(0,0003)*
$UnRate_j$	-0,03685***	-0,01557***	0,00081***	-0,00788***	-0,02189***	-0,01074***
	(0,000)	(0,000)	(0,0004)	(0,0004)	(0,000)	*(0,000)*
GDP_j	-0,01157***	-0,03845***	-0,00139***	-0,00579***	-0,02372***	-0,01820***
	(0,000)	(0,000)	*(0,000)*	(0,000)	(0,0078)	*(0,000)*

***,**,* indicates significance on the 1%, 5%, and 10% level
Only statistical significant coefficients are reported.
The table presents coefficients and the respective p-values for AR(1) and GARCH(1,1) models.
The independent variable is measured as a 0/1 dummy variable

In table (4,3,3) we could see the impact of macroeconomic announcements of PIIGS and Germany on the daily treasury bond yields of Portugal from 2007 to 2013. With respect to autocorrelation the empirical results are indifferent. The only statistical significant coefficient is GDP of Italy showing negative autocorrelation with bond yields of Portugal.

Regarding volatility, empirical results are somewhat the same with the previous tables. Initially, PPI, Unrate and GDP of Germany lower conditional volatility and coefficients are greater than these in tables (4,1,3) and (4,2,3). Additionally, announcements of Greece have great impact due to the fact that Portuguese government has bought a great amount of Greek toxic bonds. So, CPI, Unrate and GDP of Greece lower conditional volatility. Now, the empirical results of Ireland show something different. CPI, PPI and Unrate increase volatility, whereas IP, Trbalance and GDP lower it. So, the most important

thing is that the magnitude of coefficients is not so big. These results are somewhat confusing and may belong to statistical error. Furthermore, all the macroeconomic releases of Italy lower volatility with the exception of CPI which increases it.

Macroeconomic releases of Portugal and Spain are of great importance, too. IP of Spain shows to increase conditional volatility, whereas all the other releases lower it. The last country is Portugal with empirical results similar to the previous one. We see that all the statistical significant releases reduce conditional volatility of Portuguese bond yields.

Now, looking at the three tables referred to Portuguese bond yields {(4,1,3), (4,2,3), (4,3,3)} we can say with certainty that the Irish's bond market is more vulnerable in table (4,3,3). Nevertheless, if we compare the results of table (4,3,3) with these of the tables (4,3,1) and (4,3,2), we will note that Portugal comes second behind Greece. Also, It means that Portugal is in harder economic conditions than Ireland, something which is true in the real economy.

5. CONCLUSIONS

This paper investigates the interaction between announcements and volatility in European bond market, and to what extent conditional volatility is explained by macroeconomic announcements. We use daily yields on the 10-year Treasury bond, for the period march 1998 to November 2013. The macroeconomic announcements that have been scrutinized are the CPI(consumer price index), PPI(producer price index), IP(industrial production), Trade Balance, Unemployment Rate and the GDP(gross domestic product) reports published by Bloomberg calendar of events. We have argued that it is both interesting and extremely relevant from a financial economics point of view to investigate the implications of macroeconomic announcements on the variance and mean structure of Treasury bond yields.

The main findings of our empirical work can be summarized as follows: although there are few statistically significant macroeconomic announcements on the level of yields, we find many on volatility. The most important reason that macroeconomic announcement shocks have a different impact on volatility is due to the fact that they are regularly scheduled, such that the timing of these releases is known in advance. Most of the times macroeconomic releases reduce conditional volatility, regardless of the content of the releases. It means that when European markets wait for an announcement then a sense of bias and uncertainty is created which lowers when the announcement become known. From this point of view, a negative coefficient for a given release can be interpreted as an announcement which contributes to the formation of a consensus view on the country and makes the trading environment more stable. Also, European policy announcements seem to lower volatility when markets are able to reach a consensus on what these announcements imply for country risk. On the opposite side, If an announcement reveals new information not incorporated in asset prices, volatility have the tendency to rise on the announcement day, as markets adjust their position in response. Furthermore, our empirical results also show that announcement effects in European markets vary depending on country characteristics.

Macroeconomic releases have the tendency to matter less for more transparent countries according to our literature. We mean that macro releases of Germany and PIIGS have greater impact on conditional volatility of Greek bonds, follow Portuguese bonds and the last one is Irish bonds. This sequence is based on our literature and reassures that Greece is under the worst economic conditions among the three, second and third is Portugal and Ireland, respectively.

To the best of our knowledge, we have provided clues that macroeconomic releases change rational behavior for investors holding a long portfolio of treasury bonds in areas such as asset pricing, asset allocation and risk management. We mean that if the implication of an announcement for country risk is ambiguous, as it is possibly to be the case with trade balance and PPI announcements, volatility is likely to rise, as investors rebalance their portfolios in reply to the announcement and to private information that emerges subsequently through order flow. Furthermore, it is conceivable that the impact of macroeconomic announcements on bond yields depends on the general state of the economy, for example whether we are in an expansion or a recession. We end to this conclusion when we cut our sample in two pieces. The first includes observations from 1998 to 2007 and the second one from 2007 to 2013. In the second sample the impact of macroeconomic releases on the bond yields volatility is bigger than in the first sample. The second sample includes the global economic crisis and the markets are more vulnerable to macroeconomic changes.

Regarding the mean equation, we find that individual macroeconomic releases do not have a systematic effect on the daily change in yields. The most viewed macroeconomic releases are Industrial Production, Producer Price Index and Unemployment Rate. Furthermore, European policy announcements have the tendency to increase yields and bonds earn higher returns when they are more exposed to macroeconomic risk. Thus, during the global economic crisis the autocorrelation was positive most of the times and the magnitude of the impact on bonds excess return was great.

The results of this study give raise to interesting future research. The use of options data to examine the volatility impact of macroeconomic announcements may increase the power of the results. It is common-knowledge that some industries count more on macroeconomic factors than others, it will be interesting to examine industry stock portfolios. So, a good idea will be to investigate the impact of macroeconomic announcements on stock options and the most significant to interrelate data from Europe and US. This is a way to find which of the two markets manipulate the global economy.

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APPENDIX

In this appendix we quote the tables showing the impact of macroeconomic announcements on Treasury bond yields of Germany, Italy and Spain. The economic meaning of the results moves in the same direction of the previous one and the impact on volatility is smaller because we talk for more transparent countries.

Table 1
Dependent variable: German bonds (full sample)

Variables	Germany	Greece	Ireland	Italy	Portugal	Spain
Panel A:Mean						
Rt	0,03401**	0,03417**	0,03497	0,03491**	0,03412**	0,03497**
	(0,0335)	(0,0325)	(0,1276)	(0,0289)	(0,0332)	(0,0287)
CPI_j	-	-	-	-	-	-
PPI_j	-	-	-	-0,00646*	-0,00463*	-
				(0,0525)	(0,0782)	
IP_j	-	0,01044***	-	-	-	-0,004166*
		(0,0019)				(0,0780)
$TrBalance_j$	-	-	-	-	0,00672*	-
					(0,0855)	
$UnRate_j$	-	-	-	-	-	-0,00670
						(0,1086)
GDP_j	-	-	-0,01054**	-	-	-
			(0,0376)			
Panel B: Variance						
GARCH(-1)	0,95135***	0,95118***	0,52069***	0,95080***	0,95050***	0,95125***
	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)
CPI_j	-	-	-0,00114***	-	-0,00030***	-
			(0,000)		(0,0005)	
PPI_j	-	-	-0,00088***	0,00021**	-	-
			(0,0000)	(0,0119)		
IP_j	-	-	-0,00123**	-	-	-
			(0,000)			
$TrBalance_j$	-	-	-	-	-	0,00017***
						(0,0041)
$UnRate_j$	-	-	-0,00106**	-	-	-
			(0,000)			
GDP_j	-	-	-0,00159**	-	0,00015*	-
			(0,000)		(0,0723)	

***,**,* indicates significance on the 1%, 5%, and 10% level
Only statistical significant coefficients are reported.
The table presents coefficients and the respective p-values for AR(1) and GARCH(1,1) models.
The independent variable is measured as a 0/1 dummy variable

Table 2
Dependent variable: Italian Bonds (full sample)

Variables	Germany	Greece	Ireland	Italy	Portugal	Spain
Panel A:Mean						
Rt	0,10006***	0,06986***	0,07004***	0,09601***	0,06959***	0,10498***
	(0,0004)	(0,000)	(0,000)	(0,0013)	(0,000)	(0,0004)
CPI_j	-	-	-	-	-	-
PPI_j	-	-	0,00698**	-	-0,00550*	-
			(0,0108)		(0,0509)	
IP_j	-	-	-	-	-	-0,01022**
						(0,0498)
$TrBalance_j$	-	-	-	-	-	-
$UnRate_j$	-	-	-	-	-	-
GDP_j	-	-	-	-	-	-
Panel B: Variance						
GARCH(-1)	0,63518***	0,92309 ***	0,92250***	0,55943 ***	0,92498 ***	0,55680 ***
	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)
CPI_j	-0,00080***	-	-	-0,00208***	-0,00045***	-
	(0,000)			(0,000)	(0,000)	
PPI_j	-0,00275***	-	-	-0,00167***	-	-0,00185***
	(0,000)			(0,0011)		(0,000)
IP_j	-0,00069***	-	-	-0,00115**	-	-0,00207***
	(0,000)			(0,0394)		(0,000)
$TrBalance_j$	-0,00144*	-	0,00017**	-0,00261***	-	-0,00275***
	(0,0015)		(0,0323)	(0,000)		(0,000)
$UnRate_j$	-0,00255***	-	0,00012**	-0,00141**	-	-0,00305***
	(0,000)		(0,0736)	(0,000)		(0,000)
GDP_j	-0,00282***	-	-0,00027**	-	-0,00019**	-0,00324***
	(0,000)		(0,0130)		(0,0289)	(0,000)

***,**,* indicates significance on the 1%, 5%, and 10% level
Only statistical significant coefficients are reported.
The table presents coefficients and the respective p-values for AR(1) and GARCH(1,1) models.
The independent variable is measured as a 0/1 dummy variable

Table 3
Dependent variable: Spanish Bonds (full sample)

Variables	Germany	Greece	Ireland	Italy	Portugal	Spain
Panel A:Mean						
Rt	0,06896***	0,06896***	0,06951***	0,11966***	0,13172***	0,06942***
	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)
CPI_j	-	-	-	-	-	-
PPI_j	-	-	-	-	-	-
IP_j	-	-	-	-	-	-0,00745***
						(0,0024)
$TrBalance_j$	-	-	-	-	-	-
$UnRate_j$	-	-	-0,00483*	-	-0,01325*	-
			(0,0583)		(0,0629)	
GDP_j	-	-	-	-	-	0,00731*
						(0,0802)
Panel B: Variance						
GARCH(-1)	0,92063***	0,92063***	0,92130***	0,55503***	0,55208***	0,91820***
	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)
CPI_j	-	-	-	-0,00231***	-0,00298***	-
				(0,000)	(0,000)	
PPI_j	-	-	-	-0,00157***	-0,00326***	-
				(0,0041)	(0,000)	
IP_j	-	-	-	-0,00209***	-0,00253***	-
				(0,000)	(0,000)	
$TrBalance_j$	-	-	-0,00015*	-0,00300***	-0,00133**	0,00026***
			(0,0764)	(0,000)	(0,0146)	(0,0022)
$UnRate_j$	-	-	-	-0,00144**	-0,00352***	-
				(0,0187)	(0,000)	
GDP_j	-	-	-0,00031**	-0,00242***	-	-
			(0,0118)	(0,000)		

***,**,* indicates significance on the 1%, 5%, and 10% level
Only statistical significant coefficients are reported.
The table presents coefficients and the respective p-values for AR(1) and GARCH(1,1) models.
The independent variable is measured as a 0/1 dummy variable

Table 4
Dependent variable: German bonds (sample from 24/03/1998 to 31/12/2006)

Variables	Germany	Greece	Ireland	Italy	Portugal	Spain
Panel A:Mean						
Rt	0,03731*	0,03826*	0,03611	0,03665*	0,03675*	0,03703*
	(0,0907)	(0,0840)	(0,1059)	(0,0975)	(0,0995)	(0,0944)
CPI_j	-	-0,01071***	-	-	-	-
		(0,0084)				
PPI_j	-	-	-	-	-	-
IP_j	-	0,01188**	-	-	-	-0,00524*
		(0,0194)				(0,0621)
$TrBalance_j$	-	-	-	-	-	-
$UnRate_j$	-	-	-0,01091***	-	-	-
			(0,0002)			
GDP_j	-	-	-	-	-	-
Panel B: Variance						
GARCH(-1)	0,95135***	0,94924***	0,94924***	0,94605***	0,94413 ***	0,94715 ***
	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)
CPI_j	-	-	-	-	-0,00029***	-
					(0,0044)	
PPI_j	-	-	-	0,00028***	-	-
				(0,0039)		
IP_j	0,00022***	-0,00014**	-	-	-	-
	(0,0005)	(0,0224)				
$TrBalance_j$	-	-	0,00015**	-	-0,00019***	0,00014**
			(0,0348)		(0,0082)	(0,0469)
$UnRate_j$	-	-	-	-	-	-
GDP_j	0,00014*	0,00019*	-0,00029**	-	0,00026**	-
	(0,0728)	(0,0650)	(0,0115)		(0,0218)	

***,**,* indicates significance on the 1%, 5%, and 10% level
Only statistical significant coefficients are reported.
The table presents coefficients and the respective p-values for AR(1) and GARCH(1,1) models.
The independent variable is measured as a 0/1 dummy variable

Table 5
Dependent variable: Italian Bonds (sample from 24/03/1998 to 31/12/2006)

Variables	Germany	Greece	Ireland	Italy	Portugal	Spain
Panel A:Mean						
Rt	0,04849**	0,04945	0,04602**	0,04866**	0,04874**	0,04901**
	(0,0280)	(0,1341)	(0,0402)	(0,0291)	(0,0314)	(0,0284)
CPI_j	-	-0,01261***	-	-	-	-
		(0,0008)				
PPI_j	-	-	0,00698	-	-	-
			(0,1014)			
IP_j	-	0,01095**	-	-	-	-0,000553*
		(0,0151)				(0,0528)
$TrBalance_j$	-	-	-	-	-	-
$UnRate_j$	-	-	-0,01102***	-	-	-0,00690
			(0,0002)			(0,1004)
GDP_j	-	-	-	-	-	-
Panel B: Variance						
GARCH(-1)	0,95357***	0,49412***	0,95017***	0,94877***	0,94811 ***	0,94710 ***
	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)
CPI_j	-	-0,00122***	-	-	-0,00033***	-0,00008*
		(0,000)			(0,0008)	(0,0799)
PPI_j	-	-	-	0,00038***	-	-
				(0,0001)		
IP_j	0,00023***	-0,00104***	-	-	-	-
	(0,000)	(0,000)				
$TrBalance_j$	-0,00021**	-	0,00020***	-	-0,00016**	-
	(0,0430)		(0,0036)		(0,0134)	
$UnRate_j$	-	-0,00072**	-	-	-	-
		(0,0328)				
GDP_j	0,00019**	-0,00081***	-0,00034***	-	0,00028**	-
	(0,0120)	(0,0018)	(0,0026)		(0,0140)	

***,**,* indicates significance on the 1%, 5%, and 10% level
Only statistical significant coefficients are reported.
The table presents coefficients and the respective p-values for AR(1) and GARCH(1,1) models.
The independent variable is measured as a 0/1 dummy variable

Table 6
Dependent variable: Spanish Bonds (sample from 24/03/1998 to 31/12/2006)

	Germany	Greece	Ireland	Italy	Portugal	Spain
Panel A:Mean						
Rt	0,04274*	0,04372*	0,06951*	0,04157*	0,04157*	0,04206*
	(0,0573)	(0,0528)	(0,0681)	(0,0661)	(0,0662)	(0,000)
CPI_j	-	-0,01075***	-	-	-	-
		(0,0090)				
PPI_j	-	-	-	-	-	-
IP_j	-	0,01150**	-	-	-	-
		(0,0257)				
$TrBalance_j$	-	-	-	-	-	-
$UnRate_j$	-	-	-0,01098***	-	-	-
			(0,0002)			
GDP_j	-	-	-	-	-	-
Panel B: Variance						
GARCH(-1)	0,95279***	0,95208***	0,95192***	0,94985***	0,94958***	0,94975***
	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)
CPI_j	-	-	-	-	-0,00040***	-
					(0,000)	
PPI_j	-	-	-	-0,00033***	-	-
				(0,0011)		
IP_j	0,00024***	-0,00013**	-	-	-	-
	(0,0002)	(0,0303)				
$TrBalance_j$	-0,00019*	-	-0,00019***	-	-0,00015**	-
	(0,0690)		(0,0073)		(0,0346)	
$UnRate_j$	-	-	-	-	-	-
GDP_j	0,00017**	0,00019*	-0,00031***	-	0,00032***	-
	(0,0404)	(0,0724)	(0,0046)		(0,0079)	

***,**,* indicates significance on the 1%, 5%, and 10% level
Only statistical significant coefficients are reported.
The table presents coefficients and the respective p-values for AR(1) and GARCH(1,1) models.
The independent variable is measured as a 0/1 dummy variable

Table 7
Dependent variable: German bonds (sample from 01/01/2007 to 29/11/2013)

Variables	Germany	Greece	Ireland	Italy	Portugal	Spain
Panel A:Mean						
Rt	0,02804	0,03018	0,02769	0,02950	0,03574	0,02952
	(0,2327)	(0,1946)	(0,2373)	(0,2062)	(0,0995)	(0,2061)
CPI_j	-	0,01032**	-	-0,00849**	-	-
		(0,0221)		(0,0197)		
PPI_j	-	-	-	-	-	-
IP_j	-	-	-	-	-	-
$TrBalance_j$	0,00899**	-	-	-	-	-
	(0,0320)					
$UnRate_j$	-	-	-	-	-	-
GDP_j	-	-	-	-	-	-
Panel B: Variance						
GARCH(-1)	0,95318***	0,95331***	0,95434***	0,95301***	0,51930 ***	0,95277***
	(0,000)	(0,000)	(0,000)	(0,000)	(0,0002)	(0,000)
CPI_j	-	-	-	-	-0,00146***	-
					(0,0003)	
PPI_j	-	-	0,00049***	-	-	-
			(0,0040)			
IP_j	-		-	-	-	-
$TrBalance_j$	-	-	-0,00066***	-	-	-
			(0,0001)			
$UnRate_j$	-	-	-	-	-0,00127**	-
					(0,0157)	
GDP_j	-	-	-	-0,00026**	-0,00158***	-
				(0,0377)	(0,0057)	

***,**,* indicates significance on the 1%, 5%, and 10% level
Only statistical significant coefficients are reported.
The table presents coefficients and the respective p-values for AR(1) and GARCH(1,1) models.
The independent variable is measured as a 0/1 dummy variable

Table 8
Dependent variable: Italian Bonds (sample from 01/01/2007 to 29/11/2013)

Variables	Germany	Greece	Ireland	Italy	Portugal	Spain
Panel A:Mean						
Rt	0,10342***	0,12252***	0,09564***	0,09990***	0,13034***	0,09700***
	(0,0001)	(0,000)	(0,0002)	(0,0001)	(0,0017)	(0,0002)
CPI_j	-	0,00706**	-	-	-	-
		(0,0499)				
PPI_j	-	-	-	-	-	-
IP_j	-	-	-	-	-0,020483**	-0,01533***
					(0,0236)	(0,0005)
$TrBalance_j$	-	-	-	-	-	-
$UnRate_j$	-	-	-	-	-	-
GDP_j	-	-	-	-	-	-
Panel B: Variance						
GARCH(-1)	0,90178***	0,62528***	0,95017***	0,89494***	0,56369***	0,89545 ***
	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)
CPI_j	0,00032***	-	-	-	-0,00408***	-
	(0,000)				(0,0081)	
PPI_j	-	-	0,00054***	0,00032**	-0,00675***	-
			(0,0007)	(0,0414)	(0,000)	
IP_j	-	-0,00074***	-	-	-0,00810***	-
		(0,000)			(0,000)	
$TrBalance_j$	-	-	-0,00042***	-	-0,002061*	0,00037**
			(0,0040)		(0,0968)	(0,0266)
$UnRate_j$	0,00037**	0,00035**		-	-0,00429***	-
	(0,0365)	(0,0278)			(0,0001)	
GDP_j	-	-0,00056***		-	-0,00335*	-
		(0,0001)			(0,0575)	

***,**,* indicates significance on the 1%, 5%, and 10% level
Only statistical significant coefficients are reported.
The table presents coefficients and the respective p-values for AR(1) and GARCH(1,1) models.
The independent variable is measured as a 0/1 dummy variable

Table 9
Dependent variable: Spanish Bonds (sample from 01/01/2007 to 29/11/2013)

Variables	Germany	Greece	Ireland	Italy	Portugal	Spain
Panel A:Mean						
Rt	0,17780***	0,10888***	0,10550***	0,15557***	0,16691***	0,11032***
	(0,0001)	(0,000)	(0,000)	(0,0001)	(0,0002)	(0,000)
CPI_j	-	-	0,01240**	-	-	-
			(0,0269)			
PPI_j	-	-	-	-	-	-
IP_j	-	-	-	-	-	-0,01436***
						(0,0042)
$TrBalance_j$	-	-	-	-	-	-
$UnRate_j$	-	-	0,01207**	-	-	-
			(0,0208)			
GDP_j	-	-	-	-	-	-
Panel B: Variance						
GARCH(-1)	0,53718***	0,89099***	0,95192***	0,52430***	0,55989***	0,88894 ***
	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)	(0,000)
CPI_j	-	-	-	-0,00397***	-0,00438**	-
				(0,000)	(0,0266)	
PPI_j	-	-	-	-0,00227***	-0,00768***	-
				(0,0027)	(0,000)	
IP_j	-0,00129***	-	-0,00034*	-0,00423***	-0,00245	-
	(0,000)		(0.0509)	(0,000)	(0,1076)	
$TrBalance_j$	-	-	-	-0,00640***	-0,00283*	-
				(0,000)	(0,0987)	
$UnRate_j$	-0,00520***	-	-	-0,00418***	-0,00510***	-
	(0,000)			(0,000)	(0,000)	
GDP_j	-0,00873***	-	-	-0,00186***	-0,00374*	-0,00034**
	(0,000)			(0,000)	(0,0506)	(0,0382)

***,**,* indicates significance on the 1%, 5%, and 10% level
Only statistical significant coefficients are reported.
The table presents coefficients and the respective p-values for AR(1) and GARCH(1,1) models.
The independent variable is measured as a 0/1 dummy variable