Stock-Bond Return Dynamic Correlation and Macroeconomic Announcements: Time-Scale Analysis and the Financial Crisis

4.1 Introduction

The need for a better portfolio allocation during the period of financial crises has put a pressure on researchers to shift their interests from being focused on investigating the performance of stocks only (e.g. Cutler et al. 1989) or government bonds (e.g. Fleming and Remolona 1997) to study the correlation between both (e.g. Campbell and Ammer, 1993; Ilmanen 2001, and Gulko, 2002).

From one perspective, constructing a portfolio using a fixed weight over time has been always considered risky, and risk averse investors usually prefer to manage their portfolios by adding more treasury bonds which represent the 'safe haven' component especially at the time of financial turmoil.

While previous research has incorporated several factors in their models to better understand the dynamic correlation between equities, macroeconomic news, especially those published by the U.S. reporting agencies due to their global influence on the equity markets around the world remain the most commonly employed. Research in this context not only considered the raw macroeconomic data, but also the expectations for the future performance, as associated by the investor sentiment. Importantly, the macro surprise component which represents the difference between both the raw macro and its corresponding expectation is considered. However, the main focus of the current research is to investigate how long it takes for the price data to react to those surprises; and whether the reaction is determined by a specific unstable period cycle in the economy.

One strand of this research has examined at the effect of U.S. macro surprises on the European markets (e.g. Becker et al., 1995; Hanousek et al., 2009), Asian markets (Wongswan, 2009), developed Asian and European markets and on global emerging and developed markets including the G7 countries (Nikkinen et al, 2006). The general finding from these studies is that the news from the U.S. economy can widely send signals to the international markets about the health of global economy. That macroeconomic news from international markets, in turn as found, rarely affect the U.S. economy.

However, with all of these studies, one main issue that is hard to address completely is that the different trading hours between the markets, hence there might be some delay in processing the information that move from the U.S. market to the global markets and also the problem of endogeneity that both markets when studied in the same econometric system can affect each other. Some researchers were able to find a solution for that by deeply investigating the relationship between small open markets and the U.S. (e.g. Albuquerque and Vega 2009). In their study, the researchers also presumed that the U.S. market only can affect the small economy but the reverse is not true.

Developed markets such as the U.S. market, in essence, are more efficient and investors in these markets can usually digest the information contained in the macro surprises quickly and take them as a solver for the uncertainty in the equity markets. Yet, it is still an issue by itself to what extent is the U.S. financial markets are sensitive to the arrival of the new macroeconomic news. Instead of focusing on the strength of the reaction of the individual assets prices or returns in the U.S. market, this research aims to investigate the sensitivity of stock and government bond dynamic correlation to the arrival of the macroeconomic news. More specifically, to examine the connection between the dynamic correlation and the macrocosmic surprises, we focus on the periods during and round the 2008 crisis.

Some studies also concerned about the attitude of the investors during the 2007-2008 crisis. For example, Marsh and Pfleiderer (2013) argued that both the risk and the risk tolerance have changed during the recent 2008 crisis by which made an imbalance between the demand and the supply for the risky assets. While the risk averse investor was more willing to sell the risky assets, it was difficult to find another risk taker investor willing to buy the same class of asset. Füss et al. (2015) found that both the default premia and the liquidity premia significantly enlarged throughout the 2008 crisis. With a proxy for the macroeconomic uncertainty developed recently by Jurado et al. (2015), the U.S. stock market found to be mostly affected by the uncertainty during the 2008, but less in the 2001 Dot-com crisis. The previous findings of the studies above seem to be in line with the early argument of Easley and O'Hara (2010) of how the high level of uncertainty forced the financial markets to enter a freezing stage with no trading in the early days following the bankruptcy of Lehman Brothers.

Our understanding of those studies analysed both the risk and uncertainly during the 2008 crisis suggests that, the investors in U.S. market are supposed not to respond quickly to the arrival of same macroeconomic news as they did in the past in other crises. Here we should expect the U.S. financial markets to be less efficient at the time of 2008 crisis, with a drift to exist in either under-reaction or over-reaction form to some or more of macroeconomic news.

In order to empirically investigate this issue, we need to decompose the time series at given intervals, each one of them represents the specific time horizon. To do this, early research has employed the wavelet transform as an important tool which can decompose the equity series in time and frequency domains. More recent research has studied the correlation between the stock and bond markets using this approach. Kim and In (2007) examined the relationship between the stock prices and bond yields in the G7 countries and found that the sign and strength of the relationship depends on the scale. Investigating the dynamic correlation between the stock markets from a sample includes the BRIC countries (Brazil, Russia, India and China) and other developed countries. Also, using wavelet transform, some recent studies (see, for example, Graham & Nikkinen, 2011; Lehkonen and Heimonen, 2014) find that the level of co-movement between the international stock markets differ across the time-scales. Hence, our study aims to contribute to this growing research by using wavelet to decompose the U.S. equity yield series (stock and government bond) on scales before estimating the dynamic correlation between both on each scale, then examining how that correlation changes from one scale to following macroeconomic news announcement.

Our study is related to the work of Christiansen and Angelo (2007), Brenner et al. (2009), and Baker and Wurgler (2012). Christiansen and Angelo focus on the effect of macroeconomic surprises on the stock-bond realized correlation during the expansion and the recession periods in the U.S. However, their study ignored the fact that during the time any financial crisis, the market behaves in a different way than in another crisis. Hence, it is important to understand which macroeconomic factors will stay more influential than others throughout the crisis and for how long such an impact of macro news will persist. This is necessary especially when it comes to investigating the existence of bubbles in the market, at the times where markets are more characterised by the high level of uncertainty. During the crisis, investors will pay more attention to each macro news that can help in understanding the direction of the market, and hence they take the advantage of the fact that some news announced reduces the uncertainty to build their portfolios.

In the very close study to ours, Brenner et al. (2009) estimate the effect of four surprises series namely, the consumer price index (CPI), the unemployment rate, the target Federal fund rate, and nonfarm payroll on the excess daily holding period return, volatility and covariance of stocks, corporate bonds and government bonds of different maturities. For the analysed period from 1986 to 2002, Brenner et al. (2009) found that one day before the announcement, the same day, and one day later the co-movement between different classes of assets tends to affected by the macro surprises component, though less persistence effect is found comparing with that in other days.

Further, the study found a small reaction of both the government and corporate bond returns to CPI surprises and linked that to stability of inflation forecasts over the sample period (1986-2002). From the general finding of Brenner et al. (2009), and specifically from their last justification for the little reaction to CPI, doing the analysis during the 2008 crisis, the period of which characterised by uneasy levels of inflation is necessary in understand the real interaction between financial markets around the macroeconomic news announcements. We tackle this subject with our comprehensive and long macroeconomic surprises series covering the period for even after 2008 crisis.

Baker and Wurgler (2012) document that both the macroeconomic factors, financial factors and the investor sentiment all affect the co-movement between the stock and the government bonds when it is examined in a cross- sectional analysis with the investor sentiment being a strong predictor for this co-movement. Our study, though, differs from Baker and Wurgler (2012) in three ways. First, we keep our main focus on the effect of news surprises components rather the raw macroeconomic data. Second, we do our analysis directly on the dynamic correlation between the stocks and bond by which make our results more relevant to the portfolio construction process. Lastly, our research examines the speed of reaction to the macroeconomic news and not the magnitude of their effects on the stock-bond dynamic correlation.

Yet, there is generous evidence that the state of the economy is one of the main factors that determines how the market reacts to some important news, such as the unemployment rate (Boyd and Jagannathan, 2005). Using other individual macro series namely the US federal fund rate, Kurov (2010) among others seeks to investigate the reaction of the stock market during the bull and bear periods and find that investor sentiment itself plays a major role during the bear period in strengthening the reaction. Kontonikas et al. (2013) investigate the impact of Fed policy on the market during the recent financial crisis. They found that the financial crisis caused a structural shift in the macro news- stock market relationship from being significant outside the crisis but not throughout. Thus, based on the study of Kontonikas et al. (2013), we study the stock-bond return dynamic correlation reaction to U.S. macro surprises and investigate whether this reaction has changed during the financial crisis. The size of literature in this area is few compared with that devoted to study the reaction of the individual equity return.

Studies concern with the role of stock market uncertainty in formulating the reaction to the news can be related also to our research. Given that the U.S. investors were more uncertain about their investment decisions during the 2008 crisis (Easley and O'Hara 2010), this can make the uncertainty also a possible factor responsible for the delay in the reaction to the macroeconomic news. Zhang (2006), for example, found that the reaction of the daily market excess return to

Earnings announcements tends to drift when there is a high level of uncertainty. Similar finding by Bird and Yeung (2012) that the reaction to the bad news (negative surprises) is stronger than to the good news (positive surprises) when the investor faces a high level of uncertainty and low level of sentiment. These studies and others related their findings to the theories of underreaction and overreaction which of most can explain the investor behaviour through the 2008 crisis. In addition to the role of uncertainty, the financial media effect became more intensive during the crisis by which increase the attention of the investors in the U.S. markets to some macroeconomic announcements more than to others. (Persss, 2008) found that investors mainly the sophisticated ones seem to strongly react to the positive firm Earnings news which they are more covered in the media. Same notion can exist during the recent crisis with more individual investors tend to herd in the market and more macroeconomic news tend to be covered in the media, by which result in a slow reaction to the news.

Altogether, the media and uncertainty are both supposed to alter investor's response to some macroeconomic news in the U.S. market during the crisis. Other studies (see, for e.g. Tetlock, 2007 and Garcia 2013) used the media as a sentiment proxy and investigate their effect on the DJIA's index return and trading volume. With both studies constructed a pessimistic investor proxy from the scanned negative words in the American newspapers. Tetlock (2007) conducted his study on the "Abreast of the Market" column of the *Wall Street Journal* and found that the pessimistic index negatively predict the DJIA return next day while this effect tends to reverse and the market return to fundamentals in about four days later. Similar result obtained by Garcia (2013) who further found that this effect on the DJIA return is more noticeable during the recession periods than the expansion. However, the index constructed by Garcia used the negative and positive words from the "Financial Markets" and "Topics in Wall Street" Columns from the New York Times" article archive.

These studies on the media sentiment in the U.S. also tell us a story that is on how the effect of macroeconomic news on the stock-bond dynamic correlation can vary during the recent crisis if there was a reversed effect of sentiment from one day to another.

Our results are informative and can be summarised as follows. First and in consistent with the vast majority of the literature, we find very little evidence that the macroeconomic news surprises affect the equity price and stock-bond return dynamic correlation over our full sample period from 2000 to 2013. However, our evidence reveals that, when controlling for the Lehman brothers 2008 crisis, some announcements tend to significantly affect all the correlation series on the first day with this impact notably observed during throughout the crisis period. Second and for analysis done on scales we find a link between the speed of reaction of dynamic correlation to news surprises and the time and of announcements. For example, news such as factory goods order, the industrial production, the consumer credit and the new-single family house sales which they are early released on time and in the month, show a slower effect on the dynamic correlation than those released late. The impact of early macroeconomic news seems to be fully incorporated into correlation process 4-8 days after they have been announced. Third, from all the surprises series, the CPI and housing starts effects tends to persist up to 2-4 days ahead of the announcement day. However, they are the only two releases show high significant and consistent effect on all the correlation series outside the crisis period. Finally, as an additional analysis, we find that the effect of most of surprises, either in the same day of announcements or up to 16 days later, disappeared after replacing the 2008 with the 2001 Dot-com crisis or 2011 U.S. government debt ceiling dispute periods. Yet, the effect of both CPI and housing starts are the most prominent outside the crises periods. This last general finding again suggests investigating the effect in a crisis-regression analysis is more precise than analysing the effect over the full recession (expansion) period. That is using the later will ignore the differences in the level of the inflation, the sentiment and the uncertainty across the crises periods.

In our robustness checks, we find that our results are somewhat robust to using the DJIA small value and growth index returns to construct the new correlation series. However, with these two new series the correlation series tends to be less affected by macroeconomic news either in the first day or some days later after the announcements. This result here supports the general belief, that the pricing of small companies is more affected by the investor sentiment ((see, for example Lemmon & Portniaguina; (2006) and Baker & Wurgler (2007)).

In one further test, we find that due to the high level of daily U.S. news-based economic policy uncertainty as proxy by the later developed measure of Baker et al. (2013), the reaction of some news including the consumer credit tends to be small in the day of announcement, but higher and significant after controlling for the uncertainty as exactly affected in the announcement days. Yet, we find that the effect of policy uncertainty is strong only when matched with the days of announcements and tends to reverse to fundamentals afterward with the correlation being affected again by the same macroeconomic news. In one more test, and rather than running a separate regression for each macroeconomic factor, we find that important macroeconomic news maintained their significant effects even after simultaneously including all of them in the same regression as predictors.

Following this introduction 4.1, the next section reviews the related literature to our study; section 4.3 describes the data and the techniques used in our analysis. In section 4.4 we present the empirical findings before we conclude in section 4.5.

4.2 Previous studies

This section summarises those studies concerning the macro factors and their relation to equity market movements. Beginning with Section 4.2.1, we briefly summarised those studies conducted on the role of news in moving individual markets. Section 4.2.2 concerns the studies mainly investigated the role of macro news on formulating stock-bond dynamic correlation, before we summarise the main lessons drawn from the literature in section 4.2.3.

4.2.1 The Effect of Macro News on Equity Price and Volatility.

Understanding how to analyse the performance of the equity market is of highly importance to investors as well to researchers. Given this, early studies have focused on examining the factors that might affect the performance of individual assets in isolation of others. One the of early studies by Douglas and Roley (1985) used macro surprises of inflation, money growth and real output activity and investigated their effect on the daily S&P 500 price index. They found that only money growth announcements significantly affect the price, while the influence of inflation news seems to be less important. Further, the study found that there is little evidence that the effect from inflation news will persist to the next day. Investigating the effect of macro news has also considered high-frequency price data. For example, Jain (1998) built on the findings of Douglas and Roley (1985) and examined the speed of hourly stock price adjustment to the release of some announcements including, CPI (Consumer price index), PPI (Producer price index), IP (Industrial production) and the UR (Unemployment rate). Interestingly, the study found that the price adjusted quickly following the macro news, with the effect of, for example, the CPI, to persist only for fours and after that the whole effect disappeared. Although in both of the above studies the sign and the magnitude of news effect were different one day after the news has been released. Continuing in using the intraday data and within a five-minute trading interval, Ederington and Lee (1993) found that macro news leaves a significant effect with match the price interval and for those of most important are found to belong to the interval of 8:30-8:35 AM. The study also found the price adjustment occurred within one minute after the release and after that the resulted spikes tend to disappear. Meanwhile, volatility seems to be affected by news announcements for at least fifteen minutes after the release.

To enhance on the previous research, some studies (e.g. McQueen and Roley, 1993; Boyd et al., 2005) have considered the state of the economy as a main factor that can determine how the stock markets response to the news. In particular, McQueen and Roley (1993) found that when the economy is in a good condition, the stock markets will react negatively to the news about the future activity. Also, the expectation for cash flows, as an intermediate factor, will differ across the economic states, with a time varying stock market reaction to the news. A similar conclusion is also reached by Boyd et al. (2005) where they found that news of a higher unemployment rate than expected is good news for the economy during an expansion, but, bad during a contraction. The study hypothesised that varied levels of risk premium and the growth rate in the industry play an important role in determining the speed and the direction of the market's reaction to the unemployment news.

To complement the story of investigating the role of news on the stock market and to look at a less risky investing instrument, Fleming and Remolona (1998) consider to what extent macro news factors are responsible for moving the bond market. Using a very short time period from August 1993 to August 1994 and by incorporating the role of stock market uncertainty, the study found that surprise components associated with certain news including, CPI, PPI, industrial production, retail sales and capacity utilisation are the most influential on both the 5 years treasury bond price as well the trading activity on it. Fleming and Remolona (1998, p.32) also gave a general hint on those studies have conducted on the stock markets and dismiss why the research concerning the effect of macro news should also consider the bond markets, their argument was:

"The apparently weak informational effects found in the stock market are not entirely surprising. Much of the observable information likely to be relevant to the stock market as a whole takes the form of macroeconomic announcements. The theoretical effects of such announcements are often ambiguous for stocks, but not for bonds. The reason is that stock prices depend on both cash flows and the discount rate, while bond prices—for which cash flows are fixed in nominal terms—depend only on the discount rate".

Additional finding by the same study suggests that the interaction term with the change of the implied volatility index fairly helps in explaining the reaction of the bond price to news of durable goods, GDP and the housing starts.

There exists a voluminous literature on investigating the effect of macro news on the equity volatility (See, for example, Ederington and Lee, 1995; Jones et al., 1998; Flannery and Protopapadakis, 2002). Ederington and Lee (1995) found that a conspicuous jump in the volatility on the days of announcements, while the price reacts slowly due to the flow of other type of information in the market that is not related to macro news. As a corollary, Ederington and Lee (1995) found that the volatility remains at remains at a higher level only for 3 minutes following the announcements, while the price tends to keep fluctuating because the investors are uncertain about the significance of the news content.

Jones et al. (1998) used daily excess return for 5, 10 and 30-year bond maturity. Within a regime-switching GARCH framework, they found that following the days of announcements, neither the risk premium nor the volatility persist over subsequent days, using both the PPI and unemployment rate as macro news candidates. Although what Jones et al. (1998) mainly found was that the volatility level was higher on announcements days. Similar finding by Flannery and Protopapadakis (2002) has reached after conducting a study on the stock market where CPI, PPI, housing starts, and unemployment news all showed a significant impact on volatility.

A comprehensive study by Christiansen (2000) used more bond data with lower than 5 years of maturity and reported findings similar to those of Jones et al. (1998). Christiansen (2000) found no significant difference between effect of negative and positive shocks. Furthermore, and more importantly, the study found that the covariance structure, variance and the correlation between the bonds are all higher at the time of announcements, but do not persist afterward. The conclusion by Andersen et al. (2003), however, was different in that positive and negative shocks both can exert an asymmetric effect with the bad news have higher effect on the volatility as proved using the intraday data exchange rate data. Although all of the above research used the news[1] (i.e. surprises components) to examine the effect on the market, the study of Kim et al. (2004) is an exception who, in addition to the news themselves, considered the role of raw expectations. The study also found that negative retail sales news affects the bond market volatility, while that associated with the unemployment rate affect the stock market. Kim et al. (2004), however, were able to find that the news of CPI and PPI have higher effect on stock market than on bond market.

Balduzzi et. al. (2001) used a 30-minute price interval of 2, 3, 10, 30-year bond data. Interestingly, the study found a strong reaction to some announcements including CPI, PPI and housing starts and new house sales. This reaction, however, only lasts for 25 minutes following the news arrival and then disappeared, though the pattern of significance in the response is considered erratic. Furthermore, the authors reached an important conclusion that the strengthen of the effect of the news on the bond returns depends positively on the maturity, with the long mature bonds being considered more volatile than those with lower maturity.

Studies following Balduzzi et al. (2001), aimed to better understand the role of announcements in moving the bond markets. For example, Green (2004) argued that the investors in the market

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[1] More studies have examined the accuracy of the median expectations including, for example, Douglas and Roley (1985) and Aggarwal et al. (1995). The studies proved the unbiasedness of the median expectations as provided by Money Market Services (MMS), after regressing the actual reported values on the expectations for some economic news, and empirically found the slope coefficient is significantly different than zero. Another study by Gilbert et al, (2010) have instead looked at the factors that determine the significance of the news themselves, and proved that more revised news by their reporting agencies, early announced and those include more information content as related to the state of the economy, exert more impact on the market.

interpret the release in different ways that can lead to an asymmetry in bond market pricing. The study also argued that the precision level of the news is one of the main determinants of its influence on the market, that is, as argued the more precise information, the more reaction by the market will be. Consistent with Green (2004), Chartrath et al. (2006) emphasise that news in the first half of the month are associated with a high level of uncertainty, while for those released later in the month, the macro forecasts will be more accurate by which explain the greater effect of some announcements on both the trading volume and volatility in the second half of month more than that in the first half of the month.

Irrespective of this disagreement about the uncertainty that follows the news announcement days, using 5-minute intraday data, Lahaye et al, (2011) proved that certain announcements are responsible for causing jumps in both price and volatility in bond futures market, stock index futures market and exchange rate markets. Among those announcements considered, CPI is found to directly relate to the existence of jumps in the bond markets, while for the jumps to exist in the other markets, PPI was the best candidate to explain them. The studies in the literature have also tried to explain why some announcements even if they belong to the same economic indicator can leave a different effect on the market. In this context, Rangel (2011) again found that higher number of jumps on the PPI and CPI announcement days with the effect of only the former on the volatility tend to persist, while the effect of later do not last beyond its release date. An interesting explanation by the authors was that the PPI index released earlier in the month and this help investor to forecast the subsequent CPI index.

The findings of Rangel (2011) corroborate the results of Green (2004)[2], of that 'the early releases have more impact on the market than the latest announced'. The macro news-jumps relationship puzzle continued to exist until Lee (2011) used firm level stock price data and found that macro news is more important for what he called "the systematic risk" that risk affect all the companies in stock index, while as he found idiosyncratic jumps are those more associated with firm-specific Earnings news.

In a very recent study, Savor and Wilson (2013, p.370), however, offer a better explanation for that uncertainty on the news announcements days, and based on their main findings of higher sharp ratio on those days of release, the authors argued;

[2] This, however, contradicts one of the main results of Flannery and Protopapadakis (2002) of that some late releases have more effect than the earlier ones. Their explanation is in consistent with the hypothesis of the importance of the macro news identity in determining their strength.

"Because investors learn more about future economic conditions around announcements, they should be less willing to hold assets, such as stocks that covary positively with these news, even if the variance of their returns is itself not much higher. If such shocks are persistent, even a small increase in their volatility (the news arrival rate) around announcements can result in large increases in the market risk premium".

4.2.1 Macro News and Stock-Bond Dynamics

Apart from investigating the factors that the moves the stock and bond markets, research in this area has also examined the nature of their relationship. The two of main concerns of this research are directed to understand how the dynamic relationship can emerge, what factors are responsible for the co-movement and how it changes over time. An early study by Shiller and Biltratti (1993) failed to significantly link the excess stock-bond correlation to the one-year actual inflation rate. Based on the expectations of the inflation and future dividends and the short-term real interest rate, Campbell and Ammer (1993) were able to find that the later factor is, commonly but partially able to explain the stock-bond dynamic relationship. Around the crisis period, a change in the direction of the relationship is evident. In this thread, Gulko (2002) has investigated the "decoupling" stage that occurred after the 'Black-Monday' 1987 crash day. Interestingly, in his analysis, Gulko found that the correlation, but not the volatility, tends to revert to its pre-crash level after being sharply negative during the crisis. This, as explained, is due to the fact that the investors in the markets have long memories and remain nervous after the crisis. A similar idea to that of Gulko (2002) has been applied by Ilmanen (2003)[3] who instead examined the stock-bond relationship across different states of the economy and found that the correlation is low near the business cycle peaks, but low following the monetary policy tightening activities.

More recently, studies took another direction and started to incorporate macroeconomic factors in more advanced econometric models. For instance, Li (2002) allowed for the dynamic correlation fitted from bivariate-GARCH (hereafter, BV-GARCH) model to be a function of a set of macro factors. The final conclusion the study reached was that the sharp decline in correlation was partially caused by the lower inflation risk as measured by the difference in the CPI value. However, in the same study, business cycle components showed no effect on the correlation when it is dummy is included in the same regression model.

[3] The analysis is carried out using the national bureau of economic research's contraction and recession indicators. The study found that both the economic growth and the volatility mainly push the correlation to the negative direction, while the inflation, as argued helps in dominating the positive relationship due to its effect on the common discount rate for both stock and bonds. However, the study found that economic growth, volatility and inflation rate as changed across the states of the economy can interact and affect each other.

The notable success of multivariate GARCH models in formulating the dynamic correlations has triggered more interest in investigating the stock-bond dynamic correlation. Using monthly equity data and covering a long run horizon from the period from 1855 to 2001, Yang et al. (2009) documented an increase in the time varying correlation in one sub period after 1923 and also for the full sample period, as measured by the autoregressive BV-GARCH, following higher short-term interest rates and to some extent the higher CPI inflation. One explanation the study based on for the higher inflation in the second sub period was that, during this period the markets were more characterised by the level of uncertainty which in turn affect the role of inflation to cause the dynamic correlation.

A research conducted on stock and bond equity data from selected countries including the U.S., Kim et al. (2010) examined the role the European monetary union factors play in segmenting the stock-bond correlation. Using similar modelling steps to those of Li (2002), Kim et al. (2010) was found that the economic integration within the Euro region, and the reduction in currency exchange rate risk stimulated the international market integration. Meanwhile, the European monetary union seemed to cause the segmentation dynamic only within the Euro union.

Using a different methodology, Baele et al (2010), reconsidered the importance of different macro factors along the liquidity proxies represented by the transaction cost measure. Based on the correlation from the dynamic factor model, the study contradicts the previous research and interestingly found that the liquidity factor is the more responsible for the stock-bond dynamic correlation.

Different stories about the impact of the macro factors on the correlation have led to the use of the macro surprises, as a more informative risk measures than the raw macro data. For instance, in the analysis used the S&P 500 and 10-year treasury note intraday futures contract data, Christiansen and Ranaldo (2006) found that not only the realized volatility of both equities is higher on the news announcement days, but also the realized correlation. When the series of macro data is first employed and across the business cycle states, surprisingly the study concluded that the reaction of stock-bond correlation is higher during the recession period than in expansion. Using surprises components[4], the study apparently found only small evidence of the effect on the realized correlation.

[4] Following Balduzzi et al. (2001) and Andersen et al. (2003), the study first ran a separate regression for each announcement by regressing the realized correlation **(i.e.** on the individual surprises, next the study included in the announcement dummies in the regression and classified them into two groups, one before 10 a.m. and another for those announced after. One of the main findings also came in consistent with Lee (2011) on the higher impact of the macro news on the bond volatility compared with that on stock. For that the conclusion, the same explanation is hold again regarding the role of firm-level news which in turn make the difference with a little significant effect of the news on volatility.

Contrary to the commonly belief, Brenner et al. (2009)[5] was the first to report that the effect of macroeconomic news on the co-movement between the daily portfolio excess stock returns, corporate bond and government bond returns, on their return and volatility tends to be persist one day more since they have been released. This finding is against the general wisdom of previous studies that it just takes few minutes for the effect of macro news to be incorporated into the price (e.g. Balduzzi et al. (2001), among others)

More recently and contributing to the debate on the stock-bond correlation, Schopen and Missong (2011) used the DCC-GARCH model and inserted a set of macro surprises, financial crisis dummy and the change in the implied stock market volatility index in the conditional variance equation. Within a five-minute intraday interval and over the sample period from March 2007 to March 2011, Schopen and Missong (2011), found that both the macro news and the financial crisis dummy contribute less than the stock market uncertainty to the dynamic correlation.

4.2.3 What we can learn from the literature?

There is still disagreement on how quick is the equity price's reaction the macroeconomic news announcements. Studies in the literature end up with different conclusions depending on the different models, state of the market, sample periods, equity data frequency and the type of macroeconomic surprises used.

Further, only very few studies have examined the impact of news surprises on stock and bond markets co-movement. The general conclusion to be drawn here is that the persistence effect of macroeconomic surprises on the stock and bond return co-movement is either trivial or does not exist. Yet, none of these studies examined the effect directly on the stock-bond dynamic correlation an in the phases during and around the recent 2008 crisis, the time when the U.S. financial markets were strongly affected by the extreme levels of uncertainty and investor sentiment.

This study contributes to the second strand of literature, where the little work has been done.
It aims to fill the gap of small and no persistence effect from the macro news on stock and bond return interaction. It employs comprehensive and long datasets for both macroeconomic surprises and equity prices, robust model to estimate the dynamic correlation and an advanced mathematical tool to decompose the time series on time and frequency. We consider all these properties together and estimate the effect of 14 macroeconomic surprises on stock and government bond return

[5] The representatives for macro news employed were CPI, unemployment rate, nonfarm payroll and the target fund rate. The study used an extension to the DCC-GARCH model of Engle (2002), and directly incorporated the news components into GARCH (1, 1) conditional variance equation.

dynamic correlation during and around the 2008 crisis on proximity of the actual macro news releases and up to 16 days after.

4.3. Data and Methodology

This section describes the sample of data and the methodology used to estimate the impact of macro announcements on the dynamic correlation series. Section 4.3.1. provides a description for the equity market data and for the macroeconomic announcement series. Then in section 4.3.2 we define the econometric models employed for the dynamic correlation-macroeconomic news regressions.

4.3.1. Data description

This section describes the data used in our analysis; we begin by describing the stock and the Treasury bond data in the next section, while the macroeconomic news data are described in 4.3.1.2 before we provide the main summary statistics for the equity data and macro news in section 4.3.1.3.

4.3.1.1 Stock and Government Bond Prices.

Our first part of the analysis relies on the daily closing price index for DJIA Composite, NASDAQ financial, and the daily U.S government benchmark mark index on 2 years, 10 years and 30 years of maturity for the period from January 3, 2000 to December 25, 2013. Both the stock and the bond data were collected from Datastream[6]. For the later, Datastream used the most representative government bonds at each maturity to calculate the index, for a given bond they have four contributors (i.e. A, B, C and D) who are quoting the prices and then they take the average of all the four bond prices at the end of the day before they used that to calculate the index. The trading time of any bond follows that of the trading exchange where it is originally listed[7]. Our choice for the sample period is restricted by the availability of the macroeconomic news data which only

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[6] We believe that DJIA is a fairly representative of the U.S. stock indexes. The index experienced the largest one day drop on December 2008 among others following the Lehman brothers collapse before it started to recover, however, our sample initially includes the closing price index data for NASDAQ Biotechnology, DJIA transportation and the S&P composite index. Using those indices, our results are almost qualitatively and quantitatively similar. Other studies also used the Datastream benchmark indexes include, for example, Cappiello et al. (2006) and Connolly et al. (2007).

[7] For example, for those bonds listed on the NYSE, the trading hours came into thee time windows, early trading from 4:00 a.m. ET to 8:00 a.m. ET, core trading 8:00 a.m. ET to 5:00 p.m. ET and late trading 5:00 p.m. ET to 8:00 p.m. ET. Our primary information in the text on the construction of index was given to us by Datastream product specialists. For further details, refer to the Datastream government bond indices user’s guide, http://www.ucsia.org/download.aspx?c=jan.annaert&n=48181&ct=48218&e=173282.

available from January 2000. The equity price indexes are converted to return using the standard approach, the difference of the logarithm of prices on two consecutive days.

4.3.1.2 Macroeconomic news and survey data

We obtain our time series data on the actual macro-economic news and their expectations from Informa global markets, who became the main data provider for the macro news expectations after it was mainly published by the money market services (MMS) international. For the majority of the macroeconomic indicators, Informa global markets reports the data on monthly frequency since January 2000 and until December 2014.

Following Balduzzi et al. (2001) we constructed our main independent variable proxy, namely the macro news surprise using the following equation:

$$u_{k,t} = \frac{A_{k,t} - E_{k,t}}{\sigma_t} \qquad (4.1)$$

Where $A_{k,t}$ and $E_{k,t}$ are the actual value and it is corresponding expected value respectively for the news k at time t[8]. In order to compare the size of effect of one macro news with that of other which has different unit of measurement, the surprise component ($A_{k,t} - E_{k,t}$) needs to be divided by it is corresponding standard deviation σ_t across the entire sample period.

Among all available macro news, we focus only on sixteen candidates (see table 4.3) for the following reasons, first, those as argued by the literature as a fairly representative measures for the overall performance of the economy. Second, for the consistently in our analysis, we decided not to use that news who have missing data for more than one year. The actual and surprises macro series for news data, however, are fully available for the sample period.

4.3.1.3 Summary statistics

Table 4.1 reports the basic descriptive statistics for all equity return series over the full sample period, only the days where the macro announcements have been made and for those days without announcements. In Panel A of the table, the descriptive statics on the original return series. It can be noted that the standard deviation, as a basic measure of volatility, of the stock return series is higher at the announcement days than at the non-announcement days. Bond market returns,

[8] MMS conducts a telephone survey of about forty money market managers on the Friday of the week before the release of the actual value of each macroeconomic news. MMS then publish the median expectation from the survey. For more details on the MMS survey data, see Balduzzi et al. (2001) and Andersen et al. (2007).

however, are less volatile at the announcement days than at the announcement days. From the same panel, we note that for only bond 10 and 30-year maturity, the standard deviation over the full sample period is higher than when there are no announcements. The conclusion from analysis the mean values is not clear, for example, while that increased for the DJIA on the announcement days relative to the comparable values on the non-announcements days, it remains the same for bond 2 year return series and largely decreased and became negative for the bond 10 year return series.

Table 4.1 Summary Statistics of stock and bond return series.

This table shows the summary statistics for stock and bond index return series. The full sample period from 03/01/2000 to 25/12/2013 with 3649 daily observations, after the deletion of the no announcement days, the sample left with 1540 observations.

	Full Sample		Announcement Days (1540 Obs.)		Non- announcement Days (2109 Obs.)	
	Mean	SD	Mean	SD	Mean	SD
DJIA	0.000	0.135	0.000	0.012	0.000	0.011
Bond 2-year	0.000	0.433	0.000	0.001	0.000	0.001
Bond 10-year	0.000	0.018	0.000	0.017	0.000	0.018
Bond 30-year	0.000	0.009	0.000	0.008	0.000	0.009

Next in table 4.2 we report the unconditional correlation matrix between each pair of the stock and bond return series. It can be noticed that from the table, the correlation is always negative between the stock and bond return series, but positive when the bond 10 year return series is used. When comparing the strength of correlation, we note that it shows a decrease on the announcements days between any stock and bond series used in the analysis.

Table 4.2 Correlation Matrix

	Full Sample	Announcement days	Non- announcement days
	DJIA	DJIA	DJIA
Bond 2 years	-0.316	-0.290	-0.316
Bond 10 years	0.359	0.310	0.357
Bond 30 Years	-0.330	-0.280	-0.321

Table 4.3 presents the source and the summary statistics for the fourteen macroeconomic announcements used in our analysis. For four macroeconomic news, namely consumer credit, new single house sales, housing starts and Chicago PMI, the standard deviation is more than one, while it is not for the rest of macro indicators, in terms of the sign of the surprise, the housing starts has no zero surprise, while both new single house sales and the consumer credit show only one zero surprise. For other important news namely the average hourly earnings, CPI, personal income and

unemployment rate, the expectations seem to be more accurate with very high number of zero surprises obtained. Furthermore, the largest number of positive surprises is for the PMI, which means more bad news are associated with this economic indicator. The difference between the positive and negative surprises is the highest for the unemployment news which has only 44 positive surprises, which, however, represents the good news for the economy, against 82 negative ones.

Table 4.3 Summary for the predictors.

This table shows the description of the predictors used in the regression models in this study. The macroeconomic surprise series u_k is calculated for each economic variable k using the approach of Balduzzi et al. (2001) with $u_{k,t} = \frac{A_{k,t} - E_{k,t}}{\sigma_t}$, where $A_{k,t}$ is the monthly actual value obtained from the reporting agency mentioned in the table, $E_{k,t}$ the corresponding median expectation as collected from Informa global markets database, σ_t is the standard deviation of the unexpected component of *kth* economic variable. [a] (BLS) denotes the Bureau of Labor Statistics, (BC) Bureau of the Census, (FRB) Federal Reserve Board, (BEA) Bureau of Economic Analysis (BC), Bureau of the Census and (ISM) institute of supply management. [b] denotes all in Eastern time period. The macroeconomic figures of average hourly Earnings and unemployment rate are announced in the same day.

	Source of Report[a]	Mean	SD	Number of Positive	Number of Negative	Release Time[b]
Average Hourly Earnings	BLS	0.000	0.001	50	66	8:30
Business Inventory	BC	0.000	0.002	76	70	10:00
Consumer Credit	FRB	0.582	6.085	88	79	15:00
CPI (Consumer Price Index)	BLS	0.000	0.001	55	69	8:30
Factory Goods Orders	BC	0.000	0.008	88	73	10:00
Housing Starts	BC	0.695	33.308	87	81	8:30
Import Price	BC	0.000	0.006	73	81	8:30
Industrial Production	FRB	0.000	0.004	68	81	9:15
New Single Home Sales	BC	2.326	21.445	85	82	10:00
Personal Income	BEA	0.000	0.003	66	63	8:30
PMI (Purchasing manager index)	ISM	0.688	4.303	94	70	9:45
PPI (Producer Price Index)	BLS	0.000	0.004	76	73	8:30
Retail Sales	BC	0.000	0.006	75	81	8:30
Unemployment Rate	BLS	0.000	0.001	44	82	8:30

4.3.2. Methodology

This section outlines the models used in this chapter. First we describe the decomposition process using the wavelet transform and provide a brief introduction on that tool. Then the subsequent section 4.3.3.2 describes how the dynamic correlation between the stock and bond has been estimated. Last in sections 4.3.3.3 and 4.3.3.4, respectively we describe the regression models used to investigate how the equity returns and the dynamic correlation react to the macroeconomic surprises.

4.3.2.1 Wavelet transform

Wavelet is a powerful mathematical tool that can be used to decompose the time series into different frequencies. It represents an extension of other basic pre-pressing filtering, methods, such as Fourier transform and some others including, for example, Kaman filter. All of these filters however share the same feature, they only filter the data in a frequency domain and discard the information that are localised in time. Wavelets, instead, have been developed to detect the irregularities such discontinuities or jumps by scanning in both the time and frequency domain, which makes it effective tool to be used in finance and economics. Early application of wavelet in economics finance by Ramsey (2002) has followed later by more works in finance (e.g. Kim and In, 2005; Rua and Nunes, 2009; Graham and Nikkinen, 2011; Gallegati and Ramsey, 2013 and Ortu et al, 2013)[9].

The existing literature also includes more recent work by Cipollini et al. (2015), who has proved the standing of using wavelet in investigating the volatility contagion from the U.S. market to the European markets during the crisis as defined since the failure of Lehman brother bank, and also outside the crisis period. However, their evidence on the contagion existence were determined by the scale of the return series and found not to be stable over time that if only the entire return series is used in the analysis.

Transformation the return series using wavelet starts using a scaling index *j* and translation index *k* both contribute to the decomposition process which is mainly based on the mother wavelet

$$\phi_{k,j} = \frac{1}{2^{j/2}} \phi \left(\frac{t-2^j k}{2^j}\right) \tag{4.2}$$

Which in particular needs to be integer to one for a scale *j* (i.e. $\int \phi(\mathrm{t}) d_j = 1$).

and father wavelet:

$$\psi_{k,j} = \frac{1}{2^{j/2}} o\varepsilon_t \left(\frac{t-2^j k}{2^j}\right) \tag{4.3}$$

to integrate to zero where $\int \psi(\mathrm{t}) d_j = 0$.

[9] Percival and Walden (2000) is a more comprehensive reference for wavelet methods and their applications on the time series data. Ramsey (2000) reviews the contribution of wavelet in analysing the economic and financial data, while Crowley (2007) provides guidance to the economists on the importance of wavelet. Recently, In and Kim (2012) outlined the role of wavelet theory in finance with several case studies on the topic have been included in their work.

With the specifications in equations (4.2) and (4.3), we then use the stationary wavelet transform[10] and incorporated both mother and father wavelet as described above in a linear combination through a high-pass and low-pass filters. Using the low-pass filter, the return series R_n for the number of observations *n* can be decomposed into a sub series. That is, a smooth (i.e. approximation) component, A_n, that captures the events that are long in time and rarely occur with respect to the frequency. The high pass filter reproduces more detailed components D_j that are short in time and highly in frequency. The overall process to be described as follows:

$$r_{i,t} = \phi A_n + \sum_{j=1}^{n} \Psi D_j \tag{4.4}$$

Following the recommendations of others (e.g. Daubechies, 1992 & Percival and Walden 2000), several studies based their choice for mother wavelet on Daubechies least asymmetric with the length of 8 (D8, hereafter), this study is not an exception and we used this type in our analysis. This selection of wavelet is proved to be a good enough in representing the volatile time series (see, for example, Kim and In, 2010).

One main important element of the decomposition process that to be decided is the number of resolution levels. To meet our objective with the daily data at hand, six levels (J=5) is found to be the most appropriate with any number more than that, if selected, will destruct the time series at hand.

Last, the response of the equity market return to the macro surprises is quick, with the effect to completely disappear in a short time period, however, not determined in case of the dynamic correlation analysis. Hence, we decided to work only on the first three scales of the stock return and bond yield series. Specifically, that first resolution level corresponds to time horizon between 2 and 4 days, scale two represent the 4-8 days and scale 3 for 8-16 days.

4.3.3.2 the Model for the Dynamic Conditional Correlation

The multivariate GARCH models of Engle (2002) for the dynamic conditional correlation (DCC) and that of Bollerslev (1990) for the constant conditional correlation (CCC) have been always considered very successful in investigating time varying correlation between the equity returns.[11]

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[10] Also denoted in the literature by the maximum overlap discrete wavelet transform. It works by producing stationary wavelet coefficients, and in each scale, the number of observations will be exactly the same as in the original return series. For more details, see Percival and Walden (2000).

[11] For more detailed presentations of the multivariate GACRH extensions, see Bauwens et al. (2006) and Silvennoinen and Teräsvirta (2009). Engle and Colacito (2006) evaluated some extensions of the DCC-GARCH, including the ADCC-GARCH model, for the purpose of the portfolio construction.

Cappiello et al. (2006)[12] considered the fact that both models, do not allow for the asymmetric impact of news shocks on the dynamic correlation and even on the smoothness of the model parameters and hence developed the new extension called Asymmetric conditional correlation (henceforth, ADCC-GARCH).

The new model has been initially developed and proved it is attractiveness in investigating the dynamic conditional correlation between the government bond and stock returns. In a recent study, Li and Zou (2008) used the model to examine the co-movement between the Treasury bond return and the stock market returns in China.

Estimating of the ADCC-GARCH models involves of several steps. Considering the return series $r_i \mid \Omega_{t-1,} \sim N(0, H_t)$, with i= 1, 2,..., n and Ω_{t-1} is the information set at time period, the step is to estimate the conditional variance using one of the univariate GARCH models. With several univariate models available, threshold GARCH model of Golsten, Jagannathan and Runkle (1993) is selected according to Schwartz–Bayesian information criterion. The model as denoted by GJR-GARCH can be given as follows:

$$h_t^2 = \omega + \sum_{i=1}^{p} \alpha \varepsilon_{t-i}^2 + \sum_{i=1}^{q} \gamma \varepsilon_{t-i}^2 I_{t-i} + \beta h_{t-1}^2 \qquad (4.5)$$

Where $I_t[\cdot]$ is and indicator function which takes the value of one when the shock is negative (ε_{t-1}<0) zero for positive shocks (ε_{t-1}>0).

The main assumption of the model is that the effect of negative shock on the volatility as measured by ($\alpha + \gamma$) is higher than the positive one which has an impact of α . Here, the actual effect of news can be determined from where negative (positive) news have greater impact on the volatility level with γ >0(γ <0). Furthermore, *p* and q lag orders are set to 1 in both equations for stock and the bond return series and assuming that the standardized residuals $\varepsilon_{i,t}$ are normally and *iid* distributed[13].

Using estimated $h_t^{1/2}$ and the $\varepsilon_{i,t}$ from the first stage, the model proceeds by setting the conditional covariance matrix to be as follows:

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12 Although it is not of our main interests, the model allows for the inclusion of any variable in the dynamic correlation to can account for the possible structural breaks in the correlation, Li and Zou (2008) used the same idea in their study.
13 Our choice of the distribution is found not to affect the estimation of conditional variance too much; the same argument is made by Cappiello et al. (2006).

$$D_t P_t D_t \tag{4.6}$$

Where, D_t is the (n × n) diagonal matrix of time-varying conditional volatility from GJR-GARCH model on *i*th diagonal, such as $D_t = diag\left\{h_t^{1/2}\right\}$ for each single return series *t*=1,…, return series. The other term in the equation, P_t denotes the conditional correlation matrix as constructed from the standardized residuals and can be specified as follows:

$$P_t = Q_t^{*-1} Q_t Q_t^{*-1} \tag{4.7}$$

Where $Q_t^* = \left\{diag[Q_t]\right\}^{-1}$, the diagonal matrix with the main elements of Q_t, the conditional covariance matrix of the vector ε_t in it is *i*th diagonal. Between two asset return series, the conditional covariance matrix can be denoted by q_{ijt} and then the conditional correlation, $\rho_{ij,t}$ which represents diagonal entries of P_t can be computed as $\rho_{ij,t} = q_{ij,t} / q_{ii,t}^{1/2} q_{jj,t}^{1/2}$.

In order to account for the possible impact of the past news shocks on both the future volatility and the evolution of covariance, Cappiello, et al. (2006) accommodate for the asymmetries in their model and it is given as follows:

$$Q_t = (\bar{P} - A'\bar{\mathrm{P}}A - B'\bar{\mathrm{P}}B - G'\bar{N}G) + A'\varepsilon_{t-1}\varepsilon'_{t-1}A + G'\xi_{t-1}\xi'_{t-1}G + B'Q_{t-1}B \tag{4.8}$$

Where A, B and G are the parameter matrices and the later term captures the asymmetric impact given that, $\xi_{t-1} = I[\varepsilon_t < 0] \; o\varepsilon_t$, (with $I[\cdot]$ being initially k $\times 1$ indicator function which takes on value of 1 if the argument is true and zero otherwise), while "o" is the element-by-element Hadamard product function. The other terms in the equation $\bar{P}$ and $\bar{N}$ are expectations and replaced with their sample analogous such as $\bar{N} = \frac{1}{T}\sum_{t=1}^{T} n_t n'_t$ and $\bar{N} = \frac{1}{T}\sum_{t=1}^{T} n_t n'_t$ Cappiello, et al. (2006) refer to model described in equation 4.8 as asymmetric generalized AG-DCC and made it as a special case of the DCC model of Engle (2002). For our study, we use the diagonal version of ADCC model, where the matrices *A*, *B*, and *G* are replaced by their diagonal elements *a*, *b* and *g* and the model to be given by:

$$Q_t = (i\bar{\mathrm{P}}i' - a\bar{\mathrm{P}}a' - b\bar{\mathrm{P}}b' - g\bar{N}g') + a\varepsilon_{t-1}\varepsilon'_{t-1}a' + g\xi_{t-1}\xi'_{t-1}g' + bQ_{t-1}b' \tag{4.9}$$

Here *i* is the vector of ones and in order to get a positive definite value of Q_t for all observations *t*, the intercept term $(i\bar{\mathrm{P}}i' - a\bar{\mathrm{P}}a' - b\bar{\mathrm{P}}b' - g\bar{N}g')$ must be positive semi definite. Throughout our analysis in this paper, we use the diagonal version of the ADCC as the model which assumes that dynamic correlation not necessarily to be the same each time when bonds of different maturity are used in the portfolio, such as the correlation between the DJIA index return and the bond 2-year yield, can be different than that with bond 10-year yield.

4.3.2.3 Linear Regression: The Bassline model:

Primarily in this paper we try to investigate the effect of macro surprises on the return series with ignoring the effect of the 2008 financial crisis. By doing that, we aim to compare our results with those from the literature examined the effect of macroeconomic news on the return series without controlling for the state of the economy. This study however, includes long sample for all the news and also covers the period even after the 2008 crisis. In order to do that we regress the return series on the macro surprises associated with each macroeconomic variable and only each macroeconomic factor is included in the regression as a single predictor:

$$r(\rho SBm)_t = \alpha + \sum_{k=1}^{n} \beta u_{k,t} + e_t \quad (4.10)$$

Where the dependent variable is stock return series, bond yield (r_t) or the dynamic correlation series between both of them, (ρSBm_t) all at time *t.*
u_k is the is the standardized surprise for the macroeconomic announcement *k* at time *t.*

The regression above includes only the return observations on those days at which each macroeconomic announcement has been made. The exact announcement days have been matched with the dependent variable on the same days.

Henceforth, we left with only 168 observations, while any day with no announcements at all for the macroeconomic factor under consideration are excluded from the sample. This approach can be more accurate to obtain the crisis and a non-crisis regression coefficient compared with that includes all the macroeconomic observations in the regression. Also, it might be the case that investor downgrade some macroeconomic news during the crisis, whereas upgrading others depending on the level of uncertainty in the market.

4.3.3.4 Macroeconomic Surprises and Dynamic Correlation

Our main test then considers how the macroeconomic news affects stock-bond return dynamic correlation. We run identical regression to equation (4.10) and just replaced the return series (the dependent variable) with the dynamic conditional correlation as fitted from the ADCC model for each stock-bond return pair and we accounted for the 2008 crisis. The model then is given by:

$$\rho SBm_t = \alpha + [(1 - D_t^{CRISIS}) \sum_{k=1}^{n} \beta_1 u_k + D_t^{CRISIS} \sum_{k=1}^{n} \beta_2 u_k] + e_t \quad (4.11)$$

Where

D_t^{CRISIS} is a dummy variable which is equal to 1 during the crisis and zero otherwise. The crisis period is defined from September 30, 2008 to March 27, 2009.

β_1 is the sensitivity of return series to macro surprises outside the crisis period (i.e. $1 - D_t^{CRISIS}$).

β_2 is the sensitivity of return series to macro surprises during the crisis period.

A natural question here is whether that response lasts beyond the day of announcement or not. To examine this, we use both the dynamic correlation generated using the original return series and the decomposed correlation series of 2-4, 4-8 and 8-16 days following the announcements.

4.4. Empirical Results:

The first section estimates the time varying correlation using the original and the decomposed return series, whereas the following section examines the effect of -macro news surprises on either the return or dynamic correlation without accounting for the 2008 crisis. Section 4.4.3 examines the impact of the macro news surprises on the stock-bond dynamic correlation. Lastly, sections 4.4.4 and 4.4.5 show the results from the additional analysis and robustness checks, respectively.

4.1.2 Estimation of the ADCC-GACRH model

Table 4.4, panel A set out the estimated parameters when the ADCC-GARCH model on original return series is used, with all parameters for the model are being statistically significant at 1% level. Other panels from B to D report the results using the decomposed series. Again all the parameters are significant with the value of α increased and β decreased each time we move from lower scale to higher scale. Overall, it can be seen from the table that the shock to correlation typically shows high persistent (i.e. α+ β) on the same day of announcement with the average of 0.989 across all estimated correlation series. This average value decreased on the next scale (0.833) before starting to increase again, (0.917) and (0.926) for the 4-8 and 8-6 days, respectively. The estimates of log likelihood are higher for the scales than for the same days of the announcement.

Figure 4.1. plots of the dynamic correlation series on the day of announcements and 2-4 days afterward. The level of correlation remains in a narrow band, until the financial crises occurred in the markets, this is evident from all panels A, B and C regardless of the maturity of the government bond used in the estimation of the correlation. The level of correlation tends to decreases and become more negative around the 2001 Dot-com crisis, the 2008 global financial crisis, and the

2011 Euro and U.S. debt crisis periods. This provides strong evidence on to a flight-to-quality by moving in the investment from equity to government bonds throughout the crisis period. The right side panel in the figure shows that dynamic correlation tends to be higher 2-4 days following the announcement, while keeping the same pattern of the correlation when estimated on the announcements days.

Yet, comparing between all the correlation series in the left panel of the figure, we can notice that the correlation patterns are similar when either bond 2-year or 30-year is used. While using the 10-year bond tells a different story. That is, for the period between the end of the 2001 crisis and the beginning of 2008 crisis, the level of correlation higher when the 10-year bond series is employed was higher than that when either 2-year or 30-year is used. The same thing we can observe for the period started from the end of Dec 2012 when the correlation in panel B tends to decreased while plunged for those in panel in A and C. It could be the case that the U.S. investors were more uncertain about their investment position when they include the 10-year bond in their stock-bond portfolios.

Due to the long sample size used, our paper can scrutinize the dynamic correlation during and around the most recent crises (i.e.2001, 2008 and 2011) that the U.S. financial markets affected by[14].

[Insert Table 4.4 about here]

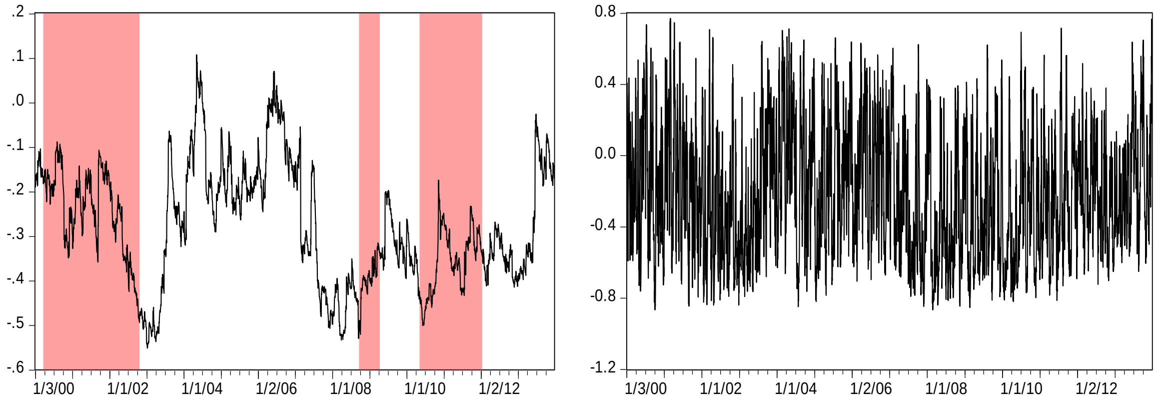
Figure 4.1 Plots of the Conditional Correlation (03/01/2000-25/12/2013).

This graph plots the dynamic correlation from the ADCC-GARCH. Left-side panels from A to C show the dynamic conditional correlation estimated based on the first day of the return series, while the right side panels

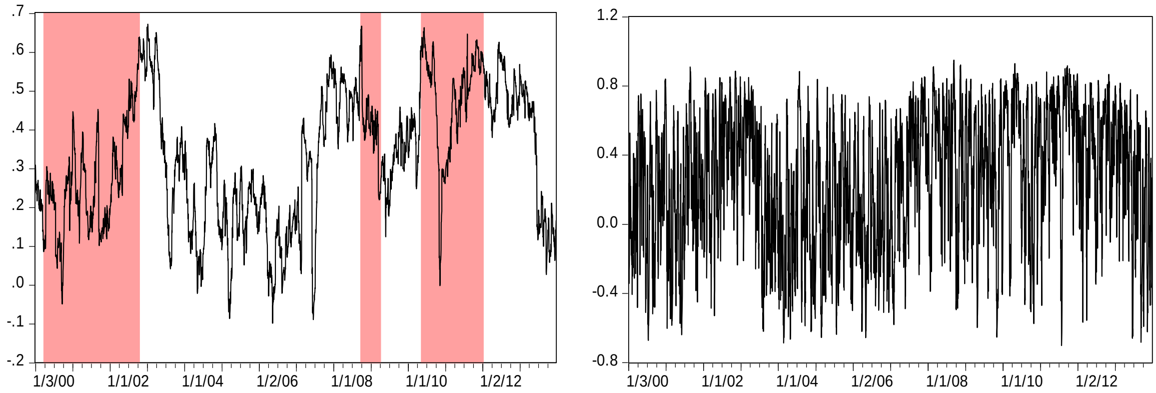
[14] Again, our main concern in this is paper is to investigate the speed of the impact of macroeconomic news during and around the 2008 crisis. But, as an additional analysis later in this chapter, we accounted for the 2001 and 2011 crises.

show the correlation accumulated over (2-4) days horizon. Shadings in the left panels represent the crisis bubbles bursting stage from Dot-Com crisis as defined from 14/03/2000 to 10/10/2002, from the global financial crisis: 15/09/2008 to 31/03/2009 and from the US government debt crisis: 30/04//2010 to 30/12/2011.

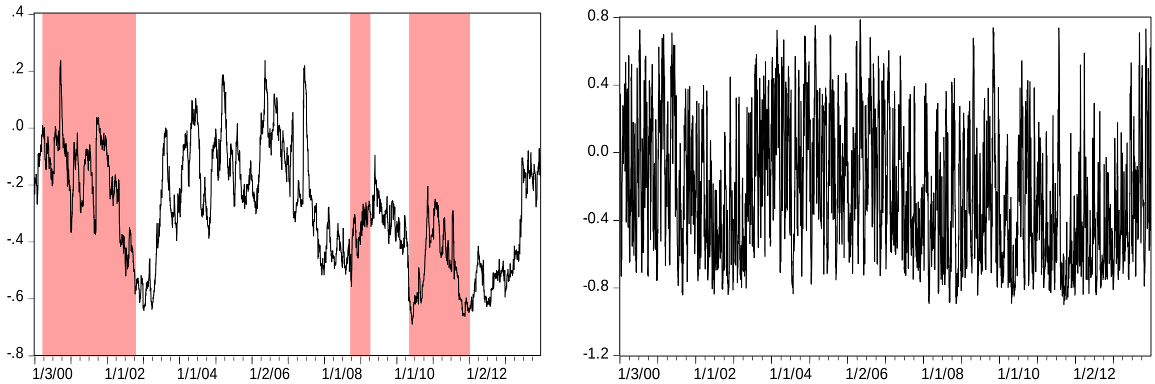
Panel A: Stock market and 2-year bond



Panel B: Stock market and 10-year bond



Panel C: Stock market and 30 year-bond



Panel (B) of the table reports the results when the asymmetric dynamic correlation as estimated from equation (4.9) is used as a dependent variable. Clearly shown, none of the announcements has an impact on the dynamic correlation series regardless of the employed bond yield series. New single family house sales, seems to affect the most among all news with an average absolute coefficient value of 2.

[Insert Table 4.5 about here]

The results in this table are more likely to be spurious, with the effects of some macroeconomic announcements tend to cancel-out each other over the full sample period. That is the case we expect when one news affects the dependent variable in one sub period (or during a given crisis period), but in another. To examine this further, we show the results in the next section when mainly the 2008 crisis dummy is incorporated into our regression.

4.4.3 Macroeconomic Surprises and the Dynamic correlation: Controlling for the 2008 Crisis:

Table 4.6 presents the slope estimates, t-statics and adjusted R^2 out from model 4.11. To make our findings comparable with those in the literature, we first estimate the model when the 2008 dummy is used (the first raw), then when it is replaced with the recession and expansion dummies from NBER (the second raw).

Regardless of the bond's maturity we consider to estimate the dynamic correlation, some announcements tend to leave a significant impact when the 2008 crisis dummy is used.

These announcements are average hourly Earnings, business inventory, personal income and unemployment rate. Among those, the unemployment rate and the average hourly Earnings news which both simultaneously announced, have the highest slope on average (of roughly 9.6% and 10.3%, respectively) across the dynamic correlation series used. On the contrary, when the NBER indicators are used, the effect of the unemployment news on the stock and bond 2-year's dynamic correlation is very small during the recession, with a slope of 0.00 (t-statistic of 0.12). Other announcements including retail sales, import, PPI index, and factory goods orders have a significant impact on all series during the recession period, but not when the 2008 crisis dummy is used.

One announcement, single family house sales affect the dynamic correlation around the crisis when either the 10-year or 30-year bond yields are included in the portfolio. With the NBER recession dummies, however, the effect on the same series comes during recession. This can explain more our intention to control for the crisis and not for the whole recession (expansion) periods, with the effect considering the later might disappear. That is because of the possible impact of the same piece of news in one crisis, but not in another.

Interestingly, both new single family house sales and the housing starts are the only factors which show the same sign of effect when we use regardless of the dummy variable used (2008 or NBER). They have both a negative effect on the stock-bond 10-year computed correlation during the bear periods and positive during the same period on either shorter or longer maturity of bond if used. From this finding, we can tell that the investors in the U.S. seem to have an agreement on the effect of housing-related macro news on their stock-bond constructed portfolios that is at least on the days when the actual figures for these are announced. Further, two of the macroeconomic news, CPI and consumer credit only show an impact during the recent crisis on stock and bond 2-year series, but not on others.

In addition, when considering the direction of effect again, all the dynamic correlation from stock and 2 or 30-bond seems to react in the same way to the macroeconomic news. Here the sign of coefficients during the bull periods are the same. In contrast, the correlation estimated when the 10-year bond maturity responds differently to the same piece of news. This does not represent a surprise, as it is already shown before from figure 4.1 that the dynamic correlation pattern for the stock and bond 10-year is different than others series.

Finally, five general findings can be drawn from the table. First, the effect of most announcements outside the crisis period or during the expansion can be neglected as it is very small. Second, Adjusted R^2 across all announcements is on average is 1.0% which means the magnitude of effect does not matter too much when it comes to the dynamic correlation-news connection, thought what is important is the speed of impact and the state of the economy in U.S. Forth, conducting a Wald test results as shown with bold figures in the table, indicate that those significant effects during the bear periods are significantly different than those when the markets are flourishing, Last, all significant announcements across all the series during the crisis period are always released early in the day before 10 AM.

[Insert Table 4.6 about here]

Next in table 4.7 we replace dynamic correlation series as constructed on the announcement days with the decomposed series of days following the announcements. Scales are denoted by (1-3), here scale 1 refers to (2-4) days, 2 and 3 represent the scales (4-8) and (8-16) respectively. Our intention to scale the dynamic correlation rather to keep it on the first day can be justified by some reasons. First, the same public announcement could generate a drift in form of underreaction in the market or it can be incorporated quickly in the price. While the first situation might be associated with the arrival of the noise traders, the latter case is more likely to occur when there are more informed traders in market (Vega 2006).

During the recent crisis, the proportion of each type of the investor in the market has changed, with some investors left the market, while others stayed. This might reflect on the dynamic correlation between the aggregate stock market returns and bonds yields, and then on the reaction to macroeconomic news which we employ in our model. Second, other factor might also slow down the reaction is the quality of the private information that the investors acquire during the crisis, no matter from which type they are. Daniel et al. (1998) argue that the investors tend to underreact to the public information and overreact to their private information. The question which can be asked here, whether this prediction holds as a rule when the investor concern about the dynamic correlation of their portfolios, in response to the macroeconomic announcements during the crisis.

Last, we expect that both the timing and the day of announcements in the month to play a major role in formulating their effects on the dynamic correlation.

The sophisticated investors are supposed not to react to each piece of news rather to wait until other news released later in the month, before they start rebalancing their portfolio. Supposing that, the market participants were more likely to herd and not to scrutinize the strength of macroeconomic news carefully before the crisis, while they tend to be more rational and conservative during the bubbles bursting stage.

From our analysis in this section, we notice that the reaction to most of the macroeconomic news has increased (in absolute value) in the first scale (2-4) days, mainly when the bond 2-year is included in the analysis. Some announcements, however, tend to increase their significance effect on (2-4) days for all dynamic correlation series examined. For example, average hourly Earnings' impact increased and almost doubled. The response to business inventory news is now significance in the first scale regardless of the used series. Interestingly, outside the crisis and on the first scale the investor seems to significantly react to both CPI and the housing starts macroeconomic news. The effect of both indicators became highly significant while it was very small in the same day of announcement outside the crisis.

The strong effect here came with the highest Adjusted R^2 (5% and 2% on average for housing starts and CPI, respectively). The reaction to these two figures outside the crisis with a consistency in the results can provide evidence that the investors agree on the importance some news. Before the crisis, both the inflation rate highly increased and the investors in the U.S. markets were a bit certain about the effect of that on the portfolios. As an outcome, both the consumer price index and the housing price increased and investor might think it is normal to strongly react to the news associated with these announcements. On higher scales, however, the effects of CPI and housing starts generally tend to decrease outside the crisis and increased throughout.

[Insert Table 4.7 about here]

Other news, such as PPI shows a different impact on higher scales, thought it released around the mid of the month and just (1-2) days before the CPI news. Another housing indicator, new single house sales seems to leave a slow impact on all the correlation series, yet significant in the third scale. Similarly, announcements released at 8:30 such as average hourly Earnings, housing starts, import and unemployment seem to strongly affect the dynamic correlation between stock and 2-year bond returns. Another clear finding from table is that industrial production shows a consistent significant impact in the second scale and on all the series.

However, when it comes to the timing and the day of the release, an interesting conclusion from the results can be reached. Three out of fourteen announcements used as predictors, namely consumer credit, factory goods order and new single house sales strongly affect the correlation series in scale 8-16. This strong effect came as we expected, those four announcements are the only ones released either in the first week of the month (consumer credit, factory good order) or in the last business week of the month (new single house sales). Also the time of those announcements is at 10 AM and after, and even the consumer credit which has the strongest effect among those three is released at 15 AM. This can support the notion that the investor's reaction is supposed to be slow to the late announcements on time and early released in a day in in the month.

4.4.4 Additional analysis

So far is in this study, our analysis concerned with the impact of the news during the 2008 crisis. The dynamic correlation's reaction to some news seems also to be determined by time and date of release and as shown to vary over time following the announcement days. In this section, we do an additional analysis by replacing the 2008 crisis with that of 2001 Dot-Com bubbles and the 2011 U.S. government debt-ceiling dispute periods.

4.4.4.1 Do some macroeconomic news also have effect during the 2001 and 2011 crises?[15]

[15] The results for only five macroeconomics news of which we found are significantly important in any of the scales are shown here. The complete findings for all news used in our analysis are available upon request. From the untabulated results and on the same day of announcements, for example, import and PPI news only show a significant impact during the 2011 crisis on all the series. The personal income tends consistently to affect on all series during the 2001 crisis. The effect of early released news both on time and the day of the week, such as consumer credit and the factory goods show

In this section we repeated our analysis from equation (4.11) and replaced the 2008 crisis with the 2001 dot-com crash (from 14/03/2000 to 10/10/2002) and the 2011 US government debt crisis. (30/04//2010 to 30/12/2011). Panel (a) of table 4.8 shows the results for analysis has been done on the 2001 crisis. Compared with the results from table 4.6 we find that the effect of average hourly earnings (on absolute value) decreased on the first day and even became insignificant. For example, with the portfolio includes the bond 2-year bond return, the beta coefficient is zero (with t-statistics of -0.22). The same is found for the effect on the second scale for which the significance level has been lost.

In panel (b) the average hourly earnings news seems to be less economically (and insignificant ly) important on the day of it is release and on 2-4 days afterward. Two important news outside the 2008 crisis period were CPI and the housing starts. Hence it is important to re-examine their effect during different crisis periods. From panel (a) and on the first scale, the CPI shows more impact on the series and became significant on the stock-bond 2-year dynamic correlation. Outside the crisis, it is effect remains significant, though economically decreased. As the time goes following the announcements days, the effect of CPI tends to generally to be higher during the dot-com crash period than in 2008 crisis period. The effect comes from housing starts releases generally decreased on the first scale during the 2001 crisis, while slightly increased outside the crisis on all the correlation series. Interestingly, on the third scale housing starts shows negligible impact on portfolio constructed with low maturity bond return (2-year), yet strong and significant effect on the correlation between stock and bond 10 or 30-year of maturity. This pattern of effect from housing starts on the first and third scales maintains even when we control for the 2011 crisis in the regression (see panel (b) from table 4.8). The results for the last two news as reported in the table are less surprising. For example, the PMI generally shows lower effect during the 2001 crisis at all the series from first day of announcements to 8-16 days following it is release. Outside the crisis and on third scale, however, the effect is significant on all the series.

small and insignificant impact on the third scale. This again, suggests doing the analysis on the single crisis-based regression, rather with the NBER's recession (expansion) dummies. Using the later dummies will suppose that the effect of one macro news is the same during all the crisis periods, while in fact it is different as shown here in our analysis.

For the same type of news (PMI), the impact on the same day of announcements during the 2011 crisis increased and became significant for the portfolios constructed with 10 and 30-year bond returns. Similar finding can be observed from the third scale, where only for that maturity of bonds; the effect is still significant outside the crisis. Last, as soon as the retail sales news releases, it shows a significant and effect on portfolios from stock and 2 and 10-year bond of maturity during the 2001 crisis period but higher effect when controlling for the 2011. Yet, same news has no significant effect throughout the 2008 crisis period on that day. On the second scale, the impact of retail sales in 2011 crisis decreased comparing with that during the 2008 crisis, it is insignificant when the 2-year bond is added to the portfolio, but it is strong and significant on the other series.

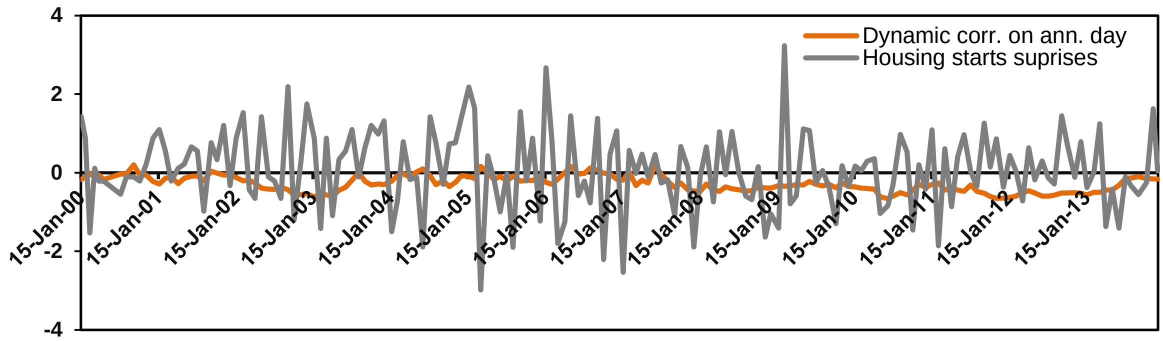
To summarise, the results in table 4.8 show that, none of the macro news has similar impact on scales across all the recent crises (2001, 2008 and 2011). Housing starts, however, has an impact outside the crises periods on the first scale, regardless of which crisis we control for in our regression.

[Insert Table 4.8 about here]

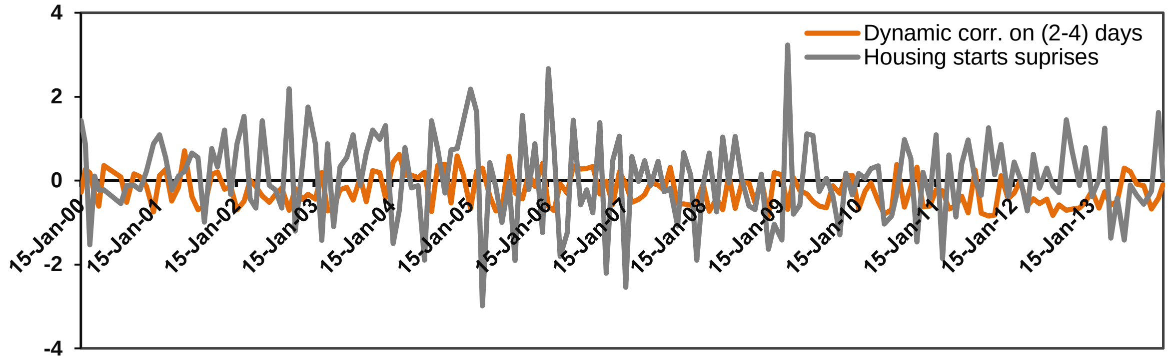
Figure 4.2 plots the dynamic correlation between the stock and 30-year government bond returns with on days matched with the housing starts surprises. On the same day of announcement (panel a), the correlation appears to be less related to surprises which supports our previous finding in table 4.6 of that the housing starts does insignificant ly affect the correlation on the first day. The scaled dynamic correlation series on (2-4) and (4-8) days in panels (b) and (c), respectively are highly correlated with the housing the surprises. The dynamic correlation seems to be more connected to the surprises between the 2001 and 2008 crises, the period when the U.S. investors were more affected by the housing price and the inflation level in general. In the third scale, notably early before the 2001 and at the end of 2011 crisis the investors appear to quickly adjust their portfolios following the housing starts news. Contrarily, on (8-16) days following the announcements, as shown in panel (c), the portfolio rebalancing tends to be less affected by the housing starts news, where the adjustment seems to be previously made on (4-8) days, with the overall effect of housing starts surprises being then fully incorporated into the portfolio pricing process.

Figure 4.2 Plot of the stock and bond 30-year dynamic correlation and the housing starts surprises.

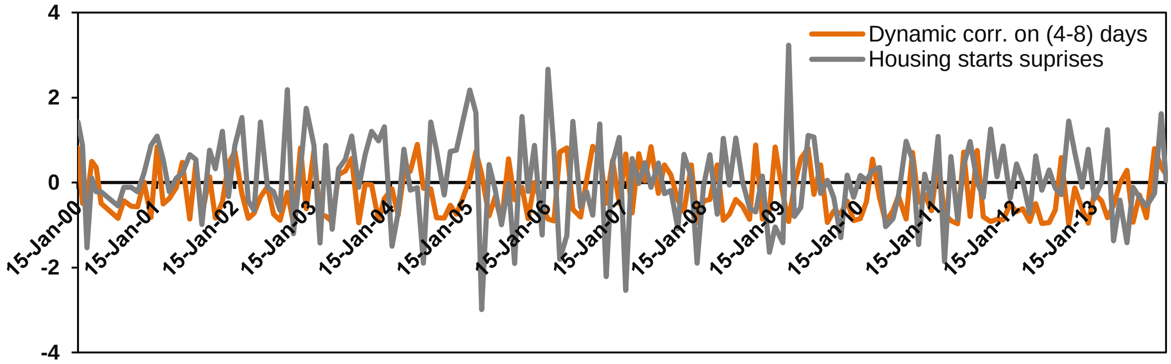
Panel (A) the dynamic correlation on the day of announcement and the surprises series.



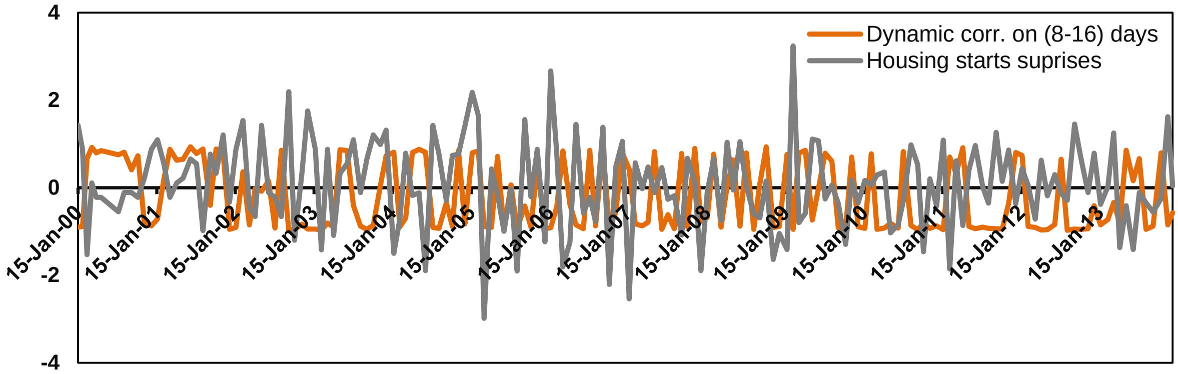
Panel (B) the dynamic correlation on the first scale (2-4 days) and the surprises series.



Panel (C) the dynamic correlation and the surprises series on the second scale (4-8 days).



Panel (D) the dynamic correlation and the surprises series on the third scale (8-16 days).



4.4.5 Robustness checks

The whole results are surprising with some news seem to be significantly and economically important during the crisis, while others show effect outside the crisis, that is regardless of the dynamic correlation series used as a dependent variable. Hence, it is worthwhile to include and describe some robustness checks. While the results in sections 4.4.5.1 and 4.4.5.2 below are reported, the others in the last section are briefly described and not tabulated. They are available upon request.

4.4.5.1 Extending the model: controlling for the economic policy uncertainty

The non-linear model we use in our main analysis includes only the macroeconomic news as a single predictor. We expect here that the response to news to be affected by uncertainty in the market. Several proxies for the uncertainty have been employed in the literature such as, the implied volatility VIX index (e.g. Kontonikas et al. (2013), among others), the macroeconomic uncertainty of Jurado et al. (2015), the Cleveland financial stress index (e.g. Cardarelli et al. (2011) & Fricke and Menkhoff (2015)), and the daily news-based economic policy uncertainty index (hereafter, EPU) of Baker et al. (2013)[16].

Using the other policy uncertainty index for the period from 1985 to 2010, Pástor and Veronesi (2013) found that the U.S. government is to more likely change it is policy when the economic condition is weak, with that change to be followed by the high market implied volatility, realized volatility and also high risk premium level.

In the new regression, we controlled for the level of daily EPU, both during and outside the 2008 crisis period:

(4.12) $$\rho SBm_t = \alpha + [(1 - D_t^{CRISIS}) \sum_{k=1}^{n} \beta_1 \, u_k + \beta_2 \, EPU_t + D_t^{CRISIS} \sum_{k=1}^{n} \beta_3 \, u_k + \beta_4 \, EPU_t] + e_t$$

Where the level of $\mathrm{EPU_t}$ is scaled down by 100, then matched with the days of macroeconomic news announcement at time t, as released each month. We keep our focus on the effects of both the

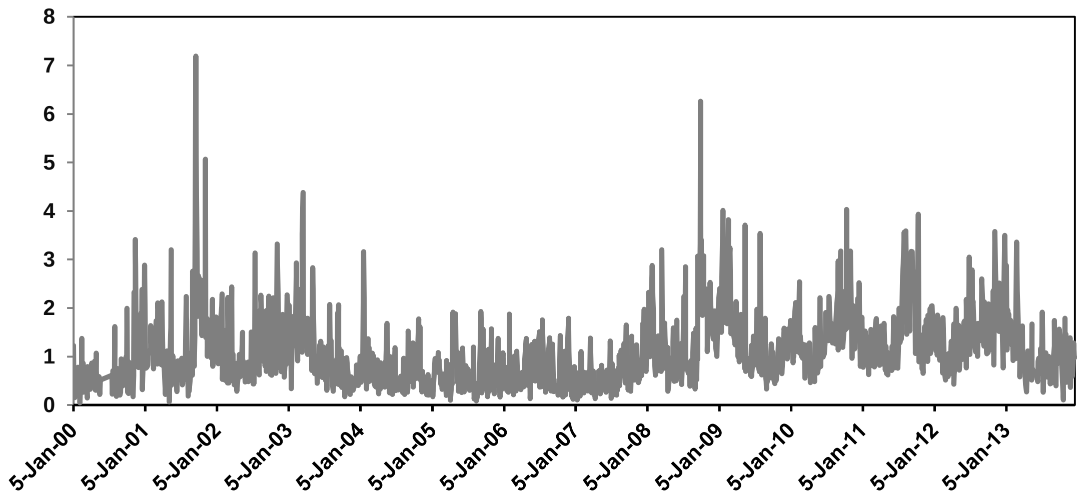
[16] The EPU index has been developed based on the newspaper archives from the Access word NewsBank Service. The index is updated every day at around 6: A.M. Pacific Standard Time and constructed by counting the number of articles contain at least one of three main terms. First term is the economic or economy, second, uncertain or uncertainty and last legislation or deficit, regulation, congress, Federal Reserve or white house. The index started to be available on the daily basis in August, 2013 after being only published on a monthly frequency. For more details on the index and it is construction, see Baker et al. (2015) and www.policyuncertainity.com/us_daily.html.

macroeconomic news and the economic policy uncertainty during the 2008 crisis as measured by β_3 and β_4 , resepectively. We expect that the impact of some news on the dynamic correlation, either on the first day or on scales to vary after controlling for the policy uncurtaining. That can be due to the possible underreaction or overreaction to some announcements, when the investor became more confused in the crisis time regarding the significance of one news comparing with others. Both the availability of the EPU index on the daily basis and it is construction based on the tone of economic newspaper news can help in examining our main findings further[17].

Figure 4.3 shows that the economic policy uncertainty exhibits more variability during the 2001 and 2008 crises than through time. Periods near after or before the crises seem to be also characterized by slightly high level of uncertainty. Surprisingly, the 2011 U.S. government debt crisis, simultaneously occurred with Euro area debt crisis, brings much lower uncertainty than other crises. Also, from January 15, 2004 to January 15, 2008 the level of uncertainty felt down, and even became more stable before it started to rise again during the 2008 crisis.

Figure 4.3. Daily news-based economic policy uncertainty index of Baker et al. (2013) around the macroeconomic news.

This figure shows the level of EPU index divided by 100 on the days coincide with the macroeconomic news announcements. The full sample period from 03/01/2000 to 25/12/2013 with 3649 daily observations. Any day with no macroeconomic news at all is excluded from the sample. We left with 1540 observations where one of our fourteen macroeconomic news has been released.



[17] The EPU index as a proxy for U.S. political economic tension is almost a comparable measure with the daily sentiment media index of Tetlock (2007) and Garcia (2013). All of these proxies are based on the U.S. newspapers and constructed from pessimistic words. We expect that including the level of any one of them in our regression to confound our findings. Both studies (Tetlock (2007) and Garcia (2013)) found that the effect of negative sentiment media on DJIA return tends to reverse in about a week and we expect to find similar reversed effect on the stock-bond dynamic correlation using the EPU index. Moreover, the data for their media sentiment index is only available until January 2006 which prevents us from using this proxy with the EPU index.

Table 4.9 reports the correlation matrix between the economic policy uncertainty and the series of original and the scaled dynamic correlation. It is pronounced that the policy uncertainty is statistically and economically correlated with the dynamic correlation series on the same day of announcement, regardless of which macro news is introduced in the analysis. In terms of the correlation sing, it is negative when bond of 2 and 30-year of maturity is used to construct the portfolio, but positive for the other series. The absolute magnitude of correlation on average is stronger with the series included the higher maturity bonds, it is -0.381 on the announcement days in the third panel, 0.380 and -0.354 in the second and first panels, respectively.

Turning the attention to the days following the announcements, the correlation level tends to decrease where it is the lowest with the dynamic correlation between the stock and bond 2-year return. Comparing the results being reported using different announcements, the correlation tends to stay statistically strong in the third and second scales at all the series when only the EPU is matched with the consumer credit releases. With three of the announcements, namely housing starts, CPI, and the industrial production, the correlation is significant in the first day.

[Insert Table 4.9 about here]

Table 4.10 reveals that with all the macro news in the regression, the effect of the EPU seems to be highly significant on the first day during the 2008 crisis. On the day of announcement also, the average hourly earnings, import, retail sales and unemployment show the strongest overall effect as measured by the adjusted R^2. As we mentioned earlier, our main focus here is to examine how the reaction to macroeconomic news can be changed after controlling for EPU level. Three news average hourly earnings, personal income and unemployment lost their significance level on the day of announcement. Business inventory, on the other hand, seems to maintain it is significance level, but less than when the effect of policy uncertainty has been ignored. Remarkably, three of the macro news, namely the consumer credit, industrial production and new single-family house sales, once they have been released, show an immediate highly significant impact on all the series. This three macro news again have been released early in the day and in the week.

For the analysis being done on 2-4 days following the announcement, the effect of EPU significantly disappeared except when the consumer credit is included in the regression as a predictor. Business inventory news shows a gradual and strong impact on the stock-bond 2-year dynamic correlation from one scale to another. The impact that housing starts, unemployment and the retail sales now became significant in the second scale at all estimated dynamic correlation series, simultaneously the effect of uncertainty. This again can support our initial assumption of underreaction to some important news during the recent crisis due to the high level of uncertainty.

On the third scale, still the consumer credit has a strong impact notably on the dynamic between the stock and 10- and 30- year bond returns.

The findings in table 4.10 leads to the general conclusions. First, it seems that when the U.S. investors confront high level of uncertainty, as proxies by daily-based economic policy index during the recent crisis period, they tend to underreact to some news (consumer credit and new single-family house sales) that are released early both on time and in the month. On the contrary, they overreact to some other late released and important news of which there is a bit agreement on their information content in the portfolios. Second, the effect of uncertainty seems to be slightly reversed after being significant in the announcement days.[18]

[Insert Table 4.10 about here]

4.4.5.2 Dow Jones small-cap value and small-cap growth indexes

Another issue might confound our results is that we used the DJIA composite index which is made of the large companies in the U.S. market. Yet, usually the large companies will be more affected by macroeconomic public news comparing with small companies, where the price, return and volatility of the later are more likely to be driven by the investor sentiment. Several studies address the role of sentiment in mispricing. For example, Lemmon and Portniaguina (2006) found that high consumer confidence level predicts lower future return of small cap stocks but not of the growth stocks. Baker and Wurgler (2007) argue that the index construction process highly determines the effect of sentiment on the return; the value weighted index with low institutional ownership will be less directed by the investor sentiment. Based on this argument, we replaced our DJIA composite index with DJIA small value and the small growth indexes. Here we expect a less reaction to the news with any of the new indexes to be used in estimating the dynamic correlation series.

[18] We replaced the EPU with an index of weekly sentiment as constructed by subtracting the bear from the bear series of the Investor Intelligence Sentiment Index Survey. We assumed that the weekly values of bull-bear are constant during the week. The sentiment, as described by Datastream, is released every Wednesday morning and reflects the outlooks of over 100 independent financial markets newsletters writers. The series data are provided to us by Datastream. The outlook is one of three. First, ‘’Bull’’, optimistic with a recommendation to buy stocks. Second, ‘’Bear’’, which is a negative outlook with a suggestion to raise cash and sell stocks. Last, ‘’Correction’’ position preferably to be in one of the two direction, one to buy with newsletter writers being cautiously optimistic when the market is rising, the other when they recommend to sell when the market is declining. In our untabulated results, we also find that effect of bull-bear investor sentiment is always significant in the first day, but notably on the dynamic correlation between the stock and bond 2-year of maturity bond returns. This effect, however, tends to reverse on the next days following the announcements, with the impact of consumer credit, for example, became significant on all the series on the same day of announcement. Our finding here of the reversal effect of either the bull-bear sentiment or the EPU supports that of Tetlock (2007) and Garcia (2013).

Table 4.11 replicates the analysis in equation 4.11 using the small value and growth return series[19]. Panel (a) shows that using small value index and in the first day, the average hourly earnings news still exhibits a significant effect on all the series, yet less than when the small growth index return is used (panel b). Other news, single-family house sales also shows an impact on all the correlation series in both panels in the first day outside the crisis, with this effect more pronounced on small value stocks. Beyond the announcement days and from both panels, the impact of the consumer credit became significant in (2-4) days scale, while significantly vanished on the third scale. The strong reaction to both average hourly earnings and the consumer credit news seems to be normal. That is because the individual investors who own the small stocks are usually concern about the macro news which affects their investment positions as well as personal spending.

[Insert Table 4.11 about here]

Further, comparing panels (a) and (b) with regard to the reaction on scales revealed some facts. First, housing starts seems to significantly affect all the series, outside the crisis in the first scale when we include the small value stock return in the portfolio, yet this is less evident for the small growth stocks. Second, the impact of the CPI at all the series in the first scale is small outside the crisis and even less when the small growth indexes are used in our analysis. Third, industrial production brings small economically, though significant effect at all the second scaled-correlation series during the crisis period. Similarly, it is significantly affect the correlation series comprises 10- and 30-year bond return in the first scale as shown in panel (b).

Generally, from the table 4.11, we find that the reaction to the news with the small value and growth returns are less when they are used to estimate the dynamic correlation. Yet, the results for some news including the average hourly earnings, CPI, housing starts and industrial productions are somewhat resembling those in table 4.6.

4.4.5.3 the simultaneous effect of all macroeconomic news announcements

Possibly, announcing more than one macro news for different factors in the same day confuses the investors, when they intend to rebalance their portfolios in the end of month. To check whether our findings are not affected by this issue, we ran a regression with all the macroeconomic news being the predictors at the same time. We exclude any observation from the correlation series that is not matched with the occurrence of one or more macroeconomic news. Hence, we left with 1540 observations. Our untabulated findings are analogues to those in tables 4.5 and 4.6. For example,

[19] The regression estimates for other macroeconomic news are available upon request.

the surprises of average hourly earnings, industrial production, personal income, still show significant effect on the series on the same day of announcement. Macro surprises such as housing starts, CPI maintain their significant effect outside the crisis on the first scale. Yet, on (4-8) days following the release, the reaction to the housing starts became significant and even economically stronger, and this again consistent across all the series. The explanation of 'late releases-slow dynamic correlation's reaction'' still holds for industrial production on the second scale, for consumer credit, new single family house sales, factory goods order on (8-16) days.

Table 4.4 Estimation of ADCC-GARCH Model

This table presents the parameter estimates from the diagonal version of the asymmetric dynamic conditional correlation ADCC-GARCH model of Cappiello et al. (2006). The model is estimated in three stages, with the GJR-GARCH (1, 1) model of Golsten, Jagannathan and Runkle (1993) is used first to estimate the conditional volatility. The sample period spans from January 3, 2000 to December 25, 2013. α denotes the ARCH effect, β is the GARCH effect, asymmetric effect is g and LL is the log likelihood value. All estimated parameters in the table are significant at 1% significance level.

	α	β	g	LL
Panel A: Original return series				
DJIA, $B2$	0.011	0.978	0.008	32547.55
DJIA, $B10$	0.023	0.964	0.001	21984.41
DJIA, $B30$	0.022	0.969	0.000	24291.57
Panel B: (2-4) days scaled return series				
DJIA, $B2$	0.277	0.555	0.013	33100.42
DJIA, $B10$	0.263	0.564	0.088	22348.84
DJIA, $B30$	0.277	0.563	0.024	24645.52
Panel C: (4-8) days scaled return series				
DJIA, $B2$	0.555	0.349	0.011	34564.21
DJIA, $B10$	0.563	0.360	0.011	24061.79
DJIA, $B30$	0.569	0.357	0.018	26343.71
Panel D: (8-16) days scaled return series				
DJIA, $B2$	0.737	0.184	0.000	36835.75
DJIA, $B10$	0.749	0.186	0.000	26450.31
DJIA, $B30$	0.789	0.133	0.029	28738.02

Table 4.5. Baseline model: return (dynamic correlation) news OLS regression.

This table reports the beta coefficient estimates from the linear regression model:

$$r(\rho SBm)_t = \alpha + \sum_{k=1}^{n} \beta u_{k,t} + e_t$$

Where r_t denotes either the DJIA or the bond index return defined as the first difference of the natural log of the closing price. ρSBm is a the dynamic correlation for each pair of stock and bond as estimated from ADCC model. u_k denotes the standardized unexpected component of economic variable k and calculated using the approach of Balduzzi et al. (2001) with $u_{k,t} = \frac{A_{k,t} - E_{k,t}}{\sigma_t}$, where $A_{k,t}$ is the monthly actual value obtained from the reporting agency, $E_{k,t}$ is the corresponding median expectation as collected from Informa global markets database, σ_t is the standard deviation of the unexpected component of *kth* economic variable for the full sample period from January 2000 to December 2013. The original sample for return series covers the period from January 3, 2000-Decmber 25, 2013 (3648 observations) and the estimates reported in the table are based on the announcement dates only with 168 observations. In panel A, an under the column (I), the dependent variable used is the DJIA return series, while in (II), (III) and (IV) the dependent variable is the 2, 10 and 30- year bond index return series, respectively. Panel B shows the estimates of the regression with the dynamic conditional correlation is used as a depended variable with (I), (II), (III) shows results when the correlation between the stock and 2, 10 and 30-year bond is used in the regression. *, ** and *** denote statistical significant at 10%, 5% and 1%, respectively. The crisis period is defined from September 2008 to March 2009.

Panel A: $r_t = \alpha + \sum_{k=1}^{n} \beta u_{k,t} + e_t$

	(I)		(II)		(III)		(IV)	
Variable	β	Adj. R^2	β	Adj. R^2	β	Adj. R^2	β	Adj. R^2
Average Hourly Earnings	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.01
Business Inventory	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Consumer Credit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPI	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.01
Factory Goods Orders	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01
Housing Starts	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02
Import Price	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00
Industrial Production	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
New Single-Family Home Sales	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Personal Income	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
PMI	0.00	0.01	0.01***	0.08	0.01*	0.02	0.00	0.02
PPI	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.02
Retail Sales	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Unemployment Rate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Panel B: $\rho SBm_t = \alpha + \sum_{k=1}^{n} \beta u_{k,t} + e_t$

	(I)		(II)		(III)	
Variable	β	Adj. R^2	β	Adj. R^2	β	Adj. R^2
Average Hourly Earnings	0.00	0.00	-0.01	0.00	0.01	0.01
Business Inventory	0.01	0.00	0.00	0.00	-0.01	0.00
Consumer Credit	0.00	0.00	0.00	0.00	0.00	0.00
CPI	0.00	0.00	0.00	0.00	0.00	0.00
Factory Goods Orders	0.00	0.00	-0.01	0.01	0.01	0.00
Housing Starts	0.00	0.00	0.01	0.00	-0.01	0.00
Import Price	0.00	0.00	0.00	0.00	0.00	0.00
Industrial Production	0.01	0.01	-0.02	0.01	0.02	0.01
New Single-Family Home Sales	0.02	0.02	-0.02	0.02	0.03	0.02
Personal Income	0.00	0.00	-0.01	0.00	0.01	0.00
PMI	0.00	0.00	0.00	0.00	-0.01	0.00
PPI	-0.01	0.01	0.02	0.02	-0.02	0.01
Retail Sales	0.01	0.00	-0.01	0.01	0.01	0.01
Unemployment Rate	-0.01	0.01	0.00	0.00	0.00	0.00

Table 4.6 Stock-bond dynamic portfolio allocation today and macroeconomic news, 2008 crisis against NBER recession dummies.

This table reports the non-linear regression estimates with White (1987) standard errors of the model:

$$\rho SBm_t = \alpha + [(1 - D_t) \sum_{k=1}^{n} \beta 1 u_{k,t} + D_t \sum_{k=1}^{n} \beta 2 u_{k,t}] + e_t$$

Where ρSBm_t is the dynamic conditional correlation between the given stock index return under consideration, S, and the benchmark bond market index return B at either m equal 2,10 and 30 years of maturity respectively, where here B denotes the number of years to maturity. r_t denotes stock index return defined as the first difference of the natural log of the closing price D_t is either a crisis dummy (equals to one for the period from 15/09/2008 to 31/03/2009 and zero otherwise) or a dummy variable equals to 1 during the recession period and zero during the expansion. NBER peak and trough indicators are used to define the recession and expansion sates. The regression is estimated first with the 2008 crisis dummy then with the NBER indicators. u_k denotes the standardized unexpected component of economic variable k and calculated using the approach of Balduzzi et al. (2001) with $u_{k,t} = \frac{A_{k,t} - E_{k,t}}{\sigma_t}$, where $A_{k,t}$ is the monthly actual value obtained from the reporting agency, $E_{k,t}$ the corresponding median expectation as collected from Informa global markets database, σ_t is the standard deviation of the unexpected component of *kth* economic variable for the full sample period from January 2000 to December 2013. The original sample for return series covers the period from January 3, 2000-Decmber 25, 2013 (3648 observations) and the estimates reported in the table are based on the announcement days for each macroeconomic news only with 168 days have been used in the regression, the exact dates on the announcements have been matched with the corresponding dynamic correlation with different dynamic correlation dates have been selected for each macroeconomic factor. The columns in the table (I), (II) and (III) show the cases when the dependent variable is the dynamic correlation between the DJIA and standard bench mark index return at one year, ten years and thirty years respectively. Figures in bold belong to the variable for which the null hypothesis of the equality ($\beta_1 = \beta_2$) from the Wald test has been rejected at 1% or higher significant level. *, ** and *** denote statistical significant at 10%, 5% and 1%, respectively.

		(I)					(II)					(III)				
Variable	Dummy	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2
Average Hourly Earning	2008	0.00	0.36	**-0.12*** **	-3.84	0.00	-0.01	-0.84	**0.10*** **	2.66	0.00	0.02	0.98	**-0.07***	-1.77	0.00
	NBER	0.00	-0.07	0.07	0.93	0.00	-0.01	-0.58	-0.05	-0.70	-0.01	0.01	0.85	0.03	0.33	-0.01
Business Inventory	2008	0.00	-0.13	**0.08*** **	3.02	0.01	0.00	-0.28	**-0.07*** **	-6.95	0.01	-0.02	-0.79	**0.13*** **	2.88	0.00
	NBER	0.01	1.20	**-0.05***	-1.83	0.01	-0.01	-0.49	**0.07*** **	2.72	0.01	0.00	0.26	**-0.09*** **	-3.72	0.02
Consumer Credit	2008	0.00	-0.13	**0.09***	1.85	0.00	0.00	0.02	-0.08	-1.62	0.00	0.00	-0.21	0.06	1.46	-0.01
	NBER	0.01	0.64	-0.04	-0.96	0.00	-0.01	-0.37	0.06	1.17	0.00	0.00	0.20	-0.05	-1.00	-0.01
CPI	2008	-0.01	-0.95	**0.03***	1.89	0.00	0.01	0.58	-0.02	-0.80	-0.01	-0.01	-0.32	0.03	1.56	-0.01
	NBER	-0.01	-0.66	0.02	0.54	-0.01	0.00	0.39	0.01	0.15	-0.01	0.00	-0.03	-0.02	-0.38	-0.01

Table 4.6 *Continued*.

		(I)					(II)					(III)				
Variable	Dummy	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2
Factory Goods Orders	2008	0.00	-0.11	0.03	1.02	-0.01	-0.01	-0.94	-0.03	-0.88	0.00	0.01	0.72	0.03	1.11	-0.01
	NBER	0.01	0.68	-0.07	**-2.21****	0.01	-0.02	-1.51	**0.08****	2.07	0.02	0.02	1.27	**-0.09****	-2.05	0.01
Housing Starts	2008	0.00	-0.08	0.03	0.67	-0.01	0.01	0.67	-0.01	-0.36	-0.01	-0.01	-0.61	0.02	0.66	-0.01
	NBER	0.00	0.10	0.03	0.33	-0.01	0.01	0.71	-0.08	0.86	0.00	-0.01	-0.66	0.10	1.06	0.00
Import	2008	0.00	-0.24	0.02	-0.59	0.00	0.00	-0.06	-0.02	-0.69	-0.01	0.00	-0.12	0.01	0.49	-0.01
	NBER	0.01	0.66	**-0.06*****	-3.51	0.01	-0.01	-0.97	**0.08*****	5.80	0.02	0.01	0.74	**-0.10*****	-9.38	0.02
Industrial Production	2008	0.01	0.72	0.03	1.32	0.00	-0.02	-0.99	-0.03	-1.65	0.00	0.02	0.81	0.03	1.59	0.00
	NBER	0.01	1.33	0.01	0.17	0.00	-0.02*	-1.73	0.01	0.33	0.00	0.02	1.46	-0.03	-0.53	0.00
New Single-Family Home Sales	2008	0.02	1.45	0.03	1.14	0.01	-0.02*	-1.74	-0.02	-1.14	0.01	0.03*	1.72	**0.03****	1.95	0.01
	NBER	0.02	1.39	0.10	1.44	0.02	-0.02	-1.61	**-0.13****	-2.08	0.02	0.02	1.64	**0.12***	2.02	0.01
Personal Income	2008	0.00	0.09	**-0.05***	-1.90	-0.01	-0.01	-0.74	**0.06****	2.34	-0.01	0.01	0.72	**-0.06*****	2.78	-0.01
	NBER	0.00	-0.07	-0.01	-0.09	-0.01	-0.01	-0.56	-0.03	-0.32	-0.01	-0.01	-0.56	-0.03	-0.32	-0.01
Chicago PMI	2008	0.00	-0.11	**0.03**	1.35	-0.01	0.00	0.33	**0.00**	-0.04	-0.01	-0.01	-0.53	-0.01	0.19	-0.01
	NBER	0.00	-0.16	0.03	0.99	-0.01	0.01	0.53	-0.03	-1.04	-0.01	-0.01	-0.72	0.04	0.81	-0.01
PPI	2008	-0.02	-1.34	0.04	**1.51**	0.01	0.02*	1.74	**-0.03**	-1.09	0.01	-0.03	-1.64	**0.02**	1.02	0.01
	NBER	-0.01	-0.49	**-0.07*****	-2.96	0.01	0.01	0.96	**0.10*****	4.45	0.02	-0.01	-0.93	**-0.11*****	-7.54	0.02
Retail Sales	2008	0.01	0.58	0.03	1.35	0.00	-0.01	-0.81	-0.03	-1.14	-0.01	0.01	0.74	0.03	1.33	0.00
	NBER	0.01	0.52	0.01*	1.79	-0.01	-0.01	-0.42	-0.02***	3.44	-0.01	0.00	0.06	0.03***	5.71	0.00
Unemployment Rate	2008	-0.01	-0.92	**-0.10****	-2.72	0.01	0.00	-0.12	**0.12****	2.28	0.00	-0.01	0.53	**-0.09****	-2.03	0.00
	NBER	-0.02	-1.54	0.00	0.12	0.00	0.01	0.41	-0.02	-0.45	-0.01	0.00	0.13	0.02	0.51	-0.01

Table 4.7 Macroeconomic news and the near term future stock-bond portfolio correlation, 2008 crisis dummies.

This table reports the non-linear regression estimates with White (1987) standard errors of the model:

$$\rho SBm_t = \alpha + [(1 - D_t^{CRISIS}) \sum_{k=1}^{n} \beta_1 u_k + D_t^{CRISIS} \sum_{k=1}^{n} \beta_2 u_k] + e_t$$

Where ρSBm_t is the dynamic conditional correlation between the given stock index return under consideration, *S*, and the benchmark bond market index return *B* at either *m* equal 1,10 and 30 years of maturity respectively, where here *B* denotes the number of years to maturity. r_t denotes stock index return defined as the first difference of the natural log of the closing price and D_t^{CRISIS} is the global crisis dummy variable which is equal to 1 during the crisis and zero otherwise. The crisis period is defined from September 2008 to March 2009. t-statistics are reported in parenthesis. *, ** and *** denote statistical significant at 10%, 5% and 1%, respectively. Scales 1, 2 and 3 denote (2-4) days, (4-8) and (8-16) days following the announcements respectively. For the rest of notations, see table 4.6.

		(I)					(II)					(III)				
Variable	Scale	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2
Average Hourly Earning	1	-0.02	-0.85	-0.21***	-2.55	0.00	0.03	0.89	0.20**	2.13	0.00	0.01	0.32	-0.16*	-1.71	-0.01
	2	-0.06	-1.28	-0.19	-0.55	0.00	0.00	0.05	0.19	0.61	-0.01	0.04	0.76	-0.20	-0.75	-0.01
	3	0.07	1.18	-0.53***	-3.80	0.01	-0.09	-1.54	-0.23	-0.51	0.00	-0.03	-0.47	0.25	0.53	-0.01
Business Inventory	1	0.03	0.95	0.07	0.71	0.00	0.00	0.06	-0.08	-0.58	-0.01	0.00	-0.07	0.07	0.68	-0.01
	2	-0.04	-0.83	-0.20**	-1.98	-0.01	0.04	0.89	0.08	0.48	-0.01	-0.03	-0.61	-0.01	-0.06	-0.01
	3	0.06	-1.06	-0.04	-0.19	-0.01	0.01	0.31	0.29	0.97	0.00	0.04	0.72	-0.13	-0.55	-0.01
Consumer Credit	1	0.00	-0.08	0.10	0.69	-0.01	0.02	0.72	0.07	0.31	-0.01	-0.02	-0.71	-0.01	-0.05	-0.01
	2	0.00	-0.12	0.02	0.08	-0.01	0.05	1.18	-0.15	-0.79	0.00	-0.07	-1.50	0.05	0.25	0.00
	3	0.04	0.63	0.31	1.50	0.00	0.02	0.37	0.87***	4.98	0.04	-0.06	-1.00	-0.54*	-1.70	0.01
CPI	1	0.07***	2.48	-0.03	-0.41	0.02	-0.08***	-2.61	0.00	0.04	0.02	0.08***	2.72	0.03	0.31	0.03
	2	-0.01	-0.11	0.09	0.82	-0.01	-0.02	-0.35	-0.04	-0.22	-0.01	0.03	0.65	0.10	0.86	-0.01
	3	-0.06	-0.95	-0.19	-1.35	0.00	0.01	0.19	0.14	0.67	-0.01	0.02	0.29	-0.14	-0.69	-0.01
Factory Goods Orders	1	-0.02	-0.63	-0.03	-0.48	-0.01	0.04	1.52	0.09	0.62	0.00	-0.05*	-1.78	-0.01	-0.07	0.00
	2	-0.03	-0.61	0.10	0.83	-0.01	0.02	0.37	-0.02	-0.11	0.01	0.00	0.02	0.14	1.03	0.01
	3	0.05	1.10	-0.01	-0.05	-0.01	-0.08	-1.45	0.36***	2.60	0.02	0.08	1.55	-0.29**	-2.05	0.01
Housing Starts	1	-0.10***	-3.83	-0.12	-1.66	0.07	0.09***	3.01	0.14***	2.40	0.05	-0.08***	-3.08	-0.08	-0.96	0.04
	2	0.03	0.72	-0.14	-1.31	0.00	0.00	-0.07	0.17	1.40	0.00	0.04	0.74	-0.21**	-2.10	0.00
	3	-0.02	-0.31	-0.31***	-3.59	0.01	0.07*	1.76	0.04	0.66	0.00	-0.06	-0.96	-0.16	-1.19	0.00

Table 4.7 *Continued*.

		(I)					(II)					(III)				
Variable	Scale	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2
Import	1	0.05*	1.75	0.06	1.37	0.01	-0.04	-1.49	-0.08	-1.29	0.01	0.03	0.92	0.12**	2.19	0.00
	2	-0.02	-0.59	0.18***	4.06	0.00	-0.04	-0.87	-0.16**	-1.96	0.00	0.06	1.14	0.06	0.39	0.00
	3	-0.08	-1.32	-0.45***	-5.29	0.03	0.05	0.82	0.08	0.32	-0.01	-0.05	-0.83	-0.10	-0.42	-0.01
Industrial Production	1	-0.05	-1.41	0.00	0.03	0.00	0.04	1.10	-0.03	-0.53	0.00	-0.04	-1.25	-0.01	-0.28	0.00
	2	0.05	0.96	-0.11**	-2.24	0.00	-0.05	-1.10	0.12***	3.30	0.01	-0.01	-0.22	-0.10**	-2.23	0.00
	3	0.09	1.35	0.03	0.26	0.00	0.03	0.52	-0.08	-1.13	-0.01	0.02	0.27	0.11	1.51	0.00
New Single-Family Home Sales	1	0.01	0.42	-0.08	-1.20	-0.01	0.00	-0.11	0.04	0.99	-0.01	-0.01	-0.34	0.03	0.65	-0.01
	2	-0.04	-0.99	-0.06	-0.56	-0.01	0.03	0.73	0.07	0.45	-0.01	-0.04	-0.96	0.00	0.04	-0.01
	3	0.03	0.43	0.30*	1.82	0.01	0.01	0.23	-0.33**	-2.10	0.00	0.00	0.00	0.35***	2.59	0.00
Personal Income	1	0.03	1.08	0.25***	3.86	0.00	-0.05	-1.58	0.09	0.85	0.01	0.07**	-2.12	0.01	0.10	0.02
	2	-0.05	-1.22	0.48***	8.24	0.02	0.05	1.43	0.10	1.13	0.00	-0.05	-1.05	0.32***	3.40	0.00
	3	-0.01	-0.16	0.02	0.09	-0.01	-0.09	-1.54	-0.03	-0.18	0.01	0.12***	2.73	0.11	0.61	0.02
Chicago PMI	1	0.01	0.34	0.19*	1.78	0.00	-0.01	-0.27	-0.21*	-1.91	0.00	0.01	0.27	0.17	1.43	0.00
	2	0.05	1.27	-0.07	-0.32	0.00	-0.04	-0.73	-0.01	-0.04	-0.01	0.03	0.64	0.10	0.57	-0.01
	3	0.07	1.23	-0.04	-0.29	0.00	-0.12**	-2.23	-0.13	-0.97	0.02	0.08	1.46	0.18	1.08	0.00
PPI	1	0.00	0.07	-0.04	-0.31	-0.01	0.00	-0.09	0.08	0.71	-0.01	-0.01	0.23	-0.06	-0.65	-0.01
	2	-0.01	-0.29	-0.02	-0.18	-0.01	-0.03	-0.62	0.05	0.93	-0.01	0.04	1.09	0.03	0.21	-0.01
	3	-0.09	-1.49	-0.23	-1.31	0.01	0.06	1.13	0.20	1.12	0.00	-0.06	-0.96	-0.14	-0.79	0.00
Retail Sales	1	0.02	0.56	-0.03	-0.40	-0.01	0.00	-0.17	0.12*	1.80	0.00	-0.01	-0.21	-0.10**	-1.99	0.00
	2	-0.08**	-1.99	0.01	0.06	0.01	0.05	1.13	0.10	1.03	0.00	0.01	0.17	-0.07	0.61	-0.01
	3	-0.04	-0.80	-0.06	-0.34	-0.01	0.06	1.13	0.01	0.04	0.04	-0.11*	-1.70	-0.01	-0.04	0.03
Unemployment Rate	1	-0.02	-0.65	-0.14	-1.18	0.00	0.01	0.39	0.04	0.24	-0.01	-0.01	-0.46	-0.07	-0.52	-0.01
	2	-0.01	-0.15	0.40**	1.97	0.00	-0.07	-1.40	-0.25	-0.96	0.01	0.01	0.17	0.05	0.19	-0.01
	3	0.15***	2.97	-0.45***	-3.71	0.04	-0.07	-1.39	-0.20	-0.52	0.00	0.03	0.61	-0.09	0.24	-0.01

Table 4.8 Macroeconomic news and the near term future stock-bond portfolio correlation, 2001 and 2011 crises.

This table reports β_1 and β_2 coefficient estimates from the non-linear regression with White (1987)'s standard errors of the model:

$$\rho SBm_t = \alpha + [(1 - D_t^{CRISIS}) \sum_{k=1}^{n} \beta_1 u_k + D_t^{CRISIS} \sum_{k=1}^{n} \beta_2 u_k] + e_t$$

Where ρSBm_t is the dynamic conditional correlation between the given stock index return under consideration, S, and the benchmark bond market index return B at either m equals 1,10 and 30 years of maturity respectively, where here B denotes the number of years to maturity. D_t^{CRISIS} is either the 2001 or the 2011 debt crisis period, the dummy variable which is equal to 1 during the crisis and zero otherwise. Dot-Com crisis is defined from 14/03/2000 to 10/10/2002, the US government debt crisis: 30/04//2010 to 30/12/2011. Scales 0, 1 2 and 3 denote the day of announcement, (2-4) days, (4-8) and (8-16) days following the announcements respectively. *, ** and *** denote statistical significant at 10%, 5% and 1%, respectively. For rest of notations, see table 4.6.

Panel A : the 2001 crisis

		(I)					(II)					(III)				
Variable	Scale	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2
Average Hourly Earning	0	0.00	0.20	0.00	-0.22	-0.01	-0.01	-0.56	-0.01	-0.58	-0.01	0.02	0.88	0.01	0.22	-0.01
	1	-0.03	-1.03	-0.02	-0.25	-0.01	0.03	0.97	0.03	0.40	-0.01	0.01	0.31	-0.01	-0.19	-0.01
	2	-0.09*	-1.91	0.10	-0.97	0.01	0.01	0.29	-0.05	-0.43	-0.01	0.03	0.50	0.06	0.48	-0.01
	3	0.07	1.11	0.00	-0.03	0.00	-0.11*	-1.77	0.00	-0.01	0.01	-0.01	-0.20	-0.06	-0.45	-0.01
CPI	0	0.00	-0.42	-0.01	-0.35	-0.01	0.00	0.24	0.01	0.54	-0.01	0.00	0.12	-0.02	-0.61	-0.01
	1	0.05	1.63	**0.12****	2.45	0.02	-0.05	-1.64	**-0.20*****	-5.03	0.04	0.05	1.51	**0.24*****	6.72	0.06
	2	0.00	-0.04	0.04	0.40	-0.01	0.00	0.03	-0.13	-1.37	0.00	0.03	0.58	0.10	0.78	-0.01
	3	-0.04	-0.65	-0.24*	-2.25	0.01	-0.01	-0.14	0.21	1.49	0.00	0.04	0.63	-0.22	-1.42	0.00
Housing **S**tarts	0	0.00	0.19	0.00	-0.12	-0.01	0.01	0.52	0.01	0.26	-0.01	-0.01	-0.64	0.02	0.53	-0.01
	1	-0.10***	-3.59	-0.17***	-2.55	0.07	0.09***	3.10	0.13	1.63	0.05	-0.08***	-3.02	-0.08	-1.18	0.04
	2	0.00	-0.12	0.02	0.08	-0.01	0.05	1.18	-0.15	-0.79	0.00	-0.07	-1.50	0.05	0.25	0.00
	3	0.04	0.63	0.31	1.50	0.00	0.02	0.37	**0.87*****	4.98	0.04	-0.06	-1.00	**-0.54***	-1.70	0.01
PMI	0	0.00	0.10	0.00	-0.11	-0.01	0.00	0.34	0.00	0.01	-0.01	-0.01	-0.44	-0.01	-0.25	-0.01
	1	0.02	0.73	0.00	0.02	-0.01	-0.02	-0.65	0.00	-0.06	-0.01	0.02	0.50	0.02	0.28	-0.01
	2	0.04	1.02	0.06	0.53	0.00	-0.03	-0.65	-0.03	-0.33	-0.01	0.04	0.79	0.00	0.04	-0.01
	3	0.10*	-1.78	-0.13	-0.86	0.01	-0.15***	-2.69	0.00	0.01	0.02	0.12**	2.14	-0.08	-0.53	0.01
Retail Sales	0	0.01	0.33	**0.01*****	2.64	-0.01	-0.01	-0.30	**-0.02*****	-3.02	0.00	0.00	0.11	**0.03****	2.41	0.00
	1	0.03	0.70	-0.01	-0.22	-0.01	0.00	-0.03	0.03	1.42	-0.01	0.01	0.28	**-0.05*****	-2.71	0.00
	2	-0.06	-1.18	-0.08	-1.52	0.00	0.02	0.40	**0.08****	2.07	0.00	0.00	0.02	0.14	1.03	-0.01
	3	-0.09	-1.12	0.01	0.16	0.00	0.04	0.46	0.07	1.10	-0.01	-0.11	-1.46	-0.09	-1.07	0.01

Table 4.8 *Continued*.

Panel B : the 2011 crisis

Variable	Scale	(I)					(II)					(III)				
		β_1	*t*-stat	β_2	*t*-stat	Adj. R^2	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2
Average Hourly Earning	0	0.00	-0.13	0.02	0.88	-0.01	0.00	-0.33	-0.04	-0.92	0.00	0.01	0.54	0.05	1.02	0.00
	1	-0.04	-1.18	0.02	-0.29	0.00	0.04	1.37	-0.04	-0.68	0.00	-0.01	-0.21	-0.08	1.30	-0.01
	2	-0.03	-0.58	-0.24***	-2.68	0.01	0.00	0.04	0.02	0.13	-0.01	0.01	0.26	0.14	1.17	-0.01
	3	0.03	0.56	0.17	1.31	0.00	-0.06	-0.99	-0.25**	-2.32	0.01	-0.04	-0.67	0.09	0.70	-0.01
CPI	0	-0.01	-0.48	0.00	-0.15	-0.01	-0.01	0.65	-0.02	-0.45	-0.01	-0.01	-0.51	0.05	0.81	-0.01
	1	**0.05***	1.72	**0.18*****	2.68	0.03	**-0.06****	-2.21	-0.12	-1.29	0.02	**0.07****	2.33	0.14	1.52	0.03
	2	0.00	0.04	0.03	0.21	-0.01	-0.01	-0.21	-0.10	-0.93	-0.01	0.02	0.43	**0.22****	2.14	0.00
	3	-0.06	-1.04	-0.15	-0.91	0.01	0.02	0.25	0.12	0.60	0.00	-0.01	-0.11	0.08	0.43	0.00
Housing Starts	0	0.00	0.01	0.02	0.72	-0.01	0.01	0.47	0.02	0.40	-0.01	-0.01	-0.46	-0.01	-0.14	-0.01
	1	-0.11***	4.19	-0.03	-0.40	0.07	0.10***	3.60	0.02	0.22	0.05	-0.09***	-3.18	-0.07	-0.70	0.04
	2	0.01	0.19	0.06	0.47	-0.01	0.02	0.35	0.01	0.08	-0.01	0.00	-0.08	0.14	1.02	-0.01
	3	-0.05	-0.91	-0.02	-0.11	0.00	0.04	0.74	**0.41*****	3.10	0.02	-0.05	0.77	-0.30*	-1.80	0.01
PMI	0	0.00	0.30	-0.03	-1.10	-0.01	0.00	-0.18	**0.07***	1.76	0.01	0.00	0.23	**-0.11*****	-2.52	0.02
	1	0.03	1.03	-0.08	-1.46	0.00	-0.03	-0.96	0.08	0.80	0.00	0.02	0.81	-0.06	-0.64	-0.01
	2	0.04	0.94	0.12	0.82	0.00	-0.03	-0.61	-0.07	-0.53	-0.01	0.03	0.65	0.05	0.39	-0.01
	3	0.08	1.27	-0.02	-0.14	0.00	-0.13**	-2.41	-0.02	-0.12	-0.01	0.10*	1.76	-0.03	-0.20	0.00
Retail Sales	0	0.01	0.79	0.05	1.58	0.00	-0.01	-0.65	**-0.12****	-2.27	0.01	0.01	0.61	**0.12***	1.87	0.00
	1	0.00	0.14	0.18	1.48	-0.01	0.02	0.71	-0.12	-1.11	0.00	-0.03	-1.09	0.14	1.30	0.00
	2	-0.07*	-1.91	-0.04	-0.26	0.00	**0.07****	2.10	**-0.40*****	-2.51	0.02	-0.02	-0.40	**0.27***	1.73	0.00
	3	-0.04	-0.89	0.00	-0.01	-0.01	0.06	1.20	-0.16	-0.98	0.00	-0.10	-1.58	-0.23	-1.51	0.01

Table 4.9. Correlation matrix: Economic policy uncertainty and the dynamic correlation

This table repots the contemporaneous correlation between the level of the economic policy uncertainty of Baker et al. (2016) and the stock-bond dynamic correlation. For each macroeconomic factor only the 168 days of announcements are selected. The columns in the table (I), (II) and (III) show the cases when the dependent variable is the dynamic correlation between the DJIA and standard bench mark index return at 1 year, 10 years and 30 years, respectively. Scales 0, 1 2 and 3 denote the day of announcement, (2-4) days, (4-8) and (8-16) days following the announcements respectively. The last row shows the average correlation across all the macroeconomic factors. The sample period from January 2000 to December 2013. *, ** and *** denote statistical significant at 10%, 5% and 1%, respectively.

	(I)				(II)				(III)			
	0	1	2	3	0	1	2	3	0	1	2	3
Average Hourly Earning	-0.391***	-0.086	0.073	0.049	0.408***	0.187**	0.121	-0.079	-0.434***	-0.240***	-0.208***	0.027
Business Inventory	-0.381***	-0.057	-0.060	-0.019	0.396***	0.148**	0.148	-0.029	-0.394***	-0.138***	-0.212***	-0.029
Consumer Credit	-0.382***	-0.141*	-0.153**	-0.022	0.369***	0.253***	0.203***	0.036	-0.386***	-0.284***	-0.181*	-0.065
CPI	-0.294***	-0.004	0.018	-0.032	0.300***	0.097	-0.045	0.021	-0.317***	-0.077	0.043	-0.019
Factory Goods Orders	-0.381***	-0.057	-0.060	-0.019	0.396***	0.148*	0.148*	-0.029	-0.394***	-0.138*	-0.212***	-0.029
Housing Starts	-0.269***	0.033	-0.073	0.068	0.288***	0.025	0.068	-0.023	-0.274***	-0.045	-0.034	0.016
Import	-0.368***	-0.084	-0.195***	0.010	0.464***	0.222***	0.284***	0.121	-0.458***	-0.211***	-0.253***	-0.169*
Industrial Production	-0.363***	-0.072	-0.021	-0.028	0.364***	0.110	0.007	0.034	-0.366***	-0.123	-0.014	-0.093
New Single-Family Home Sales	-0.335***	-0.107	-0.038	-0.024	0.365***	0.196	0.113	0.020	-0.344***	-0.169*	-0.106	-0.010
Personal Income	-0.348***	-0.087	-0.052	0.003	0.414***	0.187*	0.188*	0.069	-0.382***	-0.202***	-0.167*	0.002
Chicago PMI	-0.335***	0.028	-0.104	-0.003	0.342***	0.003	0.221***	0.116	-0.330***	-0.038	-0.247***	-0.025
PPI	-0.371***	-0.149*	-0.134*	-0.106	0.371***	0.262***	0.066	0.062	-0.356***	-0.233***	-0.035	-0.164**
Retail Sales	-0.352***	-0.161*	-0.085	0.003	0.441***	0.254***	0.184**	0.144*	-0.463***	-0.242***	-0.210***	-0.180*
Unemployment Rate	-0.391***	-0.086	0.073	0.049	0.408***	0.187**	0.121	-0.079	-0.434***	-0.240***	-0.208***	0.027
Average	-0.354	-0.074	-0.058	-0.005	0.380	0.163	0.131	0.027	-0.381	-0.170	-0.146	-0.051

Table 4.10 Controlling for the economic policy uncertainty with the 2008 crisis dummy.

This table reports the macroeconomic announcement effect as measured by β_3 and the economic policy uncertainty effect, β_4, from the model:

$$\rho SBm_t = \alpha + [(1 - D_t^{CRISIS}) \sum_{k=1}^{n} \beta_1 u_k + \beta_2 EPU_t + D_t^{CRISIS} \sum_{k=1}^{n} \beta_3 u_k + \beta_4 EPU_t] + e_t$$

Where ρSBm_t is the dynamic conditional correlation between the given stock index return under consideration, *S*, and the benchmark bond market index return *B* at either *m* equal 1,10 and 30 years of maturity respectively, where here *B* denotes the number of years to maturity. D_t^{CRISIS} is the global crisis dummy variable which is equal to 1 during the crisis and zero otherwise. *EPU* is the level of the daily news-based economic policy uncertainty index of Baker et al (2016)'s, where only the days of macroeconomic news announcement are matched with those from the EPU series. Scales 0, 1 2 and 3 denote the day of announcement, (2-4) days, (4-8) and (8-16) days following the announcements respectively. The crisis period is defined from September 2008 to March 2009. *, ** and *** denote statistical significant at 10%, 5% and 1%, respectively. The estimation used White (1987) test.

		(I)					(II)					(III)				
Variable	scale	β_3	*t*-stat	β_4	*t*-stat	Adj. R^2	β_3	*t*-stat	β_4	*t*-stat	Adj. R^2	β_3	*t*-stat	β_4	*t*-stat	Adj. R^2
Average Hourly Earning	0	-0.03	-0.93	-0.09***	-8.09	0.13	0.00	0.06	0.12***	5.75	0.15	-0.03	-0.47	-0.11***	-5.67	0.18
	1	-0.22	-1.54	-0.02	-0.29	-0.01	0.37*	1.79	-0.01	-0.14	0.04	-0.25	-1.42	-0.05	-0.57	0.05
	2	-0.30	-0.83	0.10	1.05	-0.01	0.21	0.56	0.06	0.44	-0.01	0.00	0.02	-0.23***	-3.31	0.02
	3	-0.08	-0.96	-0.17***	-3.71	0.03	0.46	0.88	-0.40***	-5.81	0.03	-0.09	-0.17	0.18	1.41	-0.01
Business Inventory	0	0.03**	2.29	-0.10***	-6.03	0.13	-0.04**	-2.30	0.11***	4.60	0.14	0.07***	4.08	-0.09***	-4.04	0.14
	1	0.15***	3.42	0.07	0.93	-0.01	-0.10	-0.82	0.04	0.24	0.00	0.11*	1.86	-0.02	-0.19	0.00
	2	-0.33***	-2.87	-0.16	-1.27	0.00	0.40***	6.84	0.41***	5.76	0.02	-0.29***	-3.00	-0.40***	-3.99	0.03
	3	-0.47***	-4.05	-0.42***	-5.09	0.01	0.12	0.38	-0.16	-0.67	-0.01	-0.08	-0.26	0.02	0.10	-0.02
Consumer Credit	0	0.05***	4.47	-0.10***	-9.25	0.14	-0.04***	-2.70	0.12***	6.34	0.14	0.05***	2.83	-0.11***	-5.99	0.14
	1	0.02	0.20	-0.15***	-3.87	0.01	0.13	0.63	0.16**	2.21	0.02	-0.06	-0.35	-0.17***	-3.20	0.04
	2	-0.09	-0.40	-0.09	-0.91	-0.02	-0.02	-0.16	0.13	1.64	-0.01	-0.11	-0.97	-0.16***	-2.88	0.00
	3	0.09	1.20	-0.28***	-4.23	0.00	0.76***	7.25	-0.11	-1.22	0.03	-0.49*	-1.70	0.07	0.59	0.00
CPI	0	-0.02**	-2.30	-0.09***	-6.44	0.08	0.04***	3.06	0.09***	5.36	0.07	-0.02	-1.44	-0.09***	-3.96	0.08
	1	-0.03	-0.27	-0.01	-0.07	0.01	0.00	-0.05	0.01	0.17	0.03	0.05	0.35	-0.01	-0.08	0.03
	2	0.16	1.03	0.09	0.57	-0.02	-0.10	-0.44	-0.09	-0.50	-0.02	0.15	0.76	0.07	0.39	-0.02
	3	-0.27*	-1.85	-0.11	-0.76	-0.01	-0.02	-0.06	-0.17	-1.32	-0.01	-0.21	0.97	-0.10	-0.65	-0.02
Factory Goods Orders	0	0.01	0.70	-0.14***	-7.00	0.17	-0.02	-1.00	0.15***	6.98	0.16	0.03	1.16	-0.15***	-6.06	0.14
	1	-0.04	-0.73	-0.03	-0.48	-0.02	0.12	1.38	0.10	1.05	0.02	-0.05	-0.63	-0.07	-0.88	0.01
	2	0.13	1.58	-0.04	-0.35	-0.01	-0.13*	-1.79	0.25***	2.69	0.01	0.17***	2.74	-0.33***	-4.18	0.04
	3	-0.01	-0.10	-0.22**	-2.42	0.00	0.22	1.54	-0.21	-1.50	0.02	-0.07	-0.44	0.14	0.92	0.00
Housing Starts	0	0.00	0.19	-0.07***	-5.07	0.06	0.01	1.48	0.08***	4.52	0.07	0.00	0.07	-0.06***	-3.52	0.05
	1	-0.13**	-2.27	-0.02	-0.37	0.06	0.14**	2.45	0.00	0.07	0.04	-0.09	-1.32	-0.03	-0.52	0.03
	2	-0.14*	-1.93	-0.03	-0.31	-0.01	0.18**	2.10	0.04	0.37	-0.01	-0.21***	-2.65	-0.01	-0.14	-0.01
	3	-0.31***	-3.86	0.01	0.12	0.00	0.08	0.47	-0.15	-1.50	0.00	-0.12	-0.73	0.09	0.91	-0.01

Table 4.10 *Continued*.

		(I)					(II)					(III)				
Variable	Scale	β_3	*t*-stat	β_4	*t*-stat	Adj. R^2	β_3	*t*-stat	β_4	*t*-stat	Adj. R^2	β_3	*t*-stat	β_4	*t*-stat	Adj. R^2
Import	0	0.01*	1.71	**-0.11*** **	-8.61	0.12	-0.01	-1.10	**0.13*** **	10.31	0.20	0.01	0.54	**-0.13*** **	-7.37	0.19
	1	0.05	1.02	-0.08	-0.88	0.00	-0.09	-1.14	0.08	0.94	0.04	0.12*	1.92	-0.08	-1.03	0.04
	2	**0.16** **	2.00	-0.21***	-2.17	0.03	-0.18	-1.61	-0.14	1.01	0.07	0.06	0.30	-0.20	-1.21	0.05
	3	**-0.43*** **	-4.41	0.07	0.57	0.02	0.09	0.45	0.14	0.82	0.00	-0.11	-0.51	-0.20	-1.17	0.01
Industrial Production	0	**0.03*** **	4.09	**-0.09*** **	-8.20	0.13	-0.04***	-5.28	0.10***	7.65	0.13	0.04***	4.36	-0.10***	-5.77	0.12
	1	0.01	0.22	0.01	0.15	0.00	-0.04	-0.87	-0.02	-0.20	0.01	0.00	-0.08	-0.01	-0.11	0.01
	2	**-0.12***	-1.95	**-0.16** **	-1.93	0.01	**0.13*** **	2.52	**0.13**	1.45	0.01	-0.11***	-2.38	-0.13	-1.52	-0.01
	3	0.03	0.29	0.00	-0.02	-0.01	-0.09	0.07	0.00	0.13	-0.02	0.13**	2.02	0.01	0.07	0.00
New Single-Family Home Sales	0	0.05***	3.07	**-0.09*** **	-5.50	0.11	-0.05***	-3.14	0.09***	4.25	0.13	0.05***	3.34	-0.08***	-4.21	0.11
	1	-0.06	-0.92	**-0.04**	-0.61	-0.01	0.02	0.31	0.05	0.97	0.02	0.05	1.20	-0.03	-0.55	0.01
	2	-0.05	-0.52	-0.04	-0.33	-0.02	0.04	0.27	0.04	0.37	0.00	0.03	0.34	-0.12	-1.06	-0.01
	3	**0.30**	1.58	**0.31*** **	3.24	0.03	**-0.33** **	-2.32	**-0.02**	-0.17	-0.01	**0.36*** **	3.17	0.12	1.04	-0.01
Personal Income	0	0.00	-0.21	-0.09***	-9.28	0.11	0.01	0.70	0.11***	6.95	0.15	-0.03	-1.33	-0.09***	-5.66	0.13
	1	**0.22** **	2.21	0.00	0.03	0.02	0.13	0.90	0.02	0.19	0.04	0.00	-0.03	-0.04	-0.46	0.06
	2	**0.49*** **	7.66	**-0.05**	-0.89	0.01	0.10	0.69	0.09	0.93	0.03	0.32	2.47	-0.10	-0.99	0.03
	3	-0.13	-0.65	**0.17**	1.69	-0.01	-0.05	-0.21	0.06	0.45	-0.01	-0.04	-0.17	0.17	1.46	0.02
Chicago PMI	0	**0.04*** **	3.47	-0.05***	-9.58	0.10	-0.01	-0.60	0.06***	6.94	0.10	0.03*	1.77	-0.06***	-6.82	0.11
	1	0.18	1.64	0.00	0.02	-0.01	-0.23**	-2.03	-0.02	-0.33	-0.01	0.19	1.57	0.01	0.14	-0.01
	2	-0.04	-0.17	-0.02	-0.51	0.00	-0.06	-0.40	0.10**	2.36	0.04	0.13	1.09	-0.16***	-3.88	0.04
	3	0.07	0.61	0.13***	2.47	0.01	-0.14	-0.88	0.09	1.24	0.02	0.25	1.55	0.06	0.94	0.00
PPI	0	0.00	-0.14	-0.07***	-3.64	0.13	0.01	0.57	0.08***	3.98	0.13	-0.01	-0.45	-0.07	-3.00	0.13
	1	-0.03	-0.20	-0.03	-0.25	0.01	0.07	0.57	0.05	0.58	0.08	-0.06	-0.61	-0.06	-0.78	0.05
	2	**-0.19*** **	-2.84	**-0.24*** **	-4.64	0.01	0.18	1.47	0.16**	2.20	-0.01	-0.08	-0.62	-0.12	-1.37	-0.01
	3	-0.20	-0.82	-0.03	-0.15	0.02	0.25	1.46	0.09	0.55	-0.01	-0.35**	-2.40	-0.31***	-4.55	0.02
Retail Sales	0	0.00	-0.41	**-0.11*** **	-8.79	0.11	0.01	0.61	0.12***	8.63	0.18	0.00	0.00	-0.12***	-7.66	0.20
	1	-0.01	0.10	-0.01	0.11	0.01	**0.12** **	2.09	0.07	0.90	0.07	**-0.11*** **	-2.56	-0.10	-1.45	0.05
	2	-0.11***	-3.00	**-0.27*** **	-4.33	0.01	0.19**	2.01	0.27***	2.61	0.03	-0.14*	-1.86	-0.24***	-2.92	0.03
	3	0.10	0.83	**0.33*** **	3.04	0.00	0.05	0.27	**0.17**	0.87	0.00	-0.05	-0.32	**-0.20**	-1.12	0.03
Unemployment Rate	0	-0.02	-0.59	-0.09***	-8.97	0.13	0.04	1.01	0.11***	7.83	0.15	-0.05	-1.09	**-0.10*** **	-7.02	0.19
	1	-0.14	-0.98	-0.01	-0.20	-0.01	0.11	0.56	0.02	0.20	0.02	-0.09	-0.67	-0.06	-0.82	0.05
	2	**0.67*** **	3.36	**-0.14**	-1.65	0.01	**-0.57*** **	-2.63	**0.28*** **	3.04	0.02	**0.45** **	2.03	-0.37***	-3.86	0.03
	3	**-0.06**	-1.28	**-0.19*** **	-3.72	0.05	**0.48***	1.92	**-0.44*** **	-5.06	0.03	-0.31	-0.88	0.25	1.56	-0.01

Table 4.11 Small cap value and growth indexes, 2008 crisis dummies.

This table reports β_1 and β_2 coefficient estimates from the non-linear regression with White (1987) standard errors of the model:

$$\rho SBm_t = \alpha + [(1 - D_t^{CRISIS}) \sum_{k=1}^{n} \beta_1 u_k + D_t^{CRISIS} \sum_{k=1}^{n} \beta_2 u_k] + e_t$$

Where ρSBm_t is the dynamic conditional correlation between either the Dow Jones small cap value index return (panel a) or Dow Jones small cap growth index return (panel b) and the benchmark bond market index return B at either m equal 1,10 and 30 years of maturity respectively, where here B denotes the number of years to maturity. D_t^{CRISIS} is the global crisis dummy variable which is equal to 1 during the crisis and zero otherwise. Scales 0, 1 2 and 3 denote the day of announcement, (2-4) days, (4-8) and (8-16) days following the announcements respectively. *, ** and *** denote statistical significant at 10%, 5% and 1%, respectively. For rest of notations, see table 4.6.

Panel A : Using the Dow Jones small cap value index return

		(I)					(II)					(III)				
Variable	scale	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2
Average Hourly Earning	0	0.00	0.16	-0.16***	-5.72	0.01	-0.01	-0.54	0.10**	2.24	-0.01	-0.01	0.86	-0.01***	-2.49	0.00
	1	0.04	-1.29	-0.22*	-2.01	0.00	0.03	1.04	0..22*	2.04	0.00	0.00	0.06	-0.18	-1.68	-0.01
	2	-0.01	-0.22	-0.25	-0.83	-0.01	0.01	0.29	-0.05	-0.43	-0.01	0.03	0.50	0.06	0.48	-0.01
	3	0.05	0.86	-0.54***	-3.42	0.00	-0.02	-0.36	-0.14	-0.34	-0.01	-0.07	-1.19	0.16	0.34	0.00
Consumer Credit	0	0.00	0.25	0.07	1.62	0.00	-0.02	-1.32	-0.05	-1.24	0.00	0.02	0.98	0.07	1.54	0.00
	1	-0.01	-0.23	-0.20	-1.27	0.00	-0.01	-0.34	-0.01	-0.08	-0.01	0.03	0.79	-0.03	-0.24	-0.01
	2	0.01	0.27	0.59***	4.39	0.02	0.02	0.34	-0.48***	-3.52	0.01	-0.01	-0.11	0.58***	4.92	0.02
	3	-0.03	-0.48	-0.18	-0.58	-0.01	-0.02	-0.35	0.04	0.17	-0.01	0.02	0.38	-0.12	-0.50	-0.01
CPI	0	-0.02	-1.54	0.05	-1.55	0.01	0.02	1.03	-0.01	-0.26	-0.01	-0.01	-0.83	0.04	1.18	0.00
	1	0.04	1.22	-0.07	-0.96	0.00	-0.04	-1.37	0.02	0.27	0.00	0.06*	1.93	0.03	0.26	0.01
	2	0.05	1.00	0.07	0.65	0.00	0.01	0.21	-0.04	-0.22	-0.01	-0.01	-0.22	0.10	0.83	-0.01
	3	0.04	0.66	-0.21*	-2.00	0.00	-0.04	-0.71	-0.13	-1.19	-0.01	0.08	1.29	0.13	1.15	0.00
Factory Goods Orders	0	0.00	0.02	0.02	0.66	-0.01	0.00	0.04	-0.05	-0.90	-0.01	0.00	0.23	0.06	1.04	-0.01
	1	-0.01	-0.17	0.12	0.95	-0.01	0.03	0.89	0.07	0.47	0.00	-0.04	-1.18	0.04	0.35	0.00
	2	-0.01	0.04	0.12	0.12	-0.01	-0.01	-0.14	0.15	-1.09	-0.01	0.02	0.48	0.26**	1.98	0.00
	3	0.07	1.11	-0.11	-0.50	0.00	-0.03	-0.39	0.22	1.46	0.00	0.07	0.99	-0.23	-1.49	0.00
Housing Starts	0	0.00	-0.21	0.04	0.82	-0.01	0.02	1.00	-0.03	-0.75	0.00	-0.01	-0.65	0.04	0.94	-0.01
	1	-0.11***	-3.65	-0.12*	-1.79	0.07	0.09***	2.73	0.18***	2.96	0.05	-0.08***	-2.67	-0.13	-1.36	0.04
	2	0.02	0.51	-0.14	-1.45	0.00	0.00	0.05	0.18	1.55	0.00	0.02	0.45	-0.21**	-2.18	0.00
	3	-0.02	-0.35	-0.19*	-1.73	0.00	0.02	0.29	-0.01	-0.04	-0.01	0.02	0.27	-0.01	-0.05	-0.01
Industrial Production	0	0.00	-0.20	0.03	0.89	0.00	-0.01	-0.58	-0.04	-1.67	0.00	0.01	0.36	0.04	1.37	0.00
	1	-0.01	0.72	0.00	0.96	-0.01	0.01	0.24	-0.01	-0.08	-0.01	-0.01	-0.24	-0.04	-0.62	-0.01
	2	0.01	0.22	-0.08*	-1.69	-0.01	0.00	-0.07	0.10***	2.99	0.00	-0.02	-0.32	-0.07*	-1.81	-0.01
	3	0.02	0.24	0.10	1.58	-0.01	-0.04	-0.53	0.01	0.09	-0.01	0.13**	1.93	0.03	0.33	0.01

Table 4.11 *Continued*.

Variable	(I)						(II)					(III)				
	Scale	β_1	*t*-stat	β_2	*t*-stat	Adj. R^2	Scale	β_1	*t*-stat	β_2	*t*-stat	Scale	β_1	*t*-stat	β_2	*t*-stat
	0	0.02*	1.71	0.05*	1.72	0.01	-0.03*	-1.74	**-0.04**	-1.51	0.01	0.03*	1.71	**0.06*****	3.21	0.01
New Single-Family Home Sales	1	0.01	0.46	**-0.20*****	-2.64	0.00	-0.01	-0.34	0.11	1.08	-0.01	0.00	-0.15	-0.01	-0.10	-0.01
	2	-0.04	-0.83	-0.04	-0.22	-0.01	0.02	0.46	0.08	0.37	-0.01	-0.07	-1.46	0.01	0.08	0.00
	3	0.03	0.55	**0.28***	1.69	0.00	-0.05	-0.73	**-0.34****	-2.72	0.00	0.05	0.91	**0.35***	2.64	0.00
Panel B : Using the Dow Jones small cap growth index return																
Average Hourly Earning	0	0.00	0.20	**-0.17*****	-5.86	0.01	-0.01	-0.66	**0.11****	2.42	0.00	0.01	0.87	**-0.14*****	-2.93	0.00
	1	-0.03	-1.42	-0.03	0.49	0.00	0.02	0.60	0.11	-0.74	-0.01	-0.01	-0.31	**-0.08***	2.04	-0.01
	2	0.00	0.07	**-0.35***	-2.11	0.01	-0.02	-0.52	0.17	0.51	-0.01	0.05	1.27	-0.12	-0.38	0.00
	3	0.07	1.30	0.33	1.15	0.00	-0.07	-1.24	-0.11	-0.29	0.00	-0.02	-0.31	0.11	-0.25	-0.01
Consumer Credit	0	0.00	-0.07	0.00	-0.16	-0.01	0.00	0.11	-0.01	-0.36	-0.01	0.00	0.04	0.03	0.66	-0.01
	1	-0.03	-1.03	0.23*	-1.76	0.01	0.00	-0.08	0.21	1.39	0.00	0.02	0.70	-0.27*	-1.76	0.01
	2	0.00	-0.03	**0.43*****	3.61	0.00	0.03	0.66	**-0.49*****	-4.01	0.01	-0.01	-0.25	**0.57*****	4.96	0.02
	3	-0.11	-1.92	-0.11	-0.39	0.01	-0.01	-0.18	0.04	0.22	-0.01	-0.01	-0.17	0.13	-0.54	-0.01
CPI	0	-0.02	-1.32	0.05*	1.70	0.01	0.01	0.88	-0.02	-0.42	-0.01	-0.01	-0.60	0.04	1.35	-0.01
	1	0.00	0.01	-0.06	-1.33	-0.01	-0.01	-0.53	0.05	0.69	-0.01	0.01	0.26	0.03	0.24	-0.01
	2	0.01	0.27	-0.04	-0.24	-0.01	-0.01	-0.14	0.00	-0.01	-0.01	0.01	0.12	0.06	0.46	-0.01
	3	0.01	0.22	**-0.41*****	-8.30	0.02	-0.10	-1.65	-0.03	-0.18	0.00	0.12**	2.04	0.02	0.11	0.01
Factory Goods Orders	0	0.00	0.07	0.07	1.55	0.00	-0.01	-0.91	-0.05	-1.11	0.00	0.01	0.61	0.07	1.52	0.00
	1	-0.01	-0.46	0.02	0.30	-0.01	0.00	0.16	**0.10****	2.69	-0.01	0.01	0.33	**-0.08*****	-3.28	-0.01
	2	-0.02	-0.45	0.11	0.76	-0.01	-0.01	-0.23	-0.05	-0.31	-0.01	0.02	0.45	0.16	1.29	-0.01
	3	0.07	1.32	-0.20	-0.86	0.00	-0.06	-1.01	0.18	1.05	0.00	0.08	1.22	-0.21	-1.30	0.00
Housing Starts	0	0.00	-0.10	0.04	0.78	-0.01	0.01	0.59	-0.02	-0.50	-0.01	-0.01	-0.29	0.03	0.70	-0.01
	1	-0.06**	-2.38	**0.00**	0.02	0.02	0.03	1.22	0.10	1.61	0.01	-0.01	-0.33	-0.09	-0.94	-0.01
	2	0.03	0.56	-0.05	-0.50	-0.01	-0.02	-0.52	0.16	1.32	0.00	0.04	0.83	-0.19**	-1.96	0.00
	3	-0.02	0.39	-0.28***	-2.74	0.00	0.07	1.04	0.15	1.08	0.00	0.00	0.03	-0.15	-0.11	-0.01
Industrial Production	0	0.00	-0.07	0.03	0.84	0.00	-0.01	-0.64	-0.04	-1.56	0.00	0.01	0.39	0.03	1.26	0.00
	1	0.06*	1.85	**0.09*****	6.48	0.04	-0.07**	-2.19	**-0.06****	-1.99	0.03	0.06*	1.85	**0.06**	1.66	0.02
	2	0.03	0.50	-0.04	-0.85	-0.01	-0.01	-0.22	**0.12*****	2.53	0.00	-0.02	-0.34	**-0.11*****	-2.33	0.00
	3	-0.04	-0.61	0.14**	2.01	0.00	-0.01	-0.19	0.03	0.38	-0.01	0.08	1.15	0.01	0.07	0.00
New Single-Family Home Sales	0	0.02	1.64	0.05	1.62	0.01	-0.03*	-1.84	-0.03*	-1.27	0.01	0.03*	1.75	0.04**	2.20	0.01
	1	0.01	0.23	0.01	0.17	-0.01	0.00	0.08	-0.03	-0.26	-0.01	-0.02	-0.63	0.02	0.10	-0.01
	2	0.00	0.10	-0.01	-0.05	-0.01	0.00	0.11	0.07	0.32	-0.01	-0.04	-0.93	**0.03**	0.19	-0.01
	3	0.05	0.74	**0.32****	2.20	0.00	-0.04	-0.59	**-0.32****	-1.87	0.00	0.03	0.59	**0.30***	1.92	0.00

4.5. Summary and conclusion:

This study analyses the effect of macroeconomic news on the stock and bond return dynamic correlation in the United States. Mainly, we question whether the effect of fourteen macro news is centred in the same day of announcements, or tend to persist up to sixteen days afterward with the analysis has been done during and around the recent 2008-2009 crisis. Using wavelet transform, we decompose the return series on scales, specifically 2-4 days, 4-8 and 8-16 days after the announcements before estimating the dynamic correlation with each scaled return series using the diagonal version of the asymmetric DCC-GARCH model of Cappiello et al. (2006).

After regressing the scaled dynamic correlation on each macro news series, we end up with informative results which can be summarised as follows. First and in consistent with the vast majority of the literature, we find very little evidence that the macroeconomic news surprises affect the equity price and stock-bond return dynamic correlation over our full sample period from 2000 to 2013. However, our evidence reveals that, when controlling for the Lehman brothers 2007-2008 crisis, some announcements tend to significantly affect all the correlation series on the first day with this impact notably observed throughout the crisis period. Second and for analysis done on scales we find a link between the speed of reaction of dynamic correlation to news surprises and the time and of announcements. For example, news such as factory goods order, the industrial production, the consumer credit and the new-single family house sales which they are early released on time and in the month, show a slower effect on the dynamic correlation than those released late. The impact of early macroeconomic news seems to be fully incorporated into correlation process 4-8 days after they have been announced. Third, from all the surprises series, the CPI and housing starts effects tends to persist up to 2-4 days ahead of the announcement day. Yet, they are the only two releases show high significant and consistent effect on all the correlation series outside the crisis period. Finally, as an additional analysis, we find that the effect of most of surprises, either in the same day of announcements or up to 16 days later, disappeared after replacing the 2008 with the 2001 Dot-com crisis or 2011 U.S. government debt ceiling dispute periods. Yet, the effect of both CPI and housing starts are the most prominent outside the crises periods. This last general finding again suggests investigating the effect in a crisis-regression analysis is more precise than analysing the effect over the full recession (expansion) period. That is using the later will ignore the differences in the level of the inflation, the sentiment and the uncertainty across the crises periods.

In our robustness checks, we find that our results are somewhat robust to using the DJIA small value and growth index returns to construct the new correlation series. However, with these two new series the correlation series tends to be less affected by macroeconomic news either in the first day or some days later after the announcements. This result here supports the general belief, that the pricing of small companies is more affected by the investor sentiment (Lemmon & Portniaguina; (2006) and Baker & Wurgler (2007). In our further test, we find that due to the high level of daily U.S. news-based economic policy uncertainty as proxy by the later developed measure of Baker et al. (2013), the reaction of some news including the consumer credit tends to be small in the day of announcement, but higher and significant after controlling for the uncertainty as exactly affected in the announcement days. Yet, we find that the effect of policy uncertainty is strong only when matched with the days of announcements and tends to reverse to fundamentals afterward with the correlation being affected again by the same macroeconomic news. In one more test, and rather than running a separate regression for each macroeconomic factor, we find that important macroeconomic news maintained their significant effects even after simultaneously including all of them in the same regression.

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