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RESEARCH ARTICLE

Behavioral Finance and Efficient Markets: What does the Euro Crisis Tell us?

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Abstract The crisis in the Eurozone between 2009 and 2015 provides an opportunity to test whether financial markets fully display the characteristics associated with the efficient market hypothesis or whether behavioral approaches which focus on excessive pessimism and confirmation bias also offer insights into the performance of markets. In this paper we test several important aspects of market behavior. Specifically we examine the extent to which large changes in risk premia amongst the countries that encountered crises were related to news. We also investigate whether the impact of good and bad news was symmetrical. Finally we explore whether changes in risk premia in Greece affected risk premia in other countries in an asymmetrical and biased way. We discover that while there is considerable evidence that financial markets often performed in an efficient way during the crisis, there are also important departures from this pattern that are consistent with the behavioral approach. Our findings imply that both the efficient and behavioral approaches are helpful when trying to understand how markets perform.

Keywords Behavioral finance · Efficient markets · Euro crisis

1 Introduction

A key question in economics relates to whether or not financial markets are efficient in the sense that they take all available information into account and adjust instantaneously as new information becomes available. For a lengthy period of time efficient market

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theory dominated academic thinking. More recently, however, an increasing number of economists have been attracted to behavioral finance in an attempt to better understand aspects of market performance that appear inconsistent with the efficient market hypothesis (EMH). The recent Euro crisis provides an opportunity to investigate these alternative views.

While there is a general theory of market efficiency, there is no equivalent theory of behavioral finance. Instead there are various ideas upon which the behavioral approach is based. This makes things more complicated, but it may also yield more explanatory power. Not all financial markets behave in the same way, nor do the same markets always behave in the same way at different times. To explain these differences it helps to have a range of theoretical ideas upon which to draw. Even if efficient market theory lacks universal applicability, this does not rule out markets behaving in ways that closely approximate its predictions in many circumstances. Likewise, different hypotheses from behavioral finance seem likely to have more applicability in some cases than in others. Over time, and with many episodes to examine, it may become possible to identify the conditions in which markets behave in certain ways.

In this paper we examine aspects of the performance of financial markets in the Eurozone during the crises in Greece over the period 2009–2015, a period in which it has often been argued that financial markets behaved badly and were dominated by excessive pessimism and self-fulfilling speculation that worsened the crisis.[1] Our objective is to see to what extent the performance of financial markets was compatible with the efficient market hypothesis (EMH) and whether behavioral theory provides a superior explanation or at least some additional insights.

An underlying problem is to devise suitable tests of the theories. There are many straightforward tests of the EMH when it is combined with risk neutrality These tests generally involve testing whether there is information in past market behavior that can be used to predict future price movements. The alternative form of testing based on the degree of correspondence to models of equilibrium prices becomes more difficult since there is often disagreement over the most appropriate model to use. Such testing also encounters a general problem in dealing with risk. For example, in the context of the euro crisis while risk may certainly be related to debt ratios and fiscal deficits, it may also be related to other things as well, such as the probability of systemic collapse. It is rational for markets to take these additional elements of risk into account. To observe divergences in risk premia from those that would be anticipated on the basis of debt and fiscal imbalances does not therefore necessarily imply that markets are inefficient. At the same time, such divergences may also reflect behavioral tendencies such as excessive optimism (irrational exuberance) or pessimism, and confirmation bias. The challenge is to distinguish between the alternative explanations.

In this paper we analyze three important aspects of financial market behavior. First, we examine the extent to which relatively large movements in risk premia during the Eurozone crisis were significantly linked to ‘news’. The EMH implies that markets respond to important news as it becomes available. They will display large movements only on days when such news occurs. The theory also implies that market responses will be symmetrical with good news reducing and bad news increasing risk premia.

[1] While such charges have been offered most frequently by officials they have also attracted some support from professional economists. See for example De Grauwe and Ji (2013).

Behavioral approaches, on the other hand, suggest that markets may exhibit excessive pessimism or optimism such that they respond in different ways to good and bad news. According to the behavioral approach, during a crisis markets may be expected to respond more strongly to bad news than to good news. As a second test, we examine the way in which markets reacted to good and bad news coming from national governments, and from regional as well as international institutions during the Eurozone crisis.

Third, we examine an important aspect of the pattern of contagion during the Eurozone crisis. There are many definitions of contagion and methods for testing its existence. Here we examine whether there was greater contagion where there were increases in risk premia in Greece, reflecting a worsening situation, than from decreases reflecting an improving one. Was there a behavioral bias towards market pessimism?

Our findings suggest that there are in fact no general answers to these questions. At some times during the crisis markets behaved in ways that would have been predicted by the EMH, while at other times behavioral characteristics seem to have played an important role. We conclude that, at this stage in our understanding of how financial markets work, it would be unwise to discard either the efficient market or the behavioral approach. Both have explanatory power.

The paper is organized in the following way. Section 2 offers a detailed examination of the literature that is relevant to our central research questions. This allows us to place our study in the context of existing studies. Section 3 explains the data and methodology that we use and goes on to present our main results. Section 4 offers a few concluding remarks. These highlight our main results and their relevance for the debate about the applicability of the efficient market hypothesis and behavioral hypotheses. We also briefly discuss the direction of future research.

2 Literature Review

A rich literature has developed dealing with the behavior of financial markets both before and during the Eurozone crisis that began in 2009. While some studies have focused on stock markets, many have examined markets for sovereign debt, typically using interest rate spreads against German bonds or CDS prices as indicators of perceived risk. Most of this literature has concentrated either on whether the levels of interest rate premia were justified by fundamentals or on the measurement of contagion. There is a smaller literature that deals with the impact of news. In this section we examine each of these strands as a precursor to what follows in the rest of the paper.

2.1 Pricing of Risk

While many of the existing studies have implications for evaluating the efficiency of markets, only a few explicitly contrast the efficient market hypothesis (EMH) with specific behavioral approaches as we do in this paper.

An important issue when evaluating the contribution of the EMH and behavioral hypotheses concerns how strictly the criteria for efficiency are fulfilled. In addition to this, there is a supplementary issue relating to the consequences of deviating from

efficiency and the endurance of deviations. For example, markets largely failed to anticipate the Mexican crisis in 1994 and the Asian crisis in 1997. The initial reaction, once the crises hit, was to move out of investments in Latin America and Asia respectively. But fairly soon thereafter markets began to differentiate between countries within the region based on a more careful assessment of their fundamentals and the extent to which regional neighbors shared characteristics with the original crisis countries.[2] Given these historical antecedents, there are reasons to believe that a similar pattern may have been exhibited in the case of the Greek/Eurozone crisis.

At first sight such behavior appears to contradict the assumption that market participants are well-informed and rational. However, it is also possible that markets quickly come to recognize that their underlying models are seriously flawed. A general pull back in the event of a crisis allows them to develop and extend or indeed replace their failed mental models. In such circumstances the major market inefficiencies may be expected to occur in the period running up to crises rather than during them and their immediate aftermath. To the extent that crises are a 'wake-up call', markets wake-up to the deficiencies of the implicit models that they have been using as the basis for assessing risk and making investment decisions.

A number of studies of the pricing of Eurozone sovereign bonds suggest that there was widespread market inefficiency prior to the crisis in Greece and the rest of the Eurozone and that this was followed by a wake-up call that resulted in a substantial re-evaluation (Beirne and Fratzscher 2013; Gibson et al. 2012, 2014). Even for countries on the periphery, such as Portugal, Ireland, Italy, Greece and Spain, risk premia in the period up to the Eurozone crisis were extremely low.

In the example of the period running up to the Eurozone crisis, and when confronted with evidence that risk premia were low, strong supporters of the efficient market hypothesis could nonetheless argue that such pricing was rational in the face of moral hazard. The assumption here is that despite the no bail out clause in the treaty establishing the Eurozone, in reality the core countries, along with the relevant Eurozone institutions, would not allow there to be defaults on the sovereign debt of any country belonging to it. Although this interpretation may help to explain the low risk premia in ways that do not necessarily undermine the assumption of rationality, it seems unlikely that taken on its own it fully accounts for the size of the departure from the levels of risk premia that would have been appropriate given a reasonable and well informed analysis of the appropriate fundamentals. On top of this, there may also have been a tendency for individual market participants to put undue weight on the opinions of others, with this resulting in a strong mutually reinforcing herding element.

The failure to accurately price risk meant that markets also failed to provide the discipline that may have helped to avert the crisis (see, for example, Willett et al. 2014). There was no early warning system. The underlying economic and financial problems associated with severe macroeconomic disequilibria, financial overleveraging and real estate bubbles were therefore allowed to deteriorate further.

Once the crisis hit, how did markets respond? Was there just a market correction or was there a more dramatic switch from underpricing risk to overpricing it? Several

[2] For interpretations of the Asian and Mexican crises along these lines see the analysis and references in Bird and Milne (1999), Willett (2000) and Willett et al. (2014).

studies provide strong evidence that in terms of standard relationships with respect to a wide range of economic fundamentals, the risk premia of a number of Eurozone countries rose to excessively high levels. The claim has also been made that this resulted in policies being adopted that were self-defeating; policies of austerity worsened economic performance in a way that further damaged the debt situation of crisis countries (De Grauwe and Ji 2013; Gibson et al. 2012, 2014).

In assessing whether the sharp increases in risk premia in the aftermath of the crisis were appropriate, it needs to be noted that 'normal' or 'standard' relationships might reasonably have been suspended. This was a period of acute economic and political uncertainty. Taken to its extreme there was the possibility that the Eurozone would collapse in its then current form.[3] It therefore remains difficult to reach an unambiguous judgment about the extent to which markets mispriced sovereign debt even where there is evidence of over pricing based on conventional indicators. However, except to the staunchest advocates of the EMH, the evidence of overpricing does seem to gel awkwardly with the theory.

The danger that the crisis in Greece would significantly damage the durability of the Eurozone as a whole depended in part on whether it spilled over and affected other countries.

2.2 Contagion

The second and largest strand of the literature examining the Eurozone crisis investigates contagion.[4] Conventionally studies in this area investigate various measures of correlation between changes in the values of assets in different countries. As is generally recognized in the recent literature such correlations in themselves do not provide evidence of contagion and market inefficiency. They may reflect interdependence.

Most recent contagion studies have attempted to distinguish between the various factors that might account for the correlations between changes in the levels of risk premia across countries both within the Eurozone and, less commonly, outside it. Frequently contagion has been subdivided into 'wake-up call contagion', 'shift contagion' and 'pure contagion'. Wake-up call contagion is where a crisis, usually in just one country, leads markets to pay closer attention to fundamentals that they have previously ignored, mis-specified or under-emphasized. This applies not only to the crisis country but more importantly from the viewpoint of wake-up call contagion also to other countries. Shift contagion is usually interpreted to exist where there is a common external shock that affects a number of countries simultaneously. In the context of earlier crises the impact of common external factors has been referred to as a monsoonal effect (Masson 1998).

'Pure contagion' is generally considered to be that part of any observed increase in correlations that is not explained by a wake-up call or by a common external shock. It is

[3] While most academic experts on the euro believed that the odds of a breakup were extremely low (see, for example, Eichengreen 2010, Bergsten 2012, and Bird 2012), not all market participants shared this view.

[4] See for example Bernoth and Erdogan (2012), Caporin et al. (2013), De Santis (2012), Giordano et al. (2013), Kalbaska and Gątkowski (2012), Ludwig (2014), Manasse and Zavalloni (2013), Metiu (2012), Missio and Watzka (2011), Philippas and Siriopoulos (2013) and Fong and Wong (2012). Some of these papers examine the transmission of volatility.

the part of a correlation that cannot be explained by a change in fundamentals.[5] Instead it involves elements of market psychology such as excessive pessimism and risk aversion. The behavioral characteristics underpinning pure contagion represent a deviation from market efficiency. As a number of authors have noted, failure to take account adequately of other forms of contagion will lead to overestimates of the degree of pure contagion.

While recent studies have differed considerably in terms of the countries and the time periods covered, as well as the statistical techniques used, there is a strong tendency to find evidence of both wake-up call contagion and shift contagion. As noted above, the existence of wake-up call contagion following a crisis implies the existence of market inefficiency in the period before the crisis. The extent of inefficiency after the crisis depends on whether the wake-up brings with it a swing from excessive optimism to excessive pessimism, or whether it merely means that market participants accurately correct their under-pricing of risk based on a better assessment of the fundamentals.

Several studies discover evidence of pure contagion following a crisis. This is consistent with the claim that there is market inefficiency. However the finding is not universal, and where pure contagion is found to exist, it is sometimes found to be less strong than the wake-up call contagion (see, for example, Giordano et al. 2013).

With a disparate collection of results being reported in the extant literature, it is difficult to reach firm conclusions about the degree and nature of contagion during the crisis in the Eurozone. While there may certainly have been some degree of pure contagion during the crisis, and while this is consistent with behavioral hypotheses, the strength, duration and costs of such contagion have not yet been firmly established.[6] Moreover, there is also a substantial amount of evidence that there were important rational elements at work that were driven by a reassessment of fundamentals which led to a repricing of risks. Are there are other types of studies that may help in assessing the contributions of the EMH and behavioral approaches?

2.3 The Impact of News

The notion of market efficiency incorporates the idea that financial markets will reassess and modify pricing, including the pricing of risk, as news becomes available and that in the absence of such news markets will not move, or at least not move to any substantial extent. This is an idea that can be tested empirically. Another implication is that markets will respond in an unbiased fashion to both good and bad news. On the other hand, behavioral approaches suggest that other factors such as swings in market sentiment between optimism and pessimism can also generate substantial market

[5] There is some disagreement about whether to exclude from pure contagion increases in correlations explained by financial linkages such as portfolio rebalancing in the face of losses and calls for more collateral. While such channels may be seen by some to represent changes in fundamentals, Bernoth and Erdogan (2012) consider them to be part of pure contagion.

[6] For example, a brief period of pure contagion while the markets reassess the situation after a wake-up call is unlikely to be very costly. On the other hand, the possibility that initial contagion and overpricing of risk may lead to a self-fulfilling speculative crisis, as suggested by De Grauwe and Ji (2013), could impose more important longer term costs.

movements. There could be confirmation bias such that markets tend to discount good news during bad times and discount bad news during good times.

Although used much less frequently in the EMH literature, several studies have sought to investigate the extent to which relatively large changes in the price of particular financial assets or instruments have been associated with the publication of new information by the press, news agencies or relevant financial institutions (see, for example, Cutler et al. 1989; Caporale et al. 2014; Beetsma et al. 2013; Büchel 2013; Mohl and Sondermann 2013; Afonso et al. 2012; Mink and De Haan 2013). In some cases the focus has been on stock market prices in general and in others on the stock market value of selected banks. The approach has also been used to examine the market in credit default swaps as well as the price of sovereign debt and spreads.

As revealed by the literature in this area, there are a number of methodological issues that are confronted in testing the impact of news. Not all studies have dealt with them in the same way. There are differences in terms of the sources of the news items used as well as the ways in which they are classified. Some studies, for example, distinguish between general macroeconomic news and news that specifically deals with bail outs (see, for example, Mink and De Haan 2013). Furthermore many news items will not contain only news that is unambiguously 'good' or 'bad' and it is therefore difficult to determine into which category they should fall, or whether ambiguous news items should be excluded altogether. This is a particular problem when seeking to discover whether news has a symmetrical or asymmetrical effect.

Perhaps even more difficult for the issue of possible asymmetrical responses is that there is no generally agreed objective method for determining the strength or importance of news. Moreover, it is difficult to determine the extent to which news is anticipated or unanticipated. In principle markets should not respond to news that is already fully anticipated and therefore incorporated into current prices.[7] On top of this there is a dilemma in calculating how much of a change in the chosen dependent variable (the number of standard deviations) there has to be in order to constitute an 'event', and for how long the impact should be expected to last.

Problems do not end here. During a crisis as extreme as the one in the Eurozone it is likely that the financial press and news agencies will carry news items on a regular and perhaps even daily basis. This implies that any observed event in terms of a large change in risk pricing may empirically coincide with a news item of some type. At the same time, there may be many occasions when news items are not associated with market responses. It is however much more of a challenge to record all news items over a lengthy period of time than it is to identify specific events. Given these problems there is a serious danger that there will be biases in the estimated impact of news on markets. Despite these problems, we believe that it is worthwhile to undertake such analysis but with the understanding that there is an 'errors in variables' problem. Thus we would not give much weight to estimates of asymmetries unless they are substantial.

[7] Studies generally note these problems but, because of their difficulty, efforts to deal with them have been fairly limited. In what follows we seek to distinguish between important and unimportant news and also between anticipated and unanticipated news by undertaking a careful reading of news reports. We cannot claim that this results in a clear and objective classification. A clearer distinction between anticipated and unanticipated news can be made where data surveys include questions about future expectations.

Given these methodological problems and the different ways in which they have been handled, not to mention the different time periods covered and the different estimation techniques used, it is unsurprising that studies have reported different findings.

Having said this, most studies discern some connection between news (albeit measured in different ways) and market responses (again measured in different ways). However, there are differences in the strength of the connection. Thus, for example, in the case of the euro crisis Mink and De Haan (2013) record that each of the 20 large events they identify coincided with a news item, with 5 of these events occurring on consecutive days. They report a particularly strong association between news about bail outs and the stock market values of banks. They distinguish between positive and negative news but find that that there is no evidence to suggest an asymmetrical response. These results are in line with the predictions of the EMH.

By contrast, in a much earlier study focusing on stock market prices in the US, Cutler et al. (1989) find a much lower association with macroeconomic news items. They report that large movements in market values often occurred on days when there was no identifiable news.

Examining the effect that newspaper stories about macroeconomics have on bond spreads across eight Eurozone countries over 1999–2014, and therefore covering a much longer period than that examined by Mink and De Haan who concentrate on 2010, Caporale et al. (2014) use a VAR-GARCH model and find that markets respond more strongly to negative than to positive news. They also find that this response increased during the period of the financial crisis following 2008. Such an asymmetrical response might suggest excessive pessimism, confirmation bias, cognitive dissonance and herding; phenomena that are associated with the behavioral approach to the analysis of markets. However, while the observation is consistent with behavioral biases during the global crisis and the Eurozone crisis, the overall results are somewhat at odds with the claims of excessive optimism during the pre-crisis period.

In a related study Beetsma et al. (2013) also examine the effect of news on interest rate spreads in a number of Eurozone countries. In their case, the news is taken from the newsflash of *Eurointelligence*, an internet source, and they focus on the amount of news. Using pooled least squares they find larger effects on the crisis countries within the Eurozone but also find that the effects are confined to bad news. This once again implies that there are strong asymmetrical effects.

In summary, as with the other strands of the literature, studies dealing with the impact of news provide somewhat mixed and nuanced results.[8] While there is evidence that most large movements in markets are associated with news as the efficient market hypothesis would suggest, this is not always the case. There is also evidence that the impact is often asymmetrical and this is consistent with aspects of the behavioral approach. It appears that even though the EMH gives useful insights and should not

[8] In addition to those cited above Büchel (2013) finds that statements made by representatives of Germany, France, the EU and ECB had an impact, but not those made by representatives of the smaller Eurozone member countries. He reports evidence of an asymmetrical response to 'dovish' and 'hawkish' comments, with good news having a less significant and smaller effect. Mohl and Sondermann (2013) also find that statements made by politicians from AAA rated countries had a particularly strong impact on spreads. Afonso et al. (2012) examine the effect of announcements from the rating agencies on bond yields and CDS spreads and find a particularly significant response to negative announcements.

be abandoned, nor should it be taken as always providing a complete explanation of market behavior. It is important to continue to investigate possible behavioral causes of potentially important deviations from efficient behavior.

In the remainder of this paper we extend the literature by investigating the extent to which the 50 largest changes in risk premia in the crisis countries from the beginning of the Eurozone crisis in 2009 to the end of 2015 were associated with news. We then examine whether there were asymmetries in the responses of risk premia to good and bad news. We also explore whether the pattern of contagion varied depending on the sign and significance of changes in risk premia in Greece.

3 Data, Methodology and Results.

3.1 The Relationship between Changes in Risk Premia and News

A major implication of the efficient market hypothesis is that substantial movements in financial markets should occur only in the face of news and not internal dynamics within the markets. Alternatively, analysis from complexity economics suggests that markets may display internal dynamics while hypotheses from behavioral finance suggest that swings from optimism to pessimism may cause major changes in markets.[9] In this sub-section we test the proposition from efficient market theory that large changes in market performance occur only in the face of news.

As part of a larger project, we assembled a record of major news reports covering announcements from national governments, the IMF, the European Commission and the European Central Bank, taken from the *Financial Times*, and running from the beginning of the Greek crisis in October 2009, which we timed as the Greek government's announcement that the previous government had severely understated the size of the budget deficit, until November 2015. Then, following the approach of Cutler et al. (1989),[10] we identified the 50 largest changes in the selected euro countries' risk premia over the entire sample period.

From among the 50 largest changes, 27 of them were rises while 23 of them were declines (see Appendix Table 7).[11] The absence of major differences in the number of

[9] See for example, Bak (1996), Caccioli et al. (2012), Dai et al. (2012), Kaizoji (2006), Khandani and Lo (2007), Lewis (2010), Lorenz (1963), Mitchell (2011), Solé (2011), Sornette (2003), Tversky and Kahneman (1974).

[10] Cutler et al. (1989) identified the fifty largest daily changes in the Standard & Poor's Composite Stock Index (S&P 500 Index) from 1941 to 1987 and investigated to what extent explanations for those big changes could be found in news from the *New York Times*.

[11] As mentioned earlier, there is no objective method for determining the importance of news and any classification must to some extent be judgmental. A specific example relates to the resignation of Antonio Borges, the chief of the IMF's European Department in November 2011 (see Appendix Table 7). This was reported as being for 'personal reasons' and might have been seen as being economically unimportant. However, it is also possible that markets may have suspected that the resignation reflected policy disputes. Even if they did not, the change of personnel in this important position, during a particularly acute phase of the crisis, might have been viewed as creating additional uncertainty. There was a substantial contemporary market movement with a 2.85% increase in Greece's risk premium. While we retain this as a news-related market movement in the results we present in the main body of the paper, we also report in footnote 13 below the effect of excluding it. Either way, the main thrust of our findings, namely that about three quarters of the 50 largest changes in risk premia were associated with news, remains intact.

Table 1 Relationship between the 50 largest changes in risk premia and news over the entire sample period (October 20, 2009 – November 19, 2015)

	total # of obs	# that associated with news	% associated
↑ in risk premium	27	20	74%
↓ in risk premium	23	18	78%

large increases and decreases in risk premia suggests that during the whole of the crisis period there was not a strong bias against declining risk premia such as would be implied by hypotheses that markets were dominated by extreme pessimism. This hypothesis will be examined in more detail in the following sub-sections.

We find that 76%[12] of the 50 largest changes were associated with major news (see Table 1).[13] This association would be biased downwards if some cases of substantial news were not reported in the *Financial Times*. Even so, the 24%[14] of major movements in risk premia that we could not associate with news supports the view that other behavioral factors were sometimes at work. Our interpretation is that the results show that attention needs to be paid to both the presence of news and the absence of news.[15]

In a related exercise we also made an attempt to distinguish between anticipated and unanticipated news since the EMH suggests that anticipated news will already have been incorporated in bond yields and that it will therefore only be unanticipated news that has a contemporary impact on markets. Making a distinction between anticipated and unanticipated news requires substantial subjective judgement and this limits the confidence that we attach to our results. We therefore do not report them here. However, although highly tentative they reveal a mixed picture that provides some support for the EMH but also some evidence that on occasions behavioral factors were important. When the news was good the market response to unanticipated news appeared to be stronger. However, when the news was bad the market appeared to respond more strongly to news that was anticipated.

One implication of the behavioral finance approach is that markets may operate differently over different time periods. For example, in the context of the Eurozone crisis there might have been different behavior when the crisis was worsening than when it was easing. To investigate this we divided the entire sample period into five sub-periods. Although somewhat subjective, we chose the sub periods to reflect major events in the evolution of the Greek crises. Period 1 starts on October 20, 2009, when the newly elected Greek government revealed the country's true budget deficit, and runs until March 8, 2012. Period 2 starts on March 9, 2012, when the historically largest-ever Greek debt restructuring took

[12] An unweighted average of the 74% and 78% in Table 1.

[13] If we exclude the Borges news item, 74% (an unweighted average of the 70% and 78%) of the 50 largest changes were associated with major news.

[14] If we exclude the Borges news item, 26% of major movements in risk premia could not associate with news.

[15] Of course it is possible that markets at times over or under reacted to news but there is no simple way of determining just how much the market should respond to each piece of news.

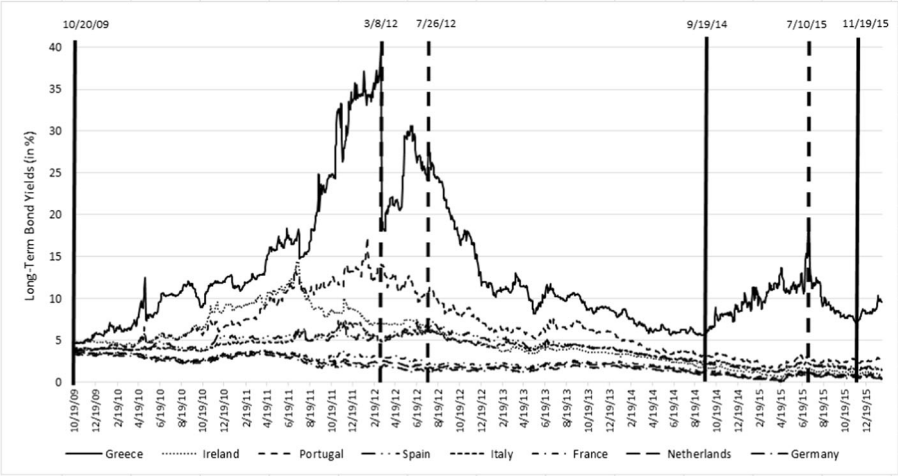

Fig. 1 Risk premia of Greece, Ireland, Italy, Portugal and Spain from October 20, 2009 to November 19, 2015

place, and runs until July 25, 2012. Period 3 starts on July 26, 2012, when Mario Draghi announced that the ECB would do "whatever it takes to preserve the euro", and runs until January 29, 2013. Period 4 starts on January 30, 2013, after the Greek central bank governor stated that the worst part of the Greek crisis was over, and runs until September 18, 2014. Period 5 starts on September 19, 2014, when the leader of the Syriza party, Alexis Tsipras, announced that he was opposed to austerity and wanted to negotiate in an alliance with other peripheral Eurozone countries, and runs until November 19, 2015, when the Greek parliament passed new austerity measures in order to receive the country's new round of bailout funds. These sub-periods are shown in Fig. 1.

During period 1 when the crisis was worsening, 73%[16] of the largest changes were associated with news. This is roughly 3%[17] less than for the full sample and gives some weak support to the view that behavioral factors were at their strongest during the first period (Period 1). None of the 50 largest movements in risk premia occurred during periods 2 and 3. During periods 4 and 5 when the second Greek crisis erupted with the election of the new far left government, the proportion of the largest changes that could be associated with news rose substantially to 86% for increases in risk premia and 90% for decreases in risk premia (see Table 2). Unlike period 1 the number of large decreases in risk premia was greater than for increases. Overall these results suggest that while there is some support for particular behavioral finance hypotheses, the efficient market hypothesis retains much more explanatory power when trying to account for changes in risk premia.

[16] If we exclude the Borges news item, 70% of the largest changes were associated with news during period 1 when the crisis was worsening.

[17] If we exclude the Borges news item, this is roughly 4% less than the full sample.

Table 2 Relationship between the 50 largest changes in risk premia and news in each sub-period

	total # of obs	# that associated with news	% associated
period 1			
↑ in risk premium	20	14	70%
↓ in risk premium	13	9	75%
period 2 + 3 + 4 + 5			
↑ in risk premium	7	6	86%
↓ in risk premium	10	9	90%

Unsurprisingly most of the largest changes in risk premia occurred in the case of Greece (46 out of 50). We therefore explored the behavior of the risk premia for each of the other major crisis countries. The 10 largest changes in risk premia for Ireland, Portugal, Spain and Italy were identified over the entire sample period (see Appendix Table 8). Among the 10 largest changes for each of the four countries, 17 of them are rises while 23 of them are declines (see Table 3). This suggests that the markets did not exhibit extreme pessimism for the broader set of crisis countries.

In this exercise the results were even more strongly consistent with the efficient market hypothesis. Of the 40 changes only one, the 71 basis point increase for Ireland on November 10, 2010, was not associated with news.

3.2 Asymmetries in the Relationship between Long-Term Bond Yields and News

Another type of test of market efficiency is to investigate whether there are asymmetrical effects associated with good and bad news. We examine the extent to which markets reacted to good and bad news by national governments, and regional as well as international institutions during the Eurozone crisis. As noted previously the EMH implies that markets have symmetrical reactions to good and bad news, while behavioral finance suggests that markets tend to exhibit excessive pessimism during a crisis and thus react more strongly to bad rather than to good news.

Announcements made independently by selected national governments,[18] the IMF, the ECB and the EC, as well as jointly by the Troika, were collected from the online archives of the *Financial Times*, *Bruegel*, *Reuters*, and the official websites of the IMF, the ECB, and the EC over the period from October 2009 until the end of April 2014.

The announcements were separated into two categories, unambiguous 'good' and unambiguous 'bad', based on the nature of the news they contained. Announcements with contents that were ambiguous were excluded from our sample.

For good news, we included only news that met at least one of the following criteria: (1) the successful formation of bailout arrangements, (2) the approval of a rescue package by international institutions, (3) better-than-expected economic news (for example, GDP growth faster than previously anticipated), and (4) specific measures

[18] Greece, Ireland, Italy, Portugal, Spain and France.

Table 3 Relationship between the 10 largest changes in each country's risk premium and news over the entire sample period (October 20, 2009 – November 19, 2015)

	total # of obs	# that associated with news	% associated
↑ in risk premium	17	16	94%
↓ in risk premium	23	23	all

by the governments to stabilize the markets.[19] For bad news, we included only news that met at least one of the following criteria: (1) the collapse of long-standing financial arrangements between crisis countries and their international creditors, (2) failures of crisis countries' governments to conclude bailout programs, (3) breakdowns in negotiation between crisis countries and their creditors, and (4) worse-than-expected economic news.[20] Overall, our dataset consisted of 283 news items, of which 219 were good news items and 64 were bad news items.

Daily yields of the ten-year government bonds for Greece, Ireland, Italy, Portugal, Spain and France were collected from *Investing.com*.

We used a standard event study methodology to investigate the asymmetrical effects of good and bad news on the ten-year government bond yields in our sample countries.[21] This approach investigates the impact of events on 'abnormal returns'; differences between predicted and actual yields in the market. We used a country-fixed effect time series FGLS regression of abnormal daily ten-year government bond yields on dummies representing good and bad news.

We focused on the immediate same day effect of news on the assumption that financial markets respond quickly, as well as to eliminate a potential problem of overlapping where there were multiple statements on consecutive days.

Our results are reported in Table 4. They show that markets responded significantly only to bad news over our sample period. During this period bad news on average drove bond yields up by 24.23 basis points, while good news drove bond yields down by only 0.99 basis points on average. The difference between the asymmetrical effects was significant at the 1% level and is much larger than we believe could be accounted for by any possible biases in coding the news. This result is consistent with the behavioral finance theory that during crises markets exhibit excessive pessimism by reacting more strongly to bad news than to good news. An efficient market interpretation on the other hand would be that governments and international organizations had lost credibility and thus their positive announcements were rationally discounted heavily by the markets. While there may be something in this argument, we think it unlikely that it could fully explain the large differences we observe.

[19] For example, on February 12, 2012, the *Financial Times* reported that "Greek Parliament passes new austerity measures demanded by bailout creditors to ensure that Greece will receive €130 billion in bailout money," and this news was classified as 'good.'

[20] For example, on March 27, 2009, the *Financial Times* reported that "Pedro Solbes, Spain's finance minister, says there is no room for new fiscal stimulus plans in Spain or the rest of the Eurozone," and this news was classified as 'raw bad.'

[21] MacKinlay (1997); Dooley and Hutchison (2009) used this method in their study on the spread of the US subprime crisis to emerging markets.

Table 4 Average Impact of Good and Bad News during the Entire Sample Period

	Average Impact (in bps)	# of obs
Good News	− 0.99	219
	(0.03)[a]	
	(0.76)[b]	
Bad News	24.23***	64
	(0.06)[a]	
	(0.00)[b]	
difference	**23.24*** **	
	(0.00)[b]	

***indicates the significance level of 1%

[a] refers to standard errors

[b] refers to *p*-values

3.3 The Relationship between Changes in Risk Premia across Countries

In this section we present another test for the existence of a pessimism bias in market behavior by examining the responses of the risk premia in the other crisis countries to both increases and decreases in Greece's risk premia. We want to see whether there was a larger and more significant response to increasing than to decreasing risk premia.

We standardize the estimates of the average movements in the risk premia of the other crisis countries to a standard change in Greece's risk premia. For ease of interpretation, we present the results in terms of the effects of a 100 basis points change in the Greek risk premium.

There is a potential problem in undertaking this exercise. Risk premia in other crisis countries will respond to factors apart from those associated with Greece. They may reflect country specific developments or shocks that affect the whole group. Such a common effect is likely to have resulted from Mario Draghi's statement that the ECB would do all that was needed to preserve the euro (see, for example Saka et al. 2015). The assumption, implicit or explicit, in most of the literature is that such effects do not lead to systematic biases in the results. We do not attempt to deal with this issue in this paper other than by looking separately at the period following Draghi's statement on the assumption that a substantial part of the observed correlations over that period were probably associated with his statement rather than direct spillovers from Greece. When interpreting our results this important caveat should be kept in mind.

We used a GARCH model (Bollerslev 1986) to test the relationship between risk premia in Greece and the other major crisis countries and assumed that the causal connection ran from Greece to the rest.[22] The results for the full period are presented in Table 5. We discover that there are significant differences in the responses to increases and decreases in Greek risk premia but that the patterns are not consistent across the other countries.

We also extended our analysis by dividing the sample into five sub-periods corresponding to the different phases of the euro crisis shown in Fig. 1. We find substantially

[22] ARCH (autoregressive conditional heteroskedasticity) effects were detected in the errors of our regressions. We used a GARCH model because it treats heteroskedasticity as a part of the variance and takes volatility into account.

Table 5 Relationships[a] between risk premia in Greece and other selected countries (October 20, 2009 – November 19, 2015)

	when Greek rp increased (↑) β coefs. (in bps)	when Greek rp decreased (↓) β coefs. (in bps)	difference (↑ − ↓)
Ireland	5.37***	3.80***	1.57***
Italy	3.33***	4.95***	−1.62***
Portugal	7.60***	7.07***	0.53***
Spain	3.87***	4.44***	−0.57***
# of obs	816	743	

***indicates the significance level of 1%

[a] relationships refer to the beta coefficients derived from GARCH regressions

different behavior across the different sub-periods. While the associations are almost always significant whether Greek risk premia were increasing or decreasing, there are frequently substantial differences in the values of the coefficients. There is no clear pattern for the coefficients to be larger for increases or for decreases. This is inconsistent with the behavioral claim that once the crisis broke out there was excessive pessimism and a confirmation bias.

During the first period shown in Table 6, when the crisis was worsening, we find that the coefficients for Italy, Portugal and Spain were all substantially larger for decreases than for increases and that the differences in responses were statistically significant. This is the opposite of what the excessive pessimism hypothesis would suggest. For the second period the results are almost completely different. The coefficients for increases were larger than those for decreases; a difference that is particularly marked for Portugal. Once again the differences in responses were statistically significant.

In the third period the coefficients are larger for increases in the cases of Portugal and Spain, but they are larger for decreases in the cases of Ireland and Italy. In the fourth period all the coefficients are high, whereas the differences between the responses to increases and decreases in risk premia in Greece are more modest. Ireland and Portugal show higher coefficients for increases, whereas Spain shows a higher one for decreases. In the fifth period that coincides with the outbreak of the second Greek crisis, the coefficients for all countries in our sample fall from their elevated values in the fourth period, and there is a mixed pattern of asymmetries. For Ireland the coefficient for increases is greater, while the opposite is the case for Italy.[23]

[23] Although we do not report the results here because of the subjective nature of distinguishing between anticipated and unanticipated news, our investigation of the issue suggests that much of the asymmetry between the effects of bad and good news does not apply to news that is unanticipated. One implication of this is that markets respond to news that is already anticipated and that anticipated bad news has a larger impact than anticipated good news. In both respects this is more consistent with the behavioral approach than the EMH.

Table 6 Relationships[a] between risk premia in Greece and other selected countries in five sub-periods

		when Greek rp increased (↑) β coefs. (in bps)	when Greek rp decreased (↓) β coefs. (in bps)	difference (↑ − ↓)
Period 1	Ireland	5.02***	4.66***	0.36***
	Italy	2.47***	4.72***	−2.25***
	Portugal	5.67***	8.21***	−2.54***
	Spain	2.34***	4.04***	−1.70***
	# of obs	**398**	**280**	
Period 2	Ireland	7.51***	1.39***	6.12***
	Italy	6.37***	1.84***	4.53***
	Portugal	14.88***	1.51	13.37***
	Spain	6.01**	2.27***	3.74***
	# of obs	**51**	**43**	
Period 3	Ireland	6.60**	8.24***	−1.64***
	Italy	7.22**	8.76***	−1.54**
	Portugal	25.66***	18.79***	6.87***
	Spain	10.42**	6.59**	3.83***
	# of obs	**45**	**81**	
Period 4	Ireland	16.36***	15.29***	1.07***
	Italy	16.51***	16.45***	0.06
	Portugal	29.03***	26.40***	2.63***
	Spain	16.48***	17.22***	−0.74***
	# of obs	**209**	**227**	
Period 5	Ireland	3.31***	1.54***	1.77***
	Italy	3.99***	5.52***	−1.53***
	Portugal	7.27***	7.72***	−0.45***
	Spain	5.18***	4.79***	0.39***
	# of obs	**164**	**155**	

The bold entries represent the numbers of observations in each period under different conditions for sample countries

*** and ** indicate the significance levels of 1% and 5% respectively

[a] relationships refer to beta coefficients derived from GARCH regressions

4 Concluding Remarks

The crisis in the Eurozone between 2009 and 2015 provides an opportunity to assess the relative performance of the efficient market hypothesis compared with propositions derived from the behavioral approach to analyzing financial markets. There are, of course, a number of different behavioral hypotheses. Here we test three specific implications that follow on from the view that markets were dominated by behavior that was irrational on the basis of fundamentals and by excessive pessimism backed up by a proclivity towards confirmation bias.

Consistent with the efficient market hypothesis, we find that most of the largest changes in risk premia for Greece and for the other crisis countries were associated with news. However, in a substantial minority of cases no major news was identified, suggesting that behavioral interpretations are also relevant. There is some suggestion that the markets were less efficient during the initial stage of the crisis as the proportion of large changes in risk premia associated with news was lower than in later periods, but this may have reflected a period of market correction and the impact of a wake-up call. Even during this early crisis period a substantial proportion of the largest changes were still associated with news.

We also find that there was a systematic tendency for markets to react more strongly to bad rather than to good news. Such asymmetrical responses are consistent with the behavioral finance view that there was a pessimistic bias in the behavior of financial markets during the crisis. Against this, we find that there was little evidence of an asymmetric bias in the response of risk premia in other crisis countries to changes in risk premia in Greece.

Based on the tests conducted, we conclude that the efficient market hypothesis displayed considerable explanatory power during the crisis period. Although there were times when markets failed to operate in the way that the efficient market hypothesis would predict, such behavior does not appear to have been a particularly dominant characteristic of the crisis.[24]

Where does this leave the debate concerning the efficiency of financial markets? The picture is complex. While the EMH certainly cannot be rejected on the basis of our results, it does not appear to be universally applicable.

In this paper we do not specifically consider whether the *level* of risk premia were appropriate to the underlying fundamentals, although it may be noted that in the build up to the crisis, fiscal and current account deficits were financed without there being any substantial increase in risk premia. This offers relatively strong *prima facie* evidence that financial markets lacked foresight and were behaving inefficiently, as is confirmed by much of the existing literature.

The failure to exhibit better foresight can in part, no doubt, be explained by the fact that the true details of Greece's fiscal position were being concealed, as well as by the belief that Germany along with the regional institutions would, in effect, underwrite the euro project and would not allow Greece to default on its debt. However it also suggests that markets displayed excessive optimism and showed an element of confirmation bias in downplaying the importance of emerging evidence relating not only to Greece but also to real estate bubbles and large current account deficits in other euro area countries. Market sentiment may have been based on faulty mental models and a tendency to follow the herd.

Just as with speculative bubbles more generally, the largest market imperfections may have existed before the crisis rather than during it.[25] While markets seemed to suffer from excessive optimism before the crisis and deviated considerably from efficient behavior, our evidence suggests that they displayed some evidence of efficient behavior during the crisis.

The outbreak of the crisis seems to have acted as a wake-up call that alerted markets to the fact that they had misperceived the situation. Thereafter many investors began to undertake more solidly based analysis of risk although not always without displaying some of the traits associated with the behavioral approach to finance.

In summary the full body of evidence relating to market behavior before and during the Eurozone crisis strongly suggests that "market failures" were larger during the period before the crisis than during it.

It seems clear that both the efficient market hypothesis and the behavioral approach possess useful explanatory power. They should be used in conjunction. It would be unwise to discard either one of them on the basis of the evidence we present in this paper.

[24] Of course there may be other behavioral hypotheses that have greater explanatory power over this period.
[25] For an argument that such behavior has occurred in a number of major crises see Willett et al. (2014).

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Appendix 1

Table 7 News and Changes in Countries' Risk Premia, October 20, 2009 – November 19, 2015

#	Date	News	largest	change (in %)
1	7-May-10	*NO ASSOCIATED NEWS*	Greece	1.43
2	10-May-10	Troika agrees a rescue package, including €720 billion of government-backed loan guarantees and a commitment to buy European sovereign bonds.	Greece	− 4.835
3	17-Jun-11	*NO ASSOCIATED NEWS*	Greece	− 1.291
4	6-Jul-11	Moody's Investors Service cut Portugal's debt rating to junk status.	Portugal	2.12
5	22-Jul-11	EU leaders agree upon a €109 bn Greek bailout.	Greece	− 1.92
6	12-Sep-11	*NO ASSOCIATED NEWS*	Greece	1.55
7	13-Sep-11	Germany plans for possible Greek default.	Greece	2.86
8	16-Sep-11	Finland sees end to Greek collateral problem.	Greece	− 3.5
9	19-Sep-11	Greece will seek to persuade its lenders that it deserves another €8 bn loan payment in a pivotal conference call that will pit the Greek finance minister against representatives from the troika.	Greece	2.91
10	1-Nov-11	George Papandreou, the Greek prime minister, announces his nation would hold a referendum on the rescue package.	Greece	4.19
11	3-Nov-11	Greek leader calls off referendum on the bailout plan.	Greece	2.40
12	4-Nov-11	*NO ASSOCIATED NEWS*	Greece	1.54
13	14-Nov-11	George Papandreou urges Greece to commit to bailout terms.	Greece	− 2.21
14	16-Nov-11	Antonio Borges, the chief of the European department of the IMF, resigns for "personal reasons" after just a year in office.	Greece	2.85
15	18-Nov-11	Greece aims to halve budget gap in 2012.	Greece	− 4.41
16	21-Nov-11	Mr. Papademos says that Greek party leaders would have to provide a written commitment to the adoption and implementation of the measures related to a new bailout plan for Greece.	Greece	− 2.51
17	1-Dec-11	Greeks strike over government's 'starvation' budget.	Greece	1.81
18	7-Dec-11	*NO ASSOCIATED NEWS*	Greece	1.35
19	8-Dec-11	Mario Draghi offers no indication that he is willing to intervene aggressively in the bond market, stressing that the onus is on European governments to resolve the debt crisis.	Greece	2.30
20	15-Dec-11	*NO ASSOCIATED NEWS*	Greece	1.61
21	16-Dec-11	*NO ASSOCIATED NEWS*	Greece	− 1.311
22	27-Dec-11	Greece's statistics chief faces criminal probe.	Greece	2.04
23	28-Dec-11	*NO ASSOCIATED NEWS*	Greece	− 2.05
24	30-Dec-11	*NO ASSOCIATED NEWS*	Greece	1.71
25	2-Jan-12	*NO ASSOCIATED NEWS*	Greece	− 1.60
26	16-Jan-12	Portugal criticizes S&P's decision to downgrade its credit rating to junk status.	Portugal	1.88

Table 7 (continued)

#	Date	News	largest	change (in %)
27	20-Jan-12	Greece is closing in on an initial deal with private bondholders that will lose investors up to 70% of the loans they have given to Athens.	Greece	2.53
28	23-Jan-12	Christine Lagarde, head of the IMF, urges Europe to commit more resources to resolve its debt crisis.	Greece	− 1.71
29	30-Jan-12	S&P downgrades Portugal's credit rating to junk status.	Portugal	2.15
30	3-Feb-12	Portugal's finance minister says that a sharp recession this year will not cause Portugal to miss budget deficit and public debt targets agreed under its €78 bn rescue plan with the EU and the IMF.	Portugal	− 1.46
31	27-Feb-12	Germany's Parliament endorses a second Greek bailout despite growing pressure from voters and the media.	Greece	− 1.41
32	6-Mar-12	The International Institute of Finance (IIF) warns on €1 tn cost of Greek euro exit.	Greece	1.61
33	8-Mar-12	A recent demonstration in central Athens is organized by a group of lawyers who claim the latest agreement with troika turns Greece into the ward of its international lenders.	Greece	1.71
34	12-Mar-12	French President Nicholas Sarkozy declares that the long-running Greek debt problem has finally been solved, following the successful implementation of a massive debt restructuring in the country.	Greece	− 19.87
35	23-Mar-12	*NO ASSOCIATED NEWS*	Greece	1.78
36	8-May-12	Two-thirds of Greek voters back parties opposed to the EU/IMF deal, renewing fears that Athens may default on its debts and leave the Eurozone.	Greece	2.62
37	14-May-12	Eurozone central bankers talk publicly for the first time of managing a possible Greek exit from Europe's monetary union as stalemate in Athens talks on a coalition government raises prospect that Greece will renege on the terms of its international bailout.	Greece	3.19
38	15-May-12	Greece is going to hold fresh elections as unity talks fail.	Greece	1.72
39	6-Jun-12	*NO ASSOCIATED NEWS*	Greece	− 1.89
40	18-Jun-12	Antonis Samaras, leader of Greece's New Democracy, begins talks to form a coalition government following his party's failure to secure an outright majority in the country's election.	Greece	− 1.51
41	23-Jul-12	Prime Minister Antonis Samaras says Greece is in a Great Depression similar to the American one in the 1930s.	Greece	2.07
42	3-Dec-12	Greece announces details of plans to spend up to €10 bn to buy its own debt at a steep discount.	Greece	− 1.47
43	19-Dec-12	ECB accepts Greece's eligibility as collateral to be used in the Eurosystem.	Greece	− 1.42
44	3-Feb-15	The Greek radical new government unveils proposals for ending the confrontation with its creditors by swapping outstanding debt for new growth-linked bonds, running a permanent budget surplus and targeting wealthy tax--evaders.	Greece	− 1.55
45	13-Feb-15	The ECB extended another €5 bn in emergency loans to banks in Greece, following fears that a spate of withdrawals could leave lenders in the country short of funding.	Greece	− 1.32
46	22-Jun-15	Athens kept alive hopes of an eleventh-hour deal with its creditors to avoid default after it presented its first substantial concessions in months of fruitless negotiations.	Greece	− 1.52

Table 7 (continued)

#	Date	News	largest	change (in %)
47	29-Jun-15	Greece closed its banks and imposed capital controls to prevent financial chaos following the breakdown of bailout talks with its international creditors.	Greece	3.93
48	6-Jul-15	The Greek leftwing government was set for a decisive victory in yesterday's referendum as voters backed its call to reject a compromise with international creditors, raising serious doubts about the country's ability to remain inside the Eurozone.	Greece	3.46
49	10-Jul-15	The Greek government was preparing to rush a package of economic reforms and austerity measures through parliament as early as today in a bid to convince its Eurozone creditors it was committed to striking a deal for a third bailout that would save it from crashing out of the euro.	Greece	− 5.95
50	13-Jul-15	Eurozone leaders reach a deal on new Greek bailout.	Greece	− 1.60

Appendix 2

Table 8 News associated with the 10 largest changes in each country's risk premium, October 20, 2009 – November 19, 2015

#	Date	News	largest	change	change (in %)
1	10-May-10	Troika agrees a rescue package, including €720 billion of government-backed loan guarantees and a commitment to buy European sovereign bonds.	Ireland, Portugal, Spain, Italy	↓	− 1.20, − 1.87, − 0.58, − 0.46
2	10-Nov-10	*NO ASSOCIATED NEWS*	Ireland	↑	0.71
3	12-Nov-10	Mr. Barroso reaffirms offer to help to Ireland.	Ireland	↓	− 0.79
4	9-May-11	Greece denies that it is considering leaving the Eurozone. Even though a year after the EU and the IMF unveiled a €110 bn rescue package for Greece, it has made little progress.	Ireland	↑	0.82
5	6-Jul-11	Moody's Investors Service cut Portugal's debt rating to junk status.	Portugal, Ireland	↑	2.12, 0.99
6	11-Jul-11	European leaders are for the first time prepared to accept that Athens should default on some of its bonds as part of a new bailout plan for Greece.	Ireland, Spain, Italy	↑	0.74, 0.51, 0.60
7	13-Jul-11	Ireland becomes the third Eurozone country to be downgraded to ba junk credit rating.	Ireland	↑	0.80
8	19-Jul-11	A proposal to tax Eurozone banks to help pay for a Greek rescue has emerged.	Ireland	↓	− 0.76
9	20-Jul-11	Bank tax is proposed to help a new Greece bailout program and to avoid a default on Greek debt.	Portugal	↓	− 0.96
10	21-Jul-11	Greece announces early details of the financing package.	Ireland	↓	− 0.84
11	8-Aug-11	ECB intervenes and buys sovereign bonds of Spain and Italy.	Spain, Italy	↓	− 0.82, − 0.75

Table 8 (continued)

#	Date	News	largest	change	change (in %)
12	9-Nov-11	Italy is engulfed in political chaos.	Italy	↑	0.61
13	11-Nov-11	The Senate approves the 2012 budget law includes new austerity measures, paving the way for Parliament to vote on the bill.	Italy	↓	− 0.55
14	24-Nov-11	Ireland seeks EU help over bank bailout.	Ireland	↑	0.80
15	5-Dec-11	Monti unveils budget cuts in Italy.	Spain, Italy	↓	− 0.51, − 0.78
16	8-Dec-11	Mario Draghi offers no indication that he is willing to intervene aggressively in the bond market, stressing that the onus is on European governments to resolve the debt crisis.	Italy	↑	0.50
17	16-Jan-12	Portugal criticizes S&P's decision to downgrade its credit rating to junk status.	Portugal	↑	1.88
18	20-Jan-12	Greece is closing in on an initial deal with private bond holders that will lose investors up to 70% of the loans they have given to Athens.	Spain	↑	0.53
19	27-Jan-12	Spain stops new energy subsidies and unveils a draft law to cut public sector deficits to zero within eight years and to reduce government debt.	Spain	↓	− 0.53
20	30-Jan-12	S&P downgrades Portugal's credit rating to junk status.	Portugal	↑	2.15
21	1-Feb-12	Vitor Gaspar, Portuguese finance minister, says that a sharp recession this year would not cause Portugal to miss budget deficit and public debt targets agreed under its €78bn rescue plan with the EU and IMF	Portugal	↓	− 0.95
22	3-Feb-12	Portugal's finance minister says that a sharp recession this year will not cause Portugal to miss budget deficit and public debt targets agreed under its €78 bn rescue plan with the EU and the IMF.	Portugal	↓	− 1.46
23	10-Feb-12	Greece's coalition government finally agrees to pass the demands made of it by international lenders. This leads to a new round of protests. But the Eurozone effectively casts doubt on the Greeks' figures, saying Athens must find a further €325 million in budget cuts to get the aid.	Portugal	↓	− 1.26
24	20-Mar-12	Greek debt swap triggers massive payouts.	Portugal	↓	− 0.98
25	29-Jun-12	Eurozone leaders agree to radically restructure Spain's €100bn bank recapitalization plan.	Spain, Italy	↓	− 0.53, − 0.49
26	26-Jul-12	The president of the ECB, Mario Draghi, announces that the ECB would do whatever it takes to preserve the Euro.	Spain, Italy	↓	− 0.55, − 0.45
27	2-Aug-12	Spain and Italy both decline to say whether they will request that Europe's rescue fund buy their governments' debt after Mario Draghi, ECB president, says no such aid will come unless the countries accept strict conditions.	Spain	↑	0.61
28	6-Sep-12	ECB signals resolve to save euro	Spain	↓	− 0.53
29	26-Feb-13	Dublin-based energy and distribution group DCC is moving its primary listing to the	Italy	↑	0.61

Table 8 (continued)

#	Date	News	largest	change	change (in %)
		London Stock Exchange in a fresh blow to the Irish market.			
30	3-Jul-13	Portugal's prime minister is struggling to hold his coalition together after the resignation of two high-profile ministers in less than 24 h.	Portugal	↑	0.97

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