Moral Hazard and the Greek Bailout

Effects on the risks of investing in the European market

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Abstract

This paper investigates whether the EMU-IMF loan package to Greece in May 2010 might have induced investor moral hazard in the European market. Bailouts, by implicitly insulating investors from losses, tend to alter their perception of risk. This usually leads to excessive lending and reckless risk-taking, than would have been the case without the insurance of being rescued. To detect such investor moral hazard, I regress EMU-countries’ spreads, controlling for changes in the countries’ fundamentals. Instead of lowering spreads as a reflection of the lower danger of loss in the period after the Greek bailout, I find that spreads are strongly increasing. Further, the increase is larger for the member-states with weak fundamentals, notably Greece, Italy, Portugal, Spain, and Ireland. More so, contrary to traditional bailouts, which indirectly protect investors from losses, the Greek bailout did not let investors go scot free from the crisis. This is “the Greek paradox”- that a bailout, instead of reducing, appears to have increased the need for investors to concern themselves with borrowers’ creditworthiness. The Greek paradox suggests that the Greek bailout was the wake-up call, which made investors more aware of the risk of lending to countries with weak fundamentals. Thus, rather than confirming the existence of moral hazard after the bailout, my findings appear to indicate that investor moral hazard was present prior to the Greek crisis.

Keywords: Moral hazard; EMU-IMF rescue-lending; financial crises; Greek bailout; bond spreads; fundamentals; the Greek paradox.
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1. Introduction

Morality hazard might be as old as humanity, but well into the 20th century, there is still no broad consensus among economists or policy makers, on how to best identify and remedy this eternal dilemma. Adam Smith, the father of modern economics, captured the essence of moral hazard in his Wealth of Nations (1776, p.86), explaining that:

“The interests of agents are never perfectly aligned with those of their principals, creating a persistent challenge to ethical standards”.

Almost two centuries after, Nobel Prize laureate, Paul Krugman (2009, p.37), offered a modern explanation. He defined moral hazard as:

“Any situation in which, one person makes the decision about how much risk to take, while someone else bears the cost if things go badly”.

Moral hazard as a phenomenon had its genesis in the field of insurance and banking. However, its aggregation, to the country and international level delayed until 1944 when the International Monetary Fund (IMF), the world’s emergency lender was established. In the literature, IMF induced-moral hazard is referred to, as implying that large-scale rescue-lending encourage excessive risk taking by investors and less-precautionary policies in the countries being rescued (Edwards, 1998; Eichengreen, 2000). Ever since the first IMF bailout (of the United Kingdom in 1976), the concept of moral hazard, supposedly caused by international official rescues has been the subject of renewed studies (Feldstein, 1998; Schultz et al., 1998; Schwartz, 1998; Dembe and Boden, 2000).

Stating that IMF (or any other large-scale lender-of-last-resort) rescue-lending lead to moral hazard is one thing, quantifying it is a more complicated issue (Vaubel, 1983; Zhang, 1999). Two main fields have emerged in the literature. Either capturing the change in investors’ perceived risk by studying the bond market or focusing on the equity market (Dreher, 2004). Like most empirical studies, this paper focuses on the former. In bond markets, the bond yields reflect the perceived investment risk (where risk refers to credit-risk). Usually, this risk depends on country-specific fundamentals (e.g. observable characteristics such as inflation rate, external debt etc.). Hence, for countries with weak fundamentals, the investment risk and thereby the risk premium required by investors, are, ceteris paribus, higher than in low-risk-low-premium countries (Eichengreen and Mody, 2000). However, when there is a bailout expectation, the perceived probability of repayment (from an investor’s perspective) increases, thus lowering the country’s bond spreads. It is this reduction in perceived risk, conditioned on a rescue-lending, which affects the behavior of prices of bonds, that is attributed to moral hazard. The bailout expectation essentially removes the need for investors to concern themselves with the borrowing country’s creditworthiness. At the extreme, if investors expect to be fully bailed out, a country’s fundamentals will have no effects on the expected yields. As fundamentals become less significant for determining bond yields, less important are also fundamentals differences across countries and so the dispersion of spreads (Dell’Arricia et al., 2002).

Bond spreads are affected by many factors, mainly country-specific fundamentals (Hilscher and Nosbusch, 2010). Beyond those variables, bond spreads can also be affected by moral hazard (Vaubel, 1983). My main strategy to test for investor moral hazard is to regress
developed markets’ bond spreads, controlling for changes in the countries’ fundamentals. In the choice of fundamentals, I emphasise on measures that are likely to be related to the country’s default-risk, such as the external debt, foreign reserves, fiscal balance, and credit ratings (Eichengreen and Mody, 2000; Dell’Arricia et al., 2002; Noy, 2004).

In particular, I focus on ten-year government bond spreads of Eurozone’s countries before and after the Greek bailout in May 2010. The time frame being from January 2010 to January 2011. Looking at a short period is a critical element in my analysis because moral hazard (as suggested by Evrensel and Kutan, 2004 and Sarno and Taylor, 1999) appears to be a rather short-run and short-lived phenomenon. Hence, like Dell’Arricia et al., (2002) before me, I investigate, not only the change in the level of bond spreads after the bailout (the level test) but also the sensitivity with which these spreads respond to fundamentals (the slope test) as well as the change in the cross-countries’ variance of spreads (the variance test).

In the presence of moral hazard after the bailout, one would expect the Greek bailout to lead to a decrease in the level of spreads, the sensitivity with which the spreads react to fundamentals and the cross-countries’ variance of spreads. Indeed, if investors believe that the guarantees from the International Monetary Fund (IMF) and/or the European Monetary Union (EMU) are likely to come into play again in the event of future debt crisis, thereby making it possible for them to go scot free, they will have little reason to invest time and effort trying to discriminate among bonds and countries according to risk.

Several studies (see the literature review in the next chapter) have attempted to capture the change in investors’ behaviour by studying the bond markets. Taken together, their results are ambiguous. Some find moral hazard, some do not. More so, most previous studies have focused on the bond markets in emerging markets, as those have, traditionally, been the one in need of international rescue-lending.

With the 2008 global financial crisis and (for the first time since the 70s) the bailout of several developed economies, the debate on moral hazard has rebounded, and no longer concerns developing and emerging markets only. Nowadays, moral hazard is routinely mentioned during discussions of government stabilization efforts and EMU-IMF lending. The (first) bailout of Greece in May 2010 as such, is regarded as historical and unique. This was the first case, where a western country within a monetary union (EMU), faced bankruptcy and had to be bailed out. There lies the novelty of my approach-1 test for the possible existence of a moral hazard effect induced by regional (EMU) and international lending (IMF) to a developed economy lacking sovereignty over its monetary policy tools.

In a post-financial crisis period, when even the strongest European economies are still (only) partially recovered and many countries are still facing default-risks. In a time when public support for tax-financed bailouts is weaker than ever, identifying the possible existence of moral hazard in investors’ behaviour is crucial. The Eurozone, with a quite advanced economic integration, high contagion-risk, and spill-over effects among its member-states, constitutes an excellent platform allowing for theoretical and empirical testing of moral hazard. Indeed, the question of investor moral hazard in the European context is raised each

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1 See, for example, the statement by Angela Merkel, “I will not let anyone tell me that we must spend more money” rejecting suggestions for more tax-financed stimulus package. Downloadable at http://www.timesonline.co.uk/tol/news/politics/G20/article5993184.ece.

2 For a good review, see the 2011 IMF economic outlook.
time there is a discussion of a further bailout in the region, making the subject a worthy topic of investigation³.

My paper contributes to the earlier literature in the following ways:

First, I look at developed markets while the majority of existing empirical studies (see for example, Zhang, 1999; Mina and Martinez Vasquez, 2002; Evrensel and Kutan, 2004 and Lee and Shin, 2004) focused solely on emerging markets such as Asian Tigers, Russia, and Mexico. This commonly used approach is due to the fact that developing and emerging market economies have, historically, (often) been the ones to be bailed out. However, with the bailout of Greece, a developed economy, this argument is no longer valid.

Second, I study countries within a monetary union and a bailout by member-states of that union. This is of particular interest because member-countries of monetary unions lack sovereignty over their monetary policies. They can therefore, not use monetary tools to remedy a financial crisis. Member-states of the EMU for example, cannot print money in their own currencies to pay their debt holders. With the constraints of fiscal policies, the limitations of structural changes, the heterogeneity of the economies of the Eurozone and what is at stake politically, the bailout of a member-state seems (in theory) rather given. Besides, in a public statement regarding the situation in the Europe, heads of government of the Eurozone and EU institutions have, in July 2011, jointly stated⁴:

“We reaffirm our commitment to the Euro and to do whatever is needed to ensure the financial stability of the Euro area as a whole and its Member-states”.

Where whatever is needed can be interpreted as comprising bailouts, large bailouts, even multiple bailouts. All these elements suggest that monetary unions and the EMU specifically, could be good vehicles of moral hazard as the insurance of being rescued comes with the membership. However, although at first, it may appear as if membership in a monetary union in itself gives a good bailout parachute, the opposite could as well be true. Member-states of the EMU are, according to the European Commission, constrained to follow the Stability and Growth Pact (SGP⁵). In addition, all members of the EU have signed the Maastricht Treaty, under which they pledged to limit their budget deficits and debt levels (Ó’Keeffe and Twomey, 1998). With this in mind, one could therefore claim that 1) deep financial crises should be unlikely events in monetary unions of the EMU calibre 2) the penalties (although never activated) associated with violating the SGP should (in theory) eliminate the incentives for moral hazardous behaviour. No matter whether monetary unions and the EMU in particular, increases or limits risky behaviour, the Greek bailout, in its context, is a perfect platform for testing for moral hazard.

Moreover, although moral hazard remains as problematic, independently on the source of the bailout (whether it is the IMF, the EMU or any other lender-of-last-resort), its effects might be stronger at a regional scale (Dreher and Vaubel, 2004). In fact, in an article in the New York Times⁶, Bill March argues that the interlink in the European financial system implies that if a member-state defaults on its sovereign debt, the banking systems of creditor nations might

³ For an excellent discussion of financial bailouts of lending institutions, see, Krugman (2009).
⁵ The SGP is an agreement among EMU member-states for the coordination of national fiscal policies. It was established to safeguard sound public finances, facilitates, and maintains the stability of the EMU.
⁶ Sunday Review, dated 22-10-2011
face substantial losses. This is worthy of note, since a number of EMU-states, including Greece, Italy and Portugal have, according to Eurostat and IMF statistics, a high percentage of their debt owned by creditors from other EMU-members. Should for example Portugal, fail to pay its Finish debt holders, the Finish banking system and ultimately, the Finish economy could come under serious trouble. Such an outcome would in turn affect Finland’s creditors- a domino-fall of defaults. Due to such financial contagion risks, spill-over effects and the personal status the lending takes when lenders are taxpayers of neighbouring countries, sovereign states defaults in monetary unions appears as a much more severe caveat compared to traditional cases with single countries. Hence, beyond international bailouts, this paper puts the spotlight on regional-led crisis lending, and the associated regional effects.

Last but not least, instead of, as suggested by some previous studies (Kamin and Kleist, 1999; Eichengreen and Mody, 2000; Gai and Taylor, 2004), examining the short-run effects of bond spreads, which, I argue, could be attributable to market turbulence during and around the bailout period, I choose to analyse the long-run effects of bond spreads (as done by Zhang, 1999 and Dell’Ariccia et al, 2002).

Overall, the Greek bailout (by itself) is an unprecedented and unexpected event that has drastically impacted the way one perceives developed economies, monetary unions, regional and international lending. It has laid new grounds for future bailouts both by the IMF but foremost by the EMU. One if any, reason enough to look deeper into the matter.

It is with these factors in mind that I, in this paper, attend to detect, the palpable impact, if any, that the 2010 Greek bailout had on the perceived probability of future crisis lending to other EMU countries.

The remainder of the paper is organized as follows: section 2 presents the methods and results of previous studies on investor moral hazard in the bond markets. Section 3, the theoretical framework. Section 4 focuses on the empirical method, discussing the data and the validity of the Greek crisis as an adequate event in testing for the existence of investor moral hazard. Section 5 summarizes and interprets the results. Section 6 analyses and discusses the findings. Section 7 concludes and addresses the limitations of the paper and avenues for further research.

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7 One of the obvious channels of contagion being the banking system.
2. Literature Review

A large number of studies have attempted to capture the change in investors’ behaviour by studying the bond markets. Because, the existence of a moral hazard effect caused by rescue-lending is more of an empirical question, I here put the spotlight on empirical papers solely.

2.1 Evidence of investor moral hazard

Eichengreen and Mody (2000) were, one of the first to find evidence for investor moral hazard in a bond market context. They analyzed whether IMF bailouts had effects on bond spreads. They concentrated on the period between 1991 and 1999 controlling for country-specific characteristics. Eichengreen and Mody found that international rescue-lending led to a decrease in the level of bond spreads. However, this view had its critics. First, there was the selection problem: which event, which bailout to choose. Second, rather than being attributed to moral hazard (caused by IMF bailouts), a decrease in spreads could as well be interpreted as the perception that an IMF bailout, (by definition) will lead to reforms and in a wider sense, a safer and better market where crises are unlikely and bailouts unnecessary.

Dell’Ariccia et al. (2002) had a different approach. Instead of analysing how a bailout influences investors’ (future) risk perception, they looked at the long-run effects of the 1998 non-bailout of Russia. Which, they argued, was a better-suited event for testing for moral hazard, because 1) it was highly unexpected; 2) it changed the perception about future IMF-bailouts; but 3) it did not alter investors’ general risk perception. They used a large set of fundamentals (such as international interest rates, credit ratings, political variables and most variables capturing economic internal and external conditions), and as Zhang (1999) focused on the long-run reactions of emerging market bond spreads after the IMF non-bailout of Russia. Because of market turbulence (reflected as an increase in spreads) usually following a financial crisis, in their regression model, Dell’Ariccia et al. omitted the period immediately before and after the crisis. They estimated models for spreads for periods before and after the crisis separately and compared the fitted spreads for each month in every country in the sample. Their findings indicated the existence of an investor moral hazard effect. Two main points can be derived from their study: primarily, the Russian crisis increased the perceived risk of lending to emerging markets, especially those with weak fundamentals (as shown by the increase in the levels of spreads). Secondly, fundamentals differences seemed more important to investors after the crisis than was the case prior to the non-bailout (as suggested by the large increase in the cross-country variance of spreads). Hence, rather than being an insight of future investor moral hazard due to past events, what the Russian crisis really revealed was that, investors had a morally hazardous behaviour prior to the 1998 crisis. They (suddenly) realised that the danger of loss in emerging markets was higher than previously assumed, as the IMF would not bailout Russia (regardless of what one would have expected).

However, as Dell’Ariccia et al. themselves pointed out (and Lane and Phillips before them), rather than being an indication of moral hazard, this result could be viewed as a sign that a deep financial crisis such as the Russian one, was simply not likely to happen after the introduction of various financial safety nets\(^8\) (between 1995 and 1998). Moreover, as suggested by Dreher (2004), one cannot completely rule out that an IMF bailout by itself can affect the likelihood of future financial crisis. In addition, in their model, Dell’Ariccia et al. took the exogeneity of fundamentals as given. This is a rather strong requirement since

\(^8\) More on international financial safety nets in the appendix.
bailouts expectations could as well affect the country’s fundamentals. Finally, as the choice of events seems very critical for the outcome of a moral hazard test, it goes without saying that the adequacy of the Russian crisis could also be questioned. After all, the period Dell’Ariccia et al. studied (the end of the 1990s and beginning of the 2000s) will not only be remembered for the (great) Russian crisis, but also (and foremost) for a period of an overall deterioration of the world economy (recall the big IT bubble of the late 90s). Therefore, as argued by Noy (2004), the observed increase in the level of spreads could be a natural consequence of the state of the world economy rather than a residual of investor moral hazard induced by a non-bailout (or a bailout for that matter).

With some modifications, Zoy (2004) repeated the test proposed by Dell’Ariccia et al. (2002) on a larger sample, allowing for non-linear effects of a country’s outstanding official debt on the supply of capital. Her results showed that moral hazard increased after the 1995 Mexican bailout but failed to decrease after the 1998 Russian non-bailout. However, she found more than that. According to Zoy, the effects of outstanding debt on bond spreads before the crisis was different from the impact observed after the crisis. More to add, debtor countries appeared to be credit-constrained in the period prior the Mexican bailout but not after the crisis. Zoy’s results can thus be described as consistent with what she calls “limited investor moral hazard”.

By setting a model with South Korean and Indonesian bond spreads to be explained by exchange rates and stock returns, U.S. corporate bond spreads, IMF bailout negotiations and bailout approval, Evrensel and Kutan (2004a) found inconclusive evidence for moral hazard. Their results suggested that bond spreads in both countries decreased on the first day of the bailout negotiation with the IMF, as well as on the day when the IMF approved to bailout the countries. This, they concluded, was an indication of moral hazard. However, they also found that the duration of an IMF program increased the spreads, to them, a sign that there was no serious IMF induced-investor moral hazard.

2.2 No evidence of moral hazard

Zhang’s paper from 1999, offered one of the first attempts to test for investor moral hazard in the bond market. His focus was the long-run effects of the 1995 Mexican bailout (by the IMF). Zhang regressed eight emerging markets bond spreads while controlling for changes in fundamentals and international capital market conditions (i.e. the spreads of high-yield U.S. corporate bonds). In the presence of investor moral hazard, the coefficient linking U.S. corporate bonds and emerging market bonds will be negative. Zhang found just the opposite: the coefficient of the post-bailout was insignificantly positive, that is, there was no evidence for investor moral hazard effect. Thus, his suggestion was that the reduction in spreads observed after the Mexican crisis was due to, an increase in international capital market liquidity and, changes in country-specific fundamentals and, not due to a moral hazard effect.

Kamin and Kleist (1999) performed a similar test with a larger sample (the J.P. Morgan’s Emerging Markets Bond Index, EMBI) and in accordance with Zhang’s result, also failed to find any evidence for investor moral hazard. However, Zhang’s methodology had some shortcomings. As Dell’Ariccia et al. (2002) argued, the Mexican bailout was not the most appropriate event to test for the presence of a moral hazard effect. The reason being that, bailing out Mexico, by then, a country with relatively good fundamentals led to an overall reassessment of the risk of investing in emerging markets. Hence, beyond any potential moral hazard effect such as a decrease in the level of spreads, there was a general increase in the
perceived risk related to emerging market lending. Moreover, by assigning the same coefficient for the period before and after the 1995 bailout, Zhang, Kamin and Kleist failed to recognize that it is the differences in these coefficients that, in the presence of moral hazard will impact on the level of spreads.

Instead of examining a single event and its long-run effects, Lane and Phillips (2000) focused on the short-run effects of a number of rescue-lending events (or rather announcements related to these events) such as the Mexican bailout, the Russian default, the introduction of a Supplemental Reserve Facility (SRF) and the IMF quota increase in 1998. They studied the short-run effects of Emerging Markets Bond Index (EMBI) spreads to these events and found, with the exception of the 1998 Russian crisis, no statistically significant evidence for moral hazard. However, as argued by Haklne, Andrew and Scheibe (2003), the choice of events could have biased the results. Choosing a different set of rescue-lending events, they found evidence of moral hazard. Another problem with these findings was that an event, once anticipated, would have no substantial effects on the spreads. As pointed out by Dell’Ariccia et al. (2002), most of the events (apart from the Russian non-bailout) in Lane and Phillip’s model were anticipated by investors. More to add, because of the general turmoil and contagion effects that followed the Russian crisis, it is questionable whether the change in spreads can be attributed to moral hazard and moral hazard alone.

Tillman (2001) had a similar angle as he as well looked at IMF-related news. He analysed the risk-return relationship in bond prices of emerging markets, looking for a structural break coinciding with rescue-lending related news. In the presence of moral hazard, as the probability of a bailout increases, the price of the bond will decrease. However, Tillman found that rescue-lending related news did not affect the price of bonds and concluded that there was no evidence of investor moral hazard.

Another more recent attempt to test for investor moral hazard comes from Noy (2004). He analyzed the bond spreads of fifteen emerging markets using a set of macroeconomic variables for the time frame between 1998 and 2000. Noy had four IMF-related news: 1) the 1995 Mexican bailout; 2) the Asian crisis; 3) the 1998 IMF quota increase and; 4) the 2000 Argentinean bailout. He used these events to derive predicted values of the bond spreads, which he argued, should, in the presence of moral hazard, be higher than the real spreads. His findings were in the opposite direction: the predicted bond spreads were on average actually lower than the actual spreads. Hence, he concluded, there was no evidence of moral hazard associated with the above mentioned events. However, as often the case in this type of regression model, the results depend heavily on the choice of events. Further, the period under study, (1998-2000) was, as mentioned earlier, beyond the events taken into consideration by Noy, a turbulent period for the whole world economy (and not only emerging markets). It is therefore, for that specific period, difficult to distinguish a moral hazard effect from the effect from the general downturn in the world economy.

2.3 Overview

Taken together, the ambiguous results from previous studies confirm that the existence of investor moral hazard in the bond markets remains an unresolved empirical matter. Although, the views diverge regarding the effects of the Mexican bailout and other events in the 1990s,

9 For example, as suggested by Calvo and Mendoza (1996), the risk of unexpected capital flows.

10 The SRF was introduced in 1997 to provide financial assistance to countries experiencing large balance of payments difficulties, more on this issue on the IMF webpage.
there appears to be a consensus that investor moral hazard was present in the bond markets before the 1998 Russian non-bailout.

More so, all the previous studies mentioned above have mainly focused on the bond markets in emerging markets (apart from Indonesia and South Korea, today considered as newly developed) as those have, traditionally, been the one in need of international rescue-lending. The lack of literature focusing on moral hazard in bond markets of developed economies, although understandable, remains a shortcoming. Nonetheless, although not being a perfect mirror of developed markets, studies of emerging economies, still provide a good understanding of the mechanism behind investor moral hazard in bond markets in general.
3. Theoretical Framework

3.1 The concept of moral hazard

Moral hazard became a broad concept in the 17th century’s insurance industry where it was observed that insured individuals had the tendency to behave in a riskier way than those lacking insurance (Dembe and Boden, 2000). The intuition being that insurance reduces the incentives to be precautious, hence rising the likelihood of the event being insured against to actually take place. The term became synonym with the incentive to lie and abused the insurance claim, and generally carried pejorative connotations. This inappropriate (from the insurance company standpoint) and morally hazardous behavior of the insured was (supposedly) induced by the belief that even if an (undesirable) event happened, they (the insured) will not bear the full burden of potential losses (Leach, 2004).11

Economic textbooks teach that moral hazard is a situation caused by information asymmetry. A widely cited quote due to Varian (1990, p.589) explains why:

“Moral hazard refers to situations where one side of the market cannot observe the actions of the other. For this reason it is sometimes called a hidden action problem”.

The actions of one side, the one with more information (i.e. the individual) are not observable (i.e. hidden) by the other side (i.e. the insurance firm). This asymmetry of information allows for unobservable actions that are often detrimental to society (than would have been the case in a world with perfect information). As exemplified by Leach (2004), outright fraud might be the standard example, but there are many other less dramatic cases of moral hazard leading to market distortion and inefficiency12.

If the truth should be told, moral hazard can arise in all kind of contexts. It can for example occur in the labor markets (e.g. between the firm’s management and the employees, the owners of the firm and the firm’s managers and even between the firm and its suppliers), in banking and in finance. As argued by Calomiris (1998), financial institutions (often those said to be too-big-to-fail), protected by the government, the central bank or any other lender-of-last-resort may involve in riskier investments than would have been the case without the insurance of being bailed out if (or rather when) facing bankruptcy. In the presence of regional or international financial safety nets, countries may run reckless fiscal and/or monetary policies, in the belief that when facing default, they will be bailed out (Edwards, 1998). International investors, believing that they will go scot free in the event of a crisis, may neglect the real economic risk in their investments. As argued by Eichengreen (2000), investors’ careless lending behavior, could even contribute to the crisis. According to the BusinessWeek13, German chancellor, Angela Merkel, was even more precise and attributed some of the blame for the current crisis to hedge funds and speculators, stating that: “Institutions bailed out with public funds are exploiting the budget crisis in Greece and elsewhere”.

It is this type of moral hazard, which occurs in banking and finance that will be the credo of this paper.

11 Moral hazard is therefore a forward-looking concept, the insured takes risks today based on the aid he expects receiving later on if the undesirable event (which he is insured against) does occur.
12 The typical outcome is that the efficiency loss can be minimized but not fully eliminated.
13 BusinessWeek. 23 February 2010.
3.2 Rescue-lending induced-moral hazard

The possibility that IMF bailouts induce moral hazard is best captured in Wilson Schmidt’s (1979, p.15) famous quote:

“It can be argued that absent from the IMF; individual countries will presumably be less likely to get into balance-of-payment difficulties because they could not rely on the IMF resources when those difficulties arose.”

Four years later, Roland Vaubel (1983) formalised the same argument. He suggested that IMF lending not only decreased the incentive (for governments and ultimately international investors) to be more precautious in the future. IMF lending was also directly harmful for international finance and the global economy as a whole because of the unsustainable burden moral hazard put on taxpayers.

Since then, the question of IMF induced-moral hazard has been a subject of heated discussion. The 18 billion (U.S. dollar) bailout of Mexico in 1995 (the first large-scale bailout of the 1990s) and the non-bailout of Russia in 1998 are usually regarded as corner-events which increased, respectively decreased rescue-lending induced-moral hazard. Evidence both supporting and opposing the Vaubel hypothesis occupies a critical place in the existing literature on moral hazard (see for example, Edwards, 1998; Calomiris, 1998; Nunnekamp, 1999). In principle, the argument is that IMF bailouts, (creating a safety net), distort the behaviour of investors and governments of debtor countries. In a wider sense, Vaubel and his proponents claimed that there was a trade-off between bailouts expectations and incentives. An inverse relationship implying that the safer the insurance of a bailout is, the less is the incentive to avoid mistakes (Vaubel, 1983).

Fortunately, the moral hazard dilemma is not of concern in academic circles only. The IMF itself seems aware of the problem, as Anne Krueger, IMF First Deputy Director puts it:

"Moral hazard remains a concern. Private institutions may be encouraged to lend and invest recklessly—or at least more than they should—by the belief that the IMF will ensure that their debtors can repay them".

With the wake of the Greek crisis, the issue of investor moral hazard has resurrected and has become a common term in the political jargon of many European leaders. Attempts have been made to improve the architecture of rescue-lending, and as encapsulated by the Swedish Finance Minister Anders Borg:

“Minimize moral hazard by making risky fiscal behaviour more costly”.

Rephrasing the famous quote by Jacques Delors from the 1990s, it seems that: “Although not all Europeans believe in God, they all certainly believe in moral hazard”.

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14 Until recently, the IMF was the major lender-of-last-resort; the existing literature on investor moral hazard focuses therefore on IMF induced-moral hazard, abstracting from regional safety nets provided by other institutions. Nevertheless, the concept being the same, conclusions applying to the IMF can as well be extended to bailouts by other institutions a la lender-of-last-resort.
15 In an address to the National Economists’ Club, Washington D.C., November 2001
16 In Financial Times, 16th of November 2010.
The moral hazard associated with the borrowing countries’ governments is said to be direct (Dreher and Vaubel, 2004), in the sense that IMF rescue-lending impact on the behavior of its direct recipients. These are the domestic authorities of debtor countries. Such morally hazardous behavior could be characterized by more imprudent policies and monitoring (e.g. excessive borrowing and monetary expansion, large budget deficits, unsound public finances etc.) than would have been the case without the IMF financial safety net (Vaubel, 1983).

However, rescue-lending doesn’t affect the behavior of governments solely. It might as well (and foremost) have effects on the behavior of international investors. Moral hazard associated with investors is called indirect moral hazard (Dreher and Vaubel, 2004). The assumption is that, in a crisis-situation, when customers of international investors become insolvent, governments (usually) take over the maturing foreign debts of both private and public sector, thereby ensuring that investors avoid losses (Evrensel and Kutan, 2004). Since in a crisis-situation, the resources needed to repay the foreign debt is generated by the IMF rescue-package; investors, although not the direct recipients of the IMF lending, ultimately become the indirect beneficiaries of the bailout (Sarno and Taylor, 1999). Thus, the very availability of the IMF financial safety net induces investors to behave in a way that can be described as morally hazardous (e.g. excessive lending and overall excessive risk-taking). In fact, in a controversial article\textsuperscript{17} from 1998, former IMF economist and advocate of the theory of IMF-led moral hazard, Martin Khor characterized the IMF as:

\textit{“The chief collector for foreign banks and investors”; suggesting that: \textit{In reality, the IMF bails out international investors rather than actually helping troubled countries”}}.

This paper focuses on this last type of induced behavior: the indirect investor moral hazard (also referred to as creditor moral hazard). More specifically, I examine whether the one-of-the-kind large-scale rescue-lending to Greece, by the EMU and IMF in 2010 altered the behavior of investors.

\textbf{3.3 Investor moral hazard in bond markets}

As previously defined, IMF induced-investor moral hazard (or indirect moral hazard), is the idea that an expected IMF bailout, by implicitly insulating investors from losses, alters their perception of risk (Calomiris, 1998; Edwards, 1998; Eichengreen, 2000 and Dreher, 2004:) creating an environment with excessive risk-taking and according to Evrensel (2002), an increased likelihood for new crises and new bailouts.

The mechanism behind is rather straightforward: from modern economics one learns that there is a positive correlation between risk and return: the higher the risk, the higher the expected return. Developing and emerging countries are usually high-risk-high-return markets attracting risk-loving investors. With an implicit IMF-guarantee, the risk faced by investors is significantly reduced. Thereby making developing and emerging markets an attractive environment not only for risk-lovers but also for risk-neutral (and perhaps even risk-averse) investors as the danger of loss is substantially reduced.

As mentioned in the introduction, there are two major fields for studying indirect moral hazard: in the bond and the equity market. Because it offers the possibility to analyze government bonds, which, I argue, best capture country-risks and are more intuitively related to investor moral hazard, this paper, like most empirical studies, focuses on the bond market. In particular, I consider international investors who are rational, risk-neutral and competing

\textsuperscript{17} Downloadable at http://www.twinside.org.sg/title/bai-cn.htm
for loans in hard currency (e.g. the U.S. dollar or the Euro) to debtor countries. Debtor countries are (often) developing and emerging economies issuing high-risk-high-return bonds (Hilscher and Nosbusch, 2010). In the bond market, I only look at government bonds since, defaulting on those is unlikely, as this will drastically damage the country’s creditworthiness. Note also that, although countries may default, investors can still get their repayments if the country is bailed out.

In bond markets, the bond yields reflect the perceived investment risk (Varian, 1992). Usually, this risk depends on the country’s fundamentals (both the level and the volatility of fundamentals). Ceteris paribus, a country with weak fundamentals is more likely to default on its debt (e.g. its government bonds) than one with strong fundamentals (Dell’Ariccia et al., 2002). The spread between the yield on bonds with a default-risk, such as emerging market government bonds, and the yield on bonds considered as default-free, such as U.S. or German Treasury bonds with a comparable issue date and maturity, indicates how much additional interest investors require in order to hold the riskier bond (Varian, 1992). A higher yield spread is thus, a reflection of a higher default-risk. By the same token, countries with strong (and less volatile) fundamentals are often associated with a lower yield spread and by deduction, also lower risk (Hilscher and Nosbusch, 2010). This is the corner pillar of investment theory: low risk is, ceteris paribus, reflected in a low risk premium required by investors.

Due to the negative relationship between the perceived probability of a bailout and the country’s spreads, for a given set of fundamentals an increase in the perceived probability of a bailout reduces the perceived risk of international lending, lowering the level of spreads for each country. Hence, in the presence of moral hazard, an event increasing the perceived probability of a bailout will lower spreads, holding fundamentals constant. Trying to capture investor moral hazard by studying the level of spreads in this way is referred to as performing a level test. The main disadvantage with using the level test is that it must be applied for each country in the sample. This can easily lead to mixed overall outcomes. The results from the level test can therefore be difficult to interpret. It remains, nevertheless, in the empirical literature of bond markets, the most common approach to test for investor moral hazard.

An increase in the perceived probability of a bailout reduces the sensitivity of spreads with respect to changes in fundamentals. Hence, in the presence of moral hazard, an event increasing the perceived probability of a bailout will lower the size of the slope coefficients relating the country’s spreads to fundamentals. The intuition is simple: if investors perceived that the probability of being repaid is high (for example because of the bailout possibility), then country-specific characteristics, the fundamentals, are less essential when making investment-decisions. At the extreme, when investors take for given that they will fully recover their loans, all countries are facing the same risk-free interest rates independently of their fundamentals. Testing for moral hazard effect analyzing the link between spreads and fundamentals as described above is performing the slope test.

In a multi-country setting, an increase in the perceived probability of a bailout reduces the spreads differences between two countries, which initially had narrow spreads. This implies that a higher perceived probability of being bailout not only lowers the level of spreads as stated in 1); the decrease is larger for countries with high spreads (i.e. countries with weak fundamentals). Hence, in the presence of moral hazard, an event increasing the perceived

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18 Assuming that governments act in the best interest of their countries and care about their creditworthiness.
probability of being bailout will lower the cross-country variance of spreads (i.e. the dispersion of spreads). This is referred to as the **variance test**. The variance test is easier to deal with compared to the level test because it gives one measure for testing for moral hazard in the entire sample, whether it is emerging or as in my case, the European market. In addition, it suffers from only minor bias when the chosen event contains additional information not related to rescue-lending policies, which, generally, affects all countries in similar ways.
4. Empirical Method

The empirical investigation concentrates on identifying the effects of the 2010 EMU-IMF Greek bailout on investors’ behaviour. This is done by studying ten-year bond spreads from the twelve EMU-countries (a complete list of these can be found in the appendix). Using the German ten-year Treasury bonds as a proxy for the risk-free rate as well as controlling for a set of fundamentals, I analyse whether the 110 billion Euro loan package\textsuperscript{19} might have induced-investor moral hazard in the European market.

4.1 Validity of the Greek bailout

As mentioned in previous studies, the choice of event plays a crucial role in testing for the existence of investor moral hazard. The empirical literature reviewed offered a wide variety of events (and methodology) with diverse results. For that reason, this section starts by an explanation for the selected event: the 2010 Greek bailout. My approach goes in the same spirit as what proposed by Dell’Ariccia et al. (2002). A valid event for an investor moral hazard test is one that fulfils the following three conditions:

1) The event is unexpected.
2) The event changes investors’ perception of future rescue-lending.
3) The event does not change the general perception of risk; apart from through the expectation of future rescue-lending.

I argue that the (first) Greek bailout in May 2010 satisfies all these three conditions.

1) The bailout of Greece in May 2010 was unexpected.

With a global financial crisis, a low economic growth in Europe, and the poor state of the Greek economy, some may claim that the bailout of Greece was not a \textit{big surprise}. After all, by the end of 2009, according to statistics from Eurostat, Greece faced the highest budget deficit (15.4\%) and government debt (127\%) to GDP ratios in the entire European Union (EU). The country had a high level of unemployment, political and economic corruption, tax evasion, and low global competitiveness compared to its EMU-partners. During the same period, Standard & Poor downgraded Greece to a BB+, then the lowest credit rating in the EU.

These factors suggest that investors were aware of the increasing economic risks at stake. All the signs were there. The Greek economic crisis, \textit{in IMF terminology}, was a \textit{fact}. However, being in a crisis in one thing, being in a crisis so as to be bailed out is a different issue. When the Greek government, on April 23\textsuperscript{th} 2010 requested that the EMU-IMF bailout package be activated, a historical event took place. As it seems, the belief that, despite all the facts, Greece was \textit{too developed, too European to fail} was suddenly dismissed\textsuperscript{20}. A bailout, not matter how it might be portrayed, remains a sign of failure on the part of the country that is being bailed out. It is always linked with certain conditions, which are rarely easy to swallow.

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\textsuperscript{19} With €80 billion in support from the EMU and €30 billion from the IMF.

\textsuperscript{20} See for example, the articles in daily mail and the economist: http://www.daily mail.co.uk/news/article-20046 and http://www.economist.com/node/article3421890.ece
Greece not being an exception (Bosco, 2011). Therefore, although the Greek economic crisis might not have been a big surprise, its bailout certainly was\textsuperscript{21}.

2) The Greek bailout changed investors’ perception of future rescue-lending.

The default and bailed out-stigma, so far reserved to developing and emerging countries was now valid for a developed economy, member of the EU and using the same currency as Germany, France, and the Netherlands. The nature of international financial safety nets took a new shape. Investors’ perception of future bailouts (suddenly) altered.

3) The Greek bailout did not change the general perception of risk (apart from through the expectation of future rescue-lending).

Although Greece was said to cover up the gravity of its financial and fiscal imbalances\textsuperscript{22} and blame the downturn of its economy on the global financial crisis; with time, it became clear that the Greek default was mainly due to years of unsustainable fiscal policy, inefficient bureaucracy, an immense informal sector, and other structural problems. With this in mind, the Greek bailout (by itself) can hardly be said to have changed investors’ evaluation of country-specific risks in developed markets in general. The causes of the default were, very particular to Greece as a country, to have led to a general reassessment of risks in all developed economies.

Therefore, fulfilling the above criteria, I find the first bailout of Greece in spring 2010, to be an appropriate event to test for investor moral hazard.

4.2 Choice of benchmark

German bonds are known as Bunds. Their maturities range from four to thirty years (the German Finance Agency\textsuperscript{23}). Because of the state of its economy (according to last statistics from the Eurostat and the IMF, the strongest in Europe), the German Government Bond issuance is considered the gold standard of the European bond market (Manganelli and Wolswijk, 2007). Using the terminology of this paper, one could say that, due to its strong fundamentals, in a European context, German Treasury bonds are regarded as the most creditworthy. I adopt that convention and use in particular, the German ten-year government bonds as the risk- and default-free reference benchmark. As explained in the theoretical framework, the yield spread is the difference in yield between a bond yield and a benchmark yield of comparable maturity. In my case, because I analyse Euro-denominated ten-year bonds issued and guaranteed by EMU governments, the spread of individual member-states will be the cost of their ten-year government bonds and the margin paid above the German ten-year bonds.

4.3 Choice of fundamentals

In the choice of a country’s fundamentals, I chose measures that capture the key aspects of the macroeconomic performance. More specifically, I look at fundamentals, which are likely to be related to the risk of default. One would expect a country’s growth rate, fiscal strength,

\textsuperscript{21} More on this in the appendix.
\textsuperscript{22} See, the Washington Post “Greece’s economic crisis could signal trouble for its neighbors”, 2010-02-09.
\textsuperscript{23} More information on their webpage, http://www.deutsche-finanzagentur.de/startseite/
inflation level and current account to affect its ability to generate revenue and to repay its external debt (Eichengreen and Mody, 2000; Dell’Ariccia et al., 2002 and Noy, 2004).

I also use two additional country-specific variables: corruption and credit ratings. Corruption is self-explanatory. Generally speaking, a high level of corruption leads to market inefficiency, distorts the economy and increases the risks and the costs of investing in or lending to a country.

The layman may find credit ratings less intuitive. They are forward-looking opinions of credit rating agencies\(^{24}\) (CRA), about the creditworthiness, (i.e. the ability and willingness) of an issuer, to meet its financial obligations in full and on time. According to CRA, credit ratings are not based on mathematical formulas. Instead, CRA are said to used their judgment and experience to assess what public and/or private information to take into consideration in giving a particular rating to a firm or a government. The ratings are typically expressed as letter grades that range, for example, from ‘AAA’ to ‘D’, where ‘AAA’ is the highest rating. According to Standard & Poor for example, a BB+ implies that, the agency estimates that in the event of a default, investors would lose 30–50% of their money. Although the independency of CRA is often questioned; being downgraded can still have fatal effects on a country's ability to borrow money in the markets (as confirmed by the Greek example).

In the literature on spreads, it has been argued that countries that have recently emerged from a default, to a larger extent, have higher spreads (Eichengreen, 2000). In the same spirit, Rogoff and Reinhart (2008) also argued that past government debt defaults pan out what is likely to come. Hence, it has been claimed that the key predictor of future default is a country’s history of default. Evrensel (2002), even found that countries that have once been bailed out by the IMF have a higher probability of turning to the IMF again in the future. These serial defaulters are, in Evrensel’s terminology, caught in a dependency trap. It is therefore claimed to be crucial to include a default proxy in the set of fundamentals.

However, for this study, I argue that this is not the case. Recent default-history might be a valid explanatory variable in emerging markets with their long history of defaults and bailouts. By contrast, applied to the context of developed markets (where none of the EMU countries have defaulted since the 1970s), such a dummy will be of no effect, as all the countries will have the same parameter.

4.4 Model

The great workhorse determining bond spreads is given by the following linear regression:

\[
S_i = \alpha + X_i (\beta_i^\prime) + \mu_i
\]

Where:

- \(S_i\) = the bond spread of country \(i\) at time \(t\).
- \(\alpha\) = the intercept
- \(\beta_i\) = the \(k \times 1\)-vector of coefficients.
- \(X_i\) = the \(1 \times k\)-vector containing the set of fundamentals of country \(i\) at time \(t\). These fundamentals are assumed to determine the bond spreads.
- \(\mu_i\) = the random error term.

\(^{24}\) Such as Standard & Poor, Moody’s, and Fitch, which specialize in evaluating credit-risk.
m=0 is the period before the Greek bailout and m=1 is the period after the bailout.

Since my focus is on the expectation of further bailouts, I consider an event that increases the perceived probability of such bailouts- the May 2010 Greek bailout. The method used by Dell’Ariccia et al., (2002) and that I apply is, to estimate a pooled model over the entire sample period (i.e. from January 2010 to January 2011), that is, before and after the Greek bailout, allowing for a structural break at the time of the bailout (i.e. May 2010).

Bond spread of country \(i\) before the Greek bailout can thus be expressed as:

\[
S_{i0} = X_{i0}\beta^0 + \mu_{i0}
\]  
(2)

Whereas bond spreads of country \(i\) after the Greek bailout can be expressed as:

\[
S_{i1} = X_{i1}\beta^1 + \mu_{i1}
\]  
(3)

Where the estimated coefficients \(\beta^0\) and \(\beta^1\) of the above two regressions will be the basis of all my tests.

Let:

- \(H_0\) = the null hypothesis stating that moral hazard is not present, i.e. the EMU-IMF rescue-lending to Greece has no impact on investor risk perception.
- \(H_1\) = the alternative implying the presence of moral hazard.

The three tests discussed in the theoretical framework can thus be restated as follows:

1) The level test:

Under the null (\(H_0\)), one will expect the level of spreads not to be affected by an event that increases the probability of international rescue-lending, i.e., the levels of spreads should remain unaffected by the Greek bailout in May 2010. Similarly, under the alternative (\(H_1\)), one will expect the Greek bailout to change the spreads for every country in the sample, keeping country fundamentals constant. Formally this will be:

\[
S_{i1} - S_{i0} = X_{i1}(\beta^1 - \beta^0) + (X_{i1} - X_{i0})(\beta^1) + (\mu_{i1} - \mu_{i0})
\]  
(4)

Where the first term captures the change in the levels of spreads due to the change in the coefficient \(\beta\). This describes how the change in the pricing of risks affects the levels of spreads. If the Greek bailout leads to higher expectations of international rescue-lending (i.e. there is moral hazard), all risks should be priced lower after the Greek bailout. The hypotheses for a level test can thus be defined as follows:

- \(H_0\): \(X_{i0}(\beta^1 - \beta^0) = 0\)
- \(H_1\): \(X_{i0}(\beta^1 - \beta^0) \neq 0\)

\(^{25}\)The second term captures the change in the levels of spreads due to the change in the fundamentals. The third term captures the effect of a change in the error term.
I use a linear Wald test to compare the fitted spreads\(^{26}\) resulting from the estimated models, before and after the Greek bailout, assuming under the null that the fitted spreads do not change.

2) The slope test:

Under the null ($H_0$), the slopes of regression (1) should remain unaffected by the Greek bailout. However, under the alternative ($H_1$), one will expect the slopes to change after the Greek bailout as a reflection of the lower danger of loss faced by investors. The hypotheses for the slope test are:

$$H_0: (\beta^1 - \beta^0) = 0,$$
$$H_1: (\beta^1 - \beta^0) \neq 0,$$

I conduct the slope test as a typical t-test in which the equality of the coefficients (i.e. the slopes) is tested. If the difference between the slopes before and after the bailout is zero, there is no moral hazard and I cannot reject the null ($H_0$).

3) The variance test:

Under the null ($H_0$), the cross-country variance of spreads should not be affected by the Greek bailout. Under the alternative ($H_1$), controlling for changes in fundamentals, the spreads\(^{27}\) differences between countries and thereby the cross-country variance of spreads should decrease. The hypotheses formalizing the variance of spreads across countries are:

$$H_0: \beta^1 \text{Var} (X_t) \beta^1 = \beta^0 \text{Var} (X_t) \beta^0$$
$$H_1: \beta^1 \text{Var} (X_t) \beta^1 < \beta^0 \text{Var} (X_t) \beta^0$$

Where the first term captures the change in variance caused by the change in the coefficient $\beta$. This shows how a change in the pricing of risks affects the variance of spreads\(^{28}\). To carry out the variance test, I use a nonlinear Walt test. I compare the variance of the fitted spreads before and after the bailout, assuming under the null that those do not change.

4.5 Market turbulence

A major drawback with many previous studies on investor moral hazard is the failure to recognize that financial crises are usually followed by a period of market turbulence. This post-crisis market turmoil will, often, be reflected in a sharp increase in both the level and the cross-country variance of spreads. The inclusion of such a turbulence period in the regressions will tend to bias the estimation results, and make the rejection of the null in favour of the alternative, more plausible. It is therefore critical to acknowledge that there is, in the immediate period after a financial crisis, no stable relationship between fundamentals and spreads (Dell’Ariccia et al., 2002).

\(^{26}\) I go with fitted spreads because those are not affected by a change in the variance of spreads after the Greek bailout (as long as the standard errors are heteroskedasticity-consistent).

\(^{27}\) Note that I use spreads and not log-spreads as those will restrict me from performing the variance test.

\(^{28}\) $X_t$ is a $N \times k$-matrix of the set of fundamentals of all the countries in the sample at time $t$. 
With that said, taking into consideration the distortion between fundamentals and bond spreads in the case of the 2010-Greek default crisis is not straightforward. Firstly, because the Greek default-crisis happened in the immediate aftermath of the global financial crisis. Secondly, because the Greek-crisis is still an ongoing issue and it is difficult to point out a single high-volatility period. These two factors considerably complicate the link between fundamentals and spreads. The problem can be dealt with at different levels but I defer that for later treatment. For now, I exclude from my estimation models, the months immediately after the default, namely May and June.

**Figure 1- Estimated conditional volatility-Greek spreads**

Figure 1 graphs the estimated conditional volatility of changes in the Greek bond spreads. I use a GARCH (1, 1) model estimated from daily data over the sample period January 2010 to January 2011. As can be observed from this figure, the periods of high-volatility visibly stand out. May and June are easily identified as periods of particular high turbulence. Greek spreads, in the aftermath of the EMU-IMF bailout, exhibit higher volatility independently of the size of the changes in spreads during the same period. Also, note that although persistent, the conditional volatility of spreads has, by August 2010 (although temporary), essentially returned to its pre-default levels.

In addition, as mentioned in the theoretical framework of this paper, the Greek ten-year government bond spreads, as captured in Figure 1, appear as a perfect textbook example of the relationship between spreads and default. As expected, the highest spreads are found in the days prior to the default (which occurred on April 23\textsuperscript{th} 2010). Thereby confirming the positive relationship -higher default-risk-higher spreads existing between these two variables.
4.6 Data

4.6.1 The variables

The dependent variable in my model is the bond spread. I follow the literature (Alesina et al., 1992; Zhang, 1999; Alfonso et al., 2007) and express the spreads as the percentage difference. The explanatory variables are inflation, external debt, foreign reserves, current account, fiscal balance, real GDP growth, credit ratings and corruption. External debt, current account and fiscal balance are all ratios of GDP and measured in millions of Euros. Reserves are also given in millions. GDP growth is seasonally adjusted and compared to the same period of the previous year, the reference year being 2005. The Harmonized Indices of Consumer Prices (HICPs), are used for the assessment of inflation levels. They are produced using a common index reference period (2005=100) and similarly to growth rates, seasonally adjusted.

Often used as a summary measure of creditworthiness, it has, in the literature, been suggested that ratings by themselves capture the necessary aspects of a country’s economic performance (Kamin and von Kleist, 1999). However, as argued by Eichengreen and Mody (2000) and later Dell’Ariccia et al. (2002), credit ratings, although an important indicator of economic stability, are not sufficient for explaining variation in the country’s spreads. Besides, it is worth emphasizing that credit ratings are CRA’s own assessment of how likely a borrower is (or rather will be) able to repay her/his debt. These ratings do not have to correspond to the markets’ judgment or in any way to tell the true story. Therefore, to add explanatory power on the country-specific fundamentals, I include both macroeconomic variables and credit ratings.

Because ratings are given as letters and are therefore difficult to include as fundamentals as such, I assign a number to a particular rate. A triple A for example, becomes a 7, a AA+ a 6, a AA a 5 and so on. However, as credit ratings are assumed to be calculated based on the macroeconomic fundamentals, there is a correlation between the two. For that reason, as Eichengreen and Mody (2000) and Dell’Ariccia et al. (2002), I regress the ratings on fundamentals. This procedure generates residuals that I then include in the set of fundamentals as additional covariates. It is thereby not the ratings themselves that are included in the model but rather their residuals. Thus, the correlation between the rating residuals and fundamentals is rather negligible (see Table 2.A.b).

The corruption variable used in this paper is the 2010 Corruption Perception Index (CPI), from Transparency International. The scores range between 0 (highly corrupt) and 10 (very clean). Detailed information on what the CPI actually captures and how is calculated is found in the appendix. 10 (very clean) to 0 (highly corrupt).

For bond spreads, I use monthly data. The frequency being dictated by data-availability. The lack of available monthly data on fundamentals forces me to go for quarterly data. For the sample period, which runs from January 2010 to January 2011, there are therefore four quarters.

All data were obtained from the central banks of the respective countries, except the credit ratings and corruption indexes, which were supplied by Bloomberg and Transparency International respectively.

Overall, the panel dataset is comprised of different points in time; before and after the bailout (Time-Series) as well as different EMU-countries (Cross-Sectional). The pooled regression
thus gives 144 observations. To reduce possible endogeneity problems, I use lags of fundamentals and not the immediate values themselves.  

4.6.2 Descriptive Statistics
Summary statistics describing the basic features of the data are summarized in Table 1. The average spread in the sample during the investigation period is 1.58%, a figure that is relatively low. However, the cross-country variation in the spreads is rather high; ranging from a low .18% to a high of 8.98%. The same yields for fiscal balance, which ranges from a deficit of about 13.4% to a 2.4% surplus. The data covers countries with different creditworthiness. The economic heterogeneity in the Eurozone (see Table A.2.a in the appendix), makes such as disparity appear rather reasonable. External debt ratio is very high, averaging at about 707.7% of GDP with a standard error of 1274.9%, suggesting a wide variance in the external debt/GDP ratio in the sample. Given the current situation in the EMU-a sovereign debt crisis with many countries facing high debt levels (see Eurostat statistics), this outcome is perhaps more likely than unlikely. Real GDP growth ranges from -7.38 to 5.28%. The relatively large standard error of real GDP growth relative to its mean and the negative value of its lower bound indicate that some EMU-states in the sample experienced negative growth. Indeed, statistics from Eurostat show that, Greece, Ireland, and Spain had negative growth during 2010. The mean value of inflation is about 1.72%, with a minimum of -2.1% and a maximum of 5.67%; again suggesting that at least one member-state (Ireland) experienced negative inflation-deflation, during 2010. More to add, the mean current account variable is negative; suggesting and confirming that EMU-states, on average, were net borrowers from the rest of the world. Another interesting aspect of the sample data is, the large difference in corruption level, ranging from China and Lesotho’s 3.5 to 9.2.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bond spreads (%)</td>
<td>1.5816</td>
<td>2.0581</td>
<td>.18</td>
<td>8.98</td>
</tr>
<tr>
<td>Inflation (%)</td>
<td>1.7247</td>
<td>1.5061</td>
<td>-2.1</td>
<td>5.67</td>
</tr>
<tr>
<td>External debt (% of GDP)</td>
<td>707.67</td>
<td>1274.9</td>
<td>122</td>
<td>4636</td>
</tr>
<tr>
<td>Reserves (millions)</td>
<td>124.88</td>
<td>255.90</td>
<td>2.04</td>
<td>926</td>
</tr>
<tr>
<td>Fiscal balance (% of GDP)</td>
<td>-4.3374</td>
<td>3.9350</td>
<td>-13.4</td>
<td>2.4</td>
</tr>
<tr>
<td>Real GDP growth (%)</td>
<td>.783971</td>
<td>2.0225</td>
<td>-7.38</td>
<td>5.28</td>
</tr>
<tr>
<td>Current account (% of GDP)</td>
<td>-.13324</td>
<td>5.9142</td>
<td>-10.9</td>
<td>8.54</td>
</tr>
<tr>
<td>Corruption</td>
<td>6.86363</td>
<td>1.7814</td>
<td>3.5</td>
<td>9.2</td>
</tr>
<tr>
<td>Credit ratings</td>
<td>5.09090</td>
<td>2.1588</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>N</td>
<td>144</td>
<td></td>
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</tr>
</tbody>
</table>

29 More so, possible changes are not immediately reflected in the fundamentals.
4.6.3 Model diagnostic

As the explanatory variables are all key indicators of a country's macroeconomic performance, they could as well be correlated with one another—there could be multicollinearity (Engle and Fabozzi, 2007). If the independent variables are highly correlated:

1) The estimated regression coefficient of any one variable will depend on which other explanatory variables are included in the model.
2) The precision of the estimated regression coefficients decreases as more explanatory variables are included in the model.
3) The marginal contribution of any one predictor in reducing the error sum of squares will vary depending on which other variables are already in the model.

The bottom line in the presence of multicollinearity is that, one can no longer interpret a slope coefficient, as the change in the mean response for each additional unit increase in the explanatory variable, holding all the other predictors constant.

I started by running the full regression with the May-June exclusion period using the Variance Inflation Factor (VIF). The rule of thumb is that VIFs exceeding 10 are, signs of serious multicollinearity requiring correction (Engle and Fabozzi, 2007). As presented in Table 2, two of the VIFs — 25.67 for Reserves and 19.27 for External debt — are larger than 10, suggesting that a high degree of multicollinearity is present. The VIF for the predictor Reserves, tells us that the variance of the estimated coefficient of Reserves is inflated by a factor of 25.67 because Reserves is highly correlated with at least one of the other predictors in the model. More so, although not exceeding 10, the VIF for the predictor Fiscal balance is marginally high at about 9.6 and certainly worth further investigation.

<table>
<thead>
<tr>
<th>Variable</th>
<th>VIF</th>
<th>1/VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves</td>
<td>25.67</td>
<td>0.0389</td>
</tr>
<tr>
<td>External debt</td>
<td>19.27</td>
<td>0.0519</td>
</tr>
<tr>
<td>Fiscal balance</td>
<td>9.66</td>
<td>0.1035</td>
</tr>
<tr>
<td>Corruption</td>
<td>4.34</td>
<td>0.2303</td>
</tr>
<tr>
<td>Inflation</td>
<td>3.69</td>
<td>0.2706</td>
</tr>
<tr>
<td>Current account</td>
<td>3.29</td>
<td>0.3043</td>
</tr>
<tr>
<td>Real GDP</td>
<td>2.74</td>
<td>0.3651</td>
</tr>
<tr>
<td>Rating resid</td>
<td>1.24</td>
<td>0.8032</td>
</tr>
<tr>
<td>Mean VIF</td>
<td>8.74</td>
<td></td>
</tr>
</tbody>
</table>

The VIF quantifies the severity of multicollinearity in an OLS regression analysis. It provides an index that measures how much the variances of the estimated coefficients are inflated as compared to when the predictor variables are not linearly correlated.

30
Next, I checked the correlation between Reserves and the variables with the largest VIF, namely, External debt and Fiscal balance. The correlation matrix is presented in Table 3. The correlation between Reserves and Fiscal balance is very whereas External debt and Reserves appear highly correlated. At this stage, it is identified that the multicollinearity present in the model is caused by either or both Reserves or External debt variables.

Table 3 - Partial and semipartial correlations of Reserves

<table>
<thead>
<tr>
<th>Variable</th>
<th>Partial</th>
<th>Semipartial</th>
<th>Partial^2</th>
<th>Semipartial^2</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>External debt</td>
<td>0.9102</td>
<td>0.7606</td>
<td>0.8285</td>
<td>0.5786</td>
<td>0.0000</td>
</tr>
<tr>
<td>Fiscal balance</td>
<td>0.1078</td>
<td>0.0375</td>
<td>0.0116</td>
<td>0.0014</td>
<td>0.2434</td>
</tr>
</tbody>
</table>

One remedy to multicollinearity is simply to remove one or some of the disturbing explanatory variables. In my case, the choice boils down to foreign reserves or external debt. Because I am, in this paper, primarily concerned with government bond spreads, thereby sovereign debt, the decision of which one to remove is clear—Reserves go and External debt remains.

I re-ran the pooled OLS on the entire sample but without Reserves as an explanatory variable. The results from the VIF test (Table 4) indicate no multicollinearity issue. As it appears, the high level of multicollinearity was caused by the variable Reserves. The moral hazard tests (the level, slope and variance) in the next chapter do therefore not contain Foreign Reserves as one of the predictors.

Table 4 – Variance Inflation Factor excluding Reserves

<table>
<thead>
<tr>
<th>Variable</th>
<th>VIF</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiscal balance</td>
<td>7.25</td>
<td>0.137950</td>
</tr>
<tr>
<td>Current account</td>
<td>3.18</td>
<td>0.314477</td>
</tr>
<tr>
<td>Corruption</td>
<td>3.18</td>
<td>0.314672</td>
</tr>
<tr>
<td>Real GDP growth</td>
<td>2.28</td>
<td>0.439487</td>
</tr>
<tr>
<td>Inflation</td>
<td>2.27</td>
<td>0.439876</td>
</tr>
<tr>
<td>External debt</td>
<td>2.13</td>
<td>0.469826</td>
</tr>
<tr>
<td>Rating residuals</td>
<td>1.18</td>
<td>0.847808</td>
</tr>
<tr>
<td>Mean VIF</td>
<td>3.07</td>
<td></td>
</tr>
</tbody>
</table>
5. Results

5.1 Risk of lending to EMU-states after the Greek bailout

Figure 2 shows the evolution of ten-year government bond spreads of six of EMU member-states. These are Belgium and the so-called GIPSI (Greece, Ireland, Portugal, Spain and Italy); also known, in a default-perspective, as the problem-states of EMU. The common denominator for problem-states is the worrying size of their budget deficits and sovereign debts. During the 2008 supreme crisis, the majority of the spreads showed no remarkable divergence from the German benchmark. Up to November 2009, these spreads were, on average, only one percent higher than the German ones. This outcome indicates that, although interlinked, the sovereign debt crisis (or rather the fear of such as crisis) seems more problematic for GIPSI than was the global financial crisis. As predicted by theory, the most noticeable example of this crisis of confidence is the widening of government bond spreads between these countries and the reference rate. Indeed, from early 2010 and thereafter, the widening of spreads between GIPSI and the German benchmark is noteworthy. However, although Ireland and Portugal also belong to the outliers, the Greek case is outstanding. By the end of 2009, the Greek crisis has made the country, by far, the most default-risky in the Eurozone. In fact, in January 2010, its ten-year government bond spreads increased to 400 basis points—then, one of the highest recorded increase in modern history.

Figure 2 - Ten-year bond spreads in the EMU 2008-2011

Figure 3 that shows long-term interest rates for a number of European countries pre- and post-bailout is even more revealing. It captures investors’ current perception of the future (of the
selected countries). The Greek crisis, if anything, seems to have reduced confidence in many European economies. More to add, as it appears, investors’ lack of confidence in GIPSIs does not only concern the short-run. In fact, all problem-states have experienced a sharp increase in their long-term interest rates since September 2010, that is, after the Greek bailout. Further, not only does Greece, by far surpass other countries with its nearly 20% interest rate, the period after the May bailout has been particularly harsh on the country. Besides, although credit ratings should be taken with a pinch of salt, by June 2011, Standard and Poor's has downgraded Greece's sovereign debt rating to CCC, the lowest in the world. Contrary to what traditional bailouts lead to, Greek is perceived as a riskier place than before it was rescued by the EMU and the IMF. Thus, despite the fact that Greece was bailed out, despite the fact that EMU-leaders have reaffirmed their commitment to the Euro and promised to do whatever is needed, frightened investors have required, and continue to demand higher interest rates from several governments (mainly from GIPSIs).

Figure 3- Long-run interest rates in Europe
5.2 Level test

I conducted the level test for each country and each month of the sample period. Table 5 reports the summary-results. In most countries, holding fundamentals constant, fitted spreads were significantly different after the Greek bailout compared to the pre-bailout levels.

Table 5-The level test

<table>
<thead>
<tr>
<th>Country</th>
<th>Periods in which fitted spreads a.b. are significantly different from b.b. spreads (H₁)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>0</td>
</tr>
<tr>
<td>Belgium</td>
<td>6</td>
</tr>
<tr>
<td>Finland</td>
<td>0</td>
</tr>
<tr>
<td>France</td>
<td>12</td>
</tr>
<tr>
<td>Greece</td>
<td>12</td>
</tr>
<tr>
<td>Ireland</td>
<td>12</td>
</tr>
<tr>
<td>Italy</td>
<td>12</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>0</td>
</tr>
<tr>
<td>Nederlands</td>
<td>6</td>
</tr>
<tr>
<td>Portugal</td>
<td>12</td>
</tr>
<tr>
<td>Spain</td>
<td>12</td>
</tr>
</tbody>
</table>

Total no of countries showing rejections of the null 8
Total no of periods 12
Total no of countries 11

Number of observations: 144 R-squared = 0.20. 95% confidence interval. a.b. = after bailout b.b. = before bailout.

Overall, given the specifications of the hypotheses, the results from the level test, to a large extent, rejected the null hypothesis of no moral hazard in favour of the alternative, as the fitted spreads, in most cases, were not the same pre- and post-bailout. However, the results are not conclusive as there are cases where the null could not be rejected. More importantly, the level test, as performed here, only captured the change in fitted spreads, not the direction of such a change. Thus, although indicating the presence of moral hazard, the level test (alone) does not specify whether moral hazard was present before or after the Greek bailout.

5.3 Slope test

Table 6 contains the regression results for the slope test with the exclusion of the high-volatility months May and June. For all the variables, except External debt, the differences in slopes pre- and post-default are significantly different from zero, leading to the rejection of the null in favour of the alternative hypothesis.

Further, all coefficients have the expected signs. High growth and rating, fiscal and current account surpluses are generally desirable situations for the domestic country. These fundamentals are negatively related to country-risk and are therefore associated with significantly lower spreads. On the other hand, high external debt/GDP ratios, high levels of inflation and corruption, tend to increase country-risk and are, for that reason, associated with significantly higher spreads.
More to add, most coefficients appear to increase in the post-bailout period, instead of, as suggested by theory, decreasing. Nonetheless, or maybe due to this surprising outcome, I did not test whether the beta-coefficients themselves were significant.

It might appear as if, the slope and the level tests capture exactly the same phenomenon and that one of them is therefore superfluous. However, that is not the true story. As the name goes, the level test is concerned with the change in the level of spreads. In this test, the fitted spreads are regressed on all fundamentals, first before, and then after the bailout. The fundamentals themselves are held constant. It is the fitted spreads that change or more specifically, the coefficient estimates difference before and after the bailout which varies. What the level test captures is therefore, only the change, if any, in the fitted spreads. In the slope test, on the other hand, I look at the slope of each fundamental before and then after the bailout. What I test, is whether, the difference between the slopes is changing. In other terms, the slope test captures, not the level of the spreads, but rather their sensitivity (relative to fundamentals).

Table 6- The slope test with the exclusion period May-June

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient a.b.</th>
<th>Std error a.b.</th>
<th>Coefficient b.b.</th>
<th>Std error b.b</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation</td>
<td>-0.451</td>
<td>0.1769</td>
<td>-0.012</td>
<td>0.1055</td>
<td>-2.371**</td>
</tr>
<tr>
<td>External d.</td>
<td>0.0005</td>
<td>0.0001</td>
<td>0.0005</td>
<td>0.0006</td>
<td>-0.478</td>
</tr>
<tr>
<td>Cuaccount</td>
<td>0.256</td>
<td>0.0437</td>
<td>0.009</td>
<td>0.0290</td>
<td>5.680**</td>
</tr>
<tr>
<td>Fiscal b.</td>
<td>-0.495</td>
<td>0.0860</td>
<td>-0.263</td>
<td>0.0594</td>
<td>-2.645**</td>
</tr>
<tr>
<td>Real GDP g.</td>
<td>-0.325</td>
<td>0.1228</td>
<td>-0.687</td>
<td>0.0850</td>
<td>3.038**</td>
</tr>
<tr>
<td>Corruption</td>
<td>-0.485</td>
<td>0.0913</td>
<td>-0.012</td>
<td>0.1086</td>
<td>-5.073**</td>
</tr>
<tr>
<td>Rating resid</td>
<td>-1.441</td>
<td>0.2054</td>
<td>-0.951</td>
<td>0.1371</td>
<td>-2.252**</td>
</tr>
<tr>
<td>-const</td>
<td>2.774</td>
<td>0.4986</td>
<td>1.454</td>
<td>0.9081</td>
<td></td>
</tr>
</tbody>
</table>

Number of observations: 45 before bailout 76 after bailout. R-squared = 0.8501. ** Significant at 5% level. a.b. = after bailout b.b. = before bailout. T-value from the test for equality. Two-tailed test.

5.4 Variance test

Table 7 shows the results for the variance test. For the entire sample period, the cross-sectional variance conditional on fundamentals before the Greek bailout is significantly different from the variance after the bailout. I therefore, with no exception, reject the null, that there is no change in the fitted variance of the spreads in favour of the alternative hypothesis. In addition, I found that the change in cross-country variance of spreads was larger for GIPSI compared to other EMU-states.

More importantly, I found that the fitted variances were significantly increasing. This result is striking. Moral hazard, when present, makes investors rely on the insurance of being (indirectly) bailed out. Consequently, country-specific fundamentals become less critical for determining bond yields. In turn, less important are also fundamentals differences across
countries and so the dispersion of spreads. Thus, in the presence of moral hazard in the period after the Greek bailout, I would have expected a decrease in the fitted variances (as a reflection of the insurance of future bailouts).

However, I found just the opposite: a strong increase in the fitted variances, especially for problem-states. More so, the increase in the fitted variances, consistent with the increase in spreads and interest rates observed in Figure 2 and 3, suggest that investors, despite the Greek bailout, have become more *risk-cautious* in the period after May 2010.

Table 7- The variance test

<table>
<thead>
<tr>
<th>Month</th>
<th>Fitted variance b.b.</th>
<th>Fitted variance a.b.</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010.jan</td>
<td>10.35</td>
<td>125.3</td>
<td>0.0178**</td>
</tr>
<tr>
<td>2010.jan</td>
<td>18.56</td>
<td>103.2</td>
<td>0.0243**</td>
</tr>
<tr>
<td>2010.mars</td>
<td>19.20</td>
<td>101.2</td>
<td>0.0273**</td>
</tr>
<tr>
<td>2010.april</td>
<td>19.51</td>
<td>104.4</td>
<td>0.0051**</td>
</tr>
<tr>
<td>2010.may</td>
<td>20.34</td>
<td>107.3</td>
<td>0.0043**</td>
</tr>
<tr>
<td>2010.june</td>
<td>20.23</td>
<td>101.0</td>
<td>0.0092**</td>
</tr>
<tr>
<td>2010.july</td>
<td>21.70</td>
<td>85.06</td>
<td>0.0301**</td>
</tr>
<tr>
<td>2010.aug</td>
<td>11.01</td>
<td>89.14</td>
<td>0.0041**</td>
</tr>
<tr>
<td>2010.sept</td>
<td>10.76</td>
<td>88.14</td>
<td>0.0040**</td>
</tr>
<tr>
<td>2010.oct</td>
<td>12.28</td>
<td>81.86</td>
<td>0.0089**</td>
</tr>
<tr>
<td>2010.nov</td>
<td>52.18</td>
<td>100.1</td>
<td>0.0003**</td>
</tr>
<tr>
<td>2010.dec</td>
<td>57.19</td>
<td>102.7</td>
<td>0.0004**</td>
</tr>
<tr>
<td>2011.jan</td>
<td>80.93</td>
<td>119.2</td>
<td>0.0000**</td>
</tr>
</tbody>
</table>

** Significant at 5% level. Two-tailed test.

Thus, given the results from the variance test, I conclude that there was indeed moral hazard in investor behaviour. However, as far as the period after the default is concerned, the increase in the fitted variances after the bailout presupposes that moral hazard could not have occurred after the Greek rescue-lending. Thus, because the variance test indicates the presence of moral hazard, it should be the case that it existed prior to the Greek rescue-lending.

5.5 Robustness test

I performed a number of robustness checks to test the validity of the results. More specifically, I experimented with several estimation techniques, to check the sensitivity of my results to different specifications regarding the exclusion period.

5.5.2 Estimation with exclusion period

To allow for a more flexible modeling of spreads in the turbulence period, assuming that the errors follow a GARCH (1,1) process, I estimated a model with the ARCH-effect. As reported in Table 8.1, all the variables, except External debt, were significant.
Next, to explore whether a larger exclusion window affects the results, I add one additional month in the exclusion period as to have May, June and July. The results, as reported in Table 8.2, remain essentially unchanged compared to the May-June estimation. All the variables, again except External debt, are significant. As it appears, the results are not sensitive to the exact specification of the exclusion period.

**Table 8.1- ARCH (1) family regression with exclusion period May-June**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient a.b.</th>
<th>Std error a.b.</th>
<th>Coefficient b.b.</th>
<th>Std error b.b</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation</td>
<td>-0.1394</td>
<td>0.0841</td>
<td>-0.4932</td>
<td>0.1361</td>
<td>4.3370**</td>
</tr>
<tr>
<td>External d.</td>
<td>0.0004</td>
<td>0.0009</td>
<td>0.0005</td>
<td>0.0002</td>
<td>0.50468</td>
</tr>
<tr>
<td>Cuaccount</td>
<td>0.0488</td>
<td>0.0226</td>
<td>0.2845</td>
<td>0.0436</td>
<td>-10.5403**</td>
</tr>
<tr>
<td>Fiscal b.</td>
<td>-0.2979</td>
<td>0.0730</td>
<td>-0.5142</td>
<td>0.0882</td>
<td>3.0503**</td>
</tr>
<tr>
<td>Real GDP g.</td>
<td>-0.6384</td>
<td>0.0741</td>
<td>-0.2848</td>
<td>0.0978</td>
<td>-4.6696**</td>
</tr>
<tr>
<td>Corruption</td>
<td>-0.0985</td>
<td>0.0744</td>
<td>-0.5111</td>
<td>0.0611</td>
<td>5.6001**</td>
</tr>
<tr>
<td>Rating resid</td>
<td>-0.9864</td>
<td>0.1131</td>
<td>-1.5584</td>
<td>0.1978</td>
<td>5.2534**</td>
</tr>
</tbody>
</table>

| arch L1. | 1.23  | .2835 | 4.35 | 0.000 | .6774 | 1.789 |
| -cons   | -0.099 | 0.1044 | 0.99 | 0.322 | -0.0973 | .2965 |

**Significant at 5% level. Number of observations: 76**

**Table 8.2- ARCH (1) family regression with exclusion period May-July**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient a.b.</th>
<th>Std error a.b.</th>
<th>Coefficient b.b.</th>
<th>Std error b.b</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation</td>
<td>-0.2394</td>
<td>0.0341</td>
<td>-0.4932</td>
<td>0.2061</td>
<td>7.62**</td>
</tr>
<tr>
<td>External d.</td>
<td>0.0066</td>
<td>0.0099</td>
<td>0.0025</td>
<td>0.0217</td>
<td>0.440</td>
</tr>
<tr>
<td>Cuaccount</td>
<td>0.0608</td>
<td>0.0122</td>
<td>0.3045</td>
<td>0.0236</td>
<td>-19.8**</td>
</tr>
<tr>
<td>Fiscal b.</td>
<td>-0.4979</td>
<td>0.0630</td>
<td>-0.7142</td>
<td>0.0982</td>
<td>3.53**</td>
</tr>
<tr>
<td>Real GDP g.</td>
<td>-0.8384</td>
<td>0.0651</td>
<td>-0.3848</td>
<td>0.0878</td>
<td>-6.87**</td>
</tr>
<tr>
<td>Corruption</td>
<td>-0.0985</td>
<td>0.0744</td>
<td>-0.5111</td>
<td>0.0611</td>
<td>5.60**</td>
</tr>
<tr>
<td>Rating resid</td>
<td>-0.1156</td>
<td>0.1531</td>
<td>-1.9584</td>
<td>0.1978</td>
<td>12.23**</td>
</tr>
</tbody>
</table>

| arch L1. | 1.453 | .3701 | 6.40 | 0.000 | .97584 | 1.9786 |
| -cons   | .00005 | .0000 | 0.37 | 0.733 | -.00015 | .0019 |

**Significant at 5% level. Number of observations: 83**
5.5.2 Estimation with no exclusion period

I started by re-running the ARCH with no exclusion period. The results remain essentially unchanged. Again, all the variables, apart from External debt are significant. The signs of the coefficient are also unchanged. As it appears, correcting for autoregressive conditional heteroskedasticity, leave the results unchanged, independently of the inclusion of any high-volatility period.

Table 8.3 - ARCH (1) family regression with no exclusion period

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient a.b.</th>
<th>Std error a.b.</th>
<th>Coefficient b.b.</th>
<th>Std error b.b</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation</td>
<td>-0,1394</td>
<td>0,0841</td>
<td>-0,5677</td>
<td>0,0658</td>
<td>5,1522**</td>
</tr>
<tr>
<td>External d.</td>
<td>0,0006</td>
<td>0,0000</td>
<td>0,0004</td>
<td>0,0000</td>
<td>1,5093</td>
</tr>
<tr>
<td>Cuaccount</td>
<td>0,0488</td>
<td>0,0222</td>
<td>0,2315</td>
<td>0,0271</td>
<td>-8,1743**</td>
</tr>
<tr>
<td>Fiscal b.</td>
<td>-0,2979</td>
<td>0,0730</td>
<td>-0,4702</td>
<td>0,0406</td>
<td>2,4001**</td>
</tr>
<tr>
<td>Real GDP g.</td>
<td>-0,6384</td>
<td>0,0741</td>
<td>-0,3894</td>
<td>0,0380</td>
<td>-3,3195**</td>
</tr>
<tr>
<td>Corruption</td>
<td>-0,0985</td>
<td>0,0744</td>
<td>-0,6107</td>
<td>0,0718</td>
<td>6,9485**</td>
</tr>
<tr>
<td>Rating resid</td>
<td>-0,9864</td>
<td>0,1131</td>
<td>-1,3530</td>
<td>0,1385</td>
<td>3,3781**</td>
</tr>
</tbody>
</table>

| arch L1.      | 1.21             | .3019          | 4.01             | 0.000         | .6190   | 1.8028  |
| -cons         | .002             | .0041          | 0.62             | 0.535         | -.0055  | .0106   |

Further, I re-ran the OLS slope regression with no exclusion period. As reported in Table 8.4, compared to the case with the exclusion period May-June, the results are weakened, as I have less rejections of the null hypothesis.

Table 8.4 - The slope test with no exclusion period

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient a.b.</th>
<th>Std error a.b.</th>
<th>Coefficient b.b.</th>
<th>Std error b.b</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation</td>
<td>-0,0127</td>
<td>0,1769</td>
<td>-0,4788</td>
<td>0,1047</td>
<td>2,7390**</td>
</tr>
<tr>
<td>External d.</td>
<td>0,0005</td>
<td>0,0001</td>
<td>0,0005</td>
<td>0,0000</td>
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<td>Cuaccount</td>
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<td>0,2269</td>
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<td>-4,9440**</td>
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<td>Fiscal b.</td>
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<td>2,6847**</td>
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<td>Real GDP g.</td>
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<td>Corruption</td>
<td>-0,0126</td>
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<td>0,0926</td>
<td>5,2476**</td>
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<tr>
<td>Rating resid</td>
<td>0,0009</td>
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</tr>
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<td>-const</td>
<td>1,4547</td>
<td>0,4986</td>
<td>2,9240</td>
<td>0,7610</td>
<td></td>
</tr>
</tbody>
</table>

** Significant at 5% level.
Beyond significance status, another interesting outcome with the estimation with no exclusion period is, the change in signs of the Rating variable. The rating residuals are of particular interest due to the manner they were obtained; namely, by regressing credit ratings on fundamentals. The assumption was that the credit themselves were based on macroeconomic fundamentals. However, as Deven Sharma, president of credit rating agency Standard & Poor’s, testified before the U.S. Congress in July 2011:

“Ratings are not statements of fact, but rather expressions of opinion about the likelihood that certain events will or will not happen in the future. Ratings do not speak to what the market value of a security should be or the potential volatility of its price, both of which can be significantly affected by factors other than underlying creditworthiness.”

Thus, contrary to what assumed, credit ratings might not be based on fundamentals as rating agencies’ subjective “judgment and experience” could, roughly put, be anything. Residuals could therefore, be capturing more than they should—omitted independent variables which might influence the spreads. As pointed out by the Financial Crisis Inquiry Commission, the global financial crisis showed that the reliability of credit ratings is and should be questioned. The fact that rating residuals change signs is therefore, reasonably, hard to interpret.

Nevertheless, overall, estimating the model without any exclusion period using OLS with robust standard errors weakens the results and generates coefficients with unexpected signs. However, although identifying a turbulence period per se is important, the exact specification of that period, beyond the highest-volatility months May and June seems less crucial. Adding July leaves the main findings essentially unchanged. Similarly, correcting for autoregressive conditional heteroskedasticity strongly strengthens the results, irrespective of the exclusion of any turbulence period.

Overall, it is worth mentioning that, the time frame, the number of observations and, the ongoing status of the Greek crisis make estimations complicated.

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6. Discussion & Analysis

Starting with the level test, beyond the overall level of spreads, Table 5 shows some other interesting results. First, note that the problem-states are all showing significant changes in the level of fitted spreads. This result is consistent with theory, as riskier countries (which the problem-states are relative to the rest of EMU countries) are expected to exhibit higher spreads.

Second, I find that French results go in line with those of GIPSI, namely, a significant change of fitted spreads after the Greek bailout. This is, somehow an unexpected outcome. France is, despite all, the second (after Germany) largest economy of the Eurozone. What explains that the French spreads are behaving as those of GIPSI despite stronger fundamentals? One plausible explanation for this lower confidence in France’s creditworthiness could be the fact that French banks hold a substantial part of foreign debt of highly-indebted European countries. As of September 2011, Bloomberg estimated that Italian borrowers alone owed French banks approximately 260 billion pounds. Thus, due to financial contagion risks, France is, by being heavily exposed to problem-states’ debt, under significant pressure. More so, although France has, in many aspects better fundamentals than GIPSI, its fiscal position is far from being optimal\textsuperscript{33}. It might also be that the coalition Germany-France (often portrayed as the backbone without which there is no EMU), with the recognition that French bonds just are not safe-haven German ones (see Figure 3), negatively impacts on investors’ perceive risk and France’s creditworthiness.

Third, and perhaps most striking is that Belgian spreads, like the Dutch ones, show significant change only for half of the sample period. In view of its fundamentals and its creditworthiness, the results for Nederlands seem reasonably plausible. Belgian on the other hand, is, at first, a surprising case. In 2010, Belgian public debt was 100% of its GDP\textsuperscript{34}- then, the third highest in the entire Eurozone (after Greece and Italy). The country has ran more than a year with a caretaker government as the two winning parties failed to agree on how to form a majority government. In November 2011, Standard & Poor downgraded its long-term credit rating from AA+ to AA. In addition, during the same period, its ten-year government bond yields over the German reached 5.66%. However, these recent years of domestic political and economic instability, seem not to have had the expected impact on its creditworthiness and eventually on its spreads. However, to Belgium’s defence, it must be added that the country has a relatively low (compared to GIPSI) government deficit (5%). More to add, Belgium debt is mainly owned by domestic creditors, making the country less exposed to financial contagion risks (compared to for example France). Thus, in the light of the above, Belgian spreads, at first appearing as controversial, could as well, simply be reflecting the true picture of the country’s current creditworthiness.

Fourth, for Austria, Finland, and Luxembourg, I do not find any significant change in fitted spreads. The null hypothesis of no moral hazard can therefore, for these golden-states not be rejected. These three countries have more than strong triple A rating in common. They usually top the ranking when it comes to GDP per capita, financial stability, and standard of living\textsuperscript{35}. Traditionally, they report very strong fundamentals in EMU and are therefore, more likely to suffer the least from the effects of a financial and/or sovereign debt crisis.

\textsuperscript{33} See for example Figure A.2a in the appendix.
\textsuperscript{34} All statistics in this section are from the Eurostat and IMF statistics.
\textsuperscript{35} See the 2011 IMF Economic Outlook.
Nonetheless, it should be added that, many of EMU-states’ spreads might have been heavily misestimated after the 2008 financial crisis. Thus, what is perceived as a change in required spreads could simply be a normalization. Speculations are many, facts few.

However, although a change in itself is an important indicator when suspecting moral hazard, the type of change is, as well, a useful component.

As mentioned in the introduction and the theoretical framework; bailouts are events which are, generally, assumed to increase the probability of future rescue-lending and lower investors’ perception of risk. Investor moral hazard manifests itself in many ways. Most frequently, it bubbles to the surface when investment decisions are made. In the presence of moral hazard after the Greek bailout, one will therefore expect a bailout to lead to a decrease in the level of spreads, in the sensitivity with which the spreads react to fundamentals and the cross-countries’ variance of spreads. The logic behind, being that, investors believing that they will go scot free in the event of a crisis, will have no reason to invest time and effort trying to discriminate among bonds and countries according to risk.

6.1 The Greek paradox

Yet, I found that, the fitted variances, instead of declining as expected, were strongly increasing after the bailout. This is the remarkable Greek paradox- that a bailout, an event that normally increases the probability of future bailouts and decreases spreads as a reflection of the lower danger of loss, in the Greek case, led to an increase in spreads. Further, I found that the increase was larger for the problem-states. Accordingly, the distinction between countries with weak (GIPSI) and those with strong (golden-states) fundamentals seems more critical after Greece defaulted than was the case prior to the crisis. If the Greek bailout and the various financial safety nets established by the IMF, the EU and the EMU do not persuade investors that the danger of loss is lower (than before the crisis), it naturally follows that countries with weak fundamentals will display a stronger increase, which they indeed, appear to do. Thus, the bailout of Greece, instead of reducing, appears to have increased the need for investors to concern themselves with potential borrowers’ creditworthiness.

An increase in the fitted variances would have been expected in the case of an event lowering the probability of future rescue-lending. In an emerging market context, such an event was, for example, the Russian non-bailout of August 1998. By not bailing out Russian, international investors worried that the IMF will, in the future, be reluctant in saving troubles countries with weak fundamentals, even those, regarded as too-big-to-fail. As Dell’Ariccia et al (2002) pointed out:

“The Russian non-bailout increased the perceived risk of emerging market debt, particularly of weak countries”.

Equally, the Greek bailout, as captured in Figure 2, 3 and the increase in the fitted variances, did, in the same spirit as the Russian non-bailout, lead to an increase in the risk-perception of developed market debt, especially of weak countries (GIPSI) of the EMU.
6.2 No investor moral hazard: the risky-place argument

This Greek paradox raises two main questions. First, what could explain that investors, despite the Greek bailout, could perceive the Eurozone as a riskier place than was assumed before the country had to be rescued? Second, and perhaps more important, if indeed investors are being more precautionous (as suggested by the higher interest rates demanded, and the higher fitted variances), then their behaviour, as appears after the bailout, can hardly be characterised as morally hazardous. If anything, moral hazard would have made them behave in a riskier and less precautionous way. As already mentioned, such morally hazardous behaviour would have been reflected in a decrease in the fitted variances and lower required interest rates. I see the reverse. Investors’ scepticism concerning EMU-states’ creditworthiness remains strong.

The first question might have many explanations. I found the following, to be plausible reasons, explaining why the Greek bailout had the reverse effect on investor behaviour, making them more, rather than less precautionous:

1) The weakening of the EMU. The fear for a possible dissolution of the EMU (albeit so far only in theory), or the letting-go of some members-states might have increased investors’ perception of risk. While it is unlikely that a sovereign states will stop being an entity or let-go of some problem-regions, the case with the EMU is clearly different. Further bailouts by the EMU, and the maintenance of the Euro as a currency for all member-states, are therefore, from investors’ perspective, perhaps not as given as previously assumed. Hence, the membership in the EMU, at first, appearing as a real source of concern.

2) The weak public support for tax-financed bailouts. Who could have foreseen, that public support for tax-financed bailouts would be so low as to put hearts in fire at dinner tables? Who could have forecasted, that moral hazard will, in Europe, become “public enemy number one” as for me to claim that all Europeans believe in moral hazard?

3) The fear that the lack of consensus among EMU-states will jeopardize future bailouts. Investors might have doubts that policy-makers will be able to quickly contain the crisis. Germany, the motor of Europe, and last remaining holdout, only reluctantly agreed to the bailout of Greece in 2010. According to the Wall Street Journal, Finland went even further by requiring collaterals from Greece as a condition for any further bailouts.

4) The severity of the crisis. The gravity of the Greek and Euro crisis might have been previously undermined. Indeed, who could have, in their wildest fantasy, predicted the deepness of the Greek (and other problem-states) economic and financial crisis?

36 See, articles in Financial Times, the Economist and Bloomberg.
37 See in particular the article in the Guardian, dated 12 July 2011.
38 Dated 19 August 2011.
Fundamentals, in particular, those increasing country-risks; such as budget deficit, debt levels and the country’s overall fiscal soundness (despite the possibility of being bailed out), remain the most influential determinants of bond yields. The default of an EMU country, in itself was shocking, not to mention the news that many other member-states were in similar or even worse economic and financial situation. Thus, it might be that, the bailout of Greece was not enough to restore investors’ confidence in struggling governments.

5) Asymmetric information and increased uncertainty. According to a presentation by Michael Simkovic at the World Bank in 2011, some governments of EMU-states were lying and faking numbers\(^{39}\) (especially deficit and debt levels). If so, fundamentals cannot be entrusted and with contagion risks; spill-over effects and economies barely recovering from a global financial crisis, we have a situation, surely not optimal, even for risk-loving investors. Who could have, given the official fundamentals of many EMU-states, predicted a sovereign debt crisis not to say a Euro-crisis?

6) The efforts to remedy the crisis by establishing stability mechanisms\(^{40}\) might not have been convincing enough. After all (as captured by Figure A.2.d in the appendix), only the Italian potential bailout costs are much larger than the lending capacity of the European Financial Stability Facility (EFSF), Europe’s main bail-out fund. Investors might not believe that the regional and international financial safety nets established since 2008 make crises and defaults less likely and if they do happen, less deep. As the saying goes: “Even mighty Germany cannot stand alone behind the whole Eurozone”.

All the explanations given above are sufficient reasons to have increased investors’ perception of risk after the Greek bailout. All the above are sufficient reasons to explain investors’ paradoxical behaviour given a bailout: that contrary to what a morally hazardous behaviour will lead to, they are more cautious when lending to governments in EMU. All the above are also sufficient reasons to have constituted a wake-up call regarding the risks at stake when irresponsibly lending to developed markets in the EMU.

Investors’ new zeal for precautionary lending could suggest that they were not as careful as they should have been prior to the Greek crisis. Thus, their sudden change in behaviour could as well be attributed to stronger risk-awareness than was the case before the melodramatic Greek crisis. Perhaps, they blindly believed in the “developed-country-do-not-default” ideology. Perhaps, before being awakened by the Greek case, they believed that, in the unlikely event of a default, a developed country of the EMU would be rescued, at no cost for them. Perhaps, after the global financial crisis and governments’ bailouts of financial institutions too-big-to-fail, investors believed that the same will be true in Europe and with European countries.

With this in mind, it might not be surprising that a default indeed occurred. After all, as mentioned in the theoretical framework, the intuition behind moral hazard is that “…insurance reduces the incentives to be precautious, hence rising the likelihood of the event being insured against to actually take place”. Hence, assuming investors perceived an EMU-state default unlikely and that the membership in the EMU made them believe that they will

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\(^{39}\) See, “Bankruptcy Immunities, Transparency, and Capital Structure”.

\(^{40}\) More on financial safety nets in the appendix.
go scot free in the event of a crisis; it is not surprising that their incentives to be precautious were lower than would have been the case without such a guarantee. As theory predicts, being less precautious (i.e., irresponsible lending and reckless risk-taking) tends to increase the probability of the event insured against, say a financial crisis or a default, to actually take place. In that view, the Greek case is an outstanding textbook scenario of how the very availability of financial safety nets can make crises more likely.

6.2 No investor moral hazard: the scot free argument

The fact that investors have reasons to act out of character, mistrusting the insurance of going scot free in the event of future crises in the EMU, supports the claim that moral hazard could hardly have occurred after the Greek bailout. The very essence of moral hazard is the belief that even if an (undesirable) event, such as a default happened, investors will not bear the burden of potential losses. It is the –not-bearing-the-burden, in other words, going scot free, which makes moral hazard, moral hazard.

With hindsight, it appears as if neither investors (mainly banks), nor EMU-states nor Greek tax-payers went scot free from the crisis. Investors’ haircuts were comparatively large. In fact, on October 2011, they were forced to accept a 50% write-off of their Greek loans, according to the Economist and BBC, an equivalent of 100 billion Euros. If losing half the value of a bond does not amount to a loss, what does? Thus, investors (or rather the majority of those) did not go scot free from the Greek bailout. However, neither did the rest of the EMU-countries. The Greek bailout led to a serious crisis of confidence in many other EMU-countries, even still solvent states (see for example the article by Brendel and Pauly, 2011). In an attempt to restore confidence in their economies, member-states undertook severe austerity measures (e.g., higher taxes and lower expenses) and many countries are still under pressure (see the IMF Economic Outlook 2011). More to add, merely a year after their rescue-lending to Greece, it became obvious that with the original interest rates, the Greek debt was not sustainable. The EMU-states were forced to lower the interest rates and extend the maturity of their loans. Generally speaking, EMU-states had to, as phrased in the Economist: “...wake up from the lie that Greece could one day repay its debt”.

Thus, EMU-states can hardly be said to have gone scot free from the Greek bailout. Greek citizens and tax-payers definitely did not. First, the bailout was not a free-lunch. As confirmed by the EMU and the IMF, it was made of relatively high-interest loans. Second, the rescue-lending was conditional on the implementation of harsh austerity measures. Draconian measures, which costed thousands of Greeks, their jobs, their homes, even their pension savings.

Thus, the costs for being bailed out are to be considered as high enough to have offset reckless risky behaviour in (the nearest) future. If being bailed out is a victory, then in the Greek case, it was a pyrrhic victory, i.e., a victory gained at too great a cost, a victory hardly worth winning because of the devastating costs it carries. A victory that investors, governments and EMU-citizens, would perhaps have been without if they thought they could.

41 There might be speculators and other actors who benefited from the Greek crisis.
42 See for example, the article in the Economist, http://www.economist.com/node/21534851
43 Can be found at http://www.spiegel.de/international/bmeiness/0,1518,764299,00.html
6.3 Bailouts after the Greek bailout

Some will argue that moral hazard, if hard to capture and ensure analysing investors' behaviour in the period after the Greek bailout, can, on the other hand, hardly be fully refuted. As we all know, the Greek bailout was followed by an 85 billion Euro rescue-package for Ireland in November 2010 and a 78 billion Euro rescue-lending to Portugal in May 2011. Most striking, Greece itself was bailed out a second time, to an amount estimated to 109 billion Euros, barely a year and a half after its first bailout. Besides, as notified earlier, heads of government of the Eurozone have, at numerous occasions affirmed their: "...commitment to the Euro and to do whatever is needed to ensure the financial stability of the Euro area as a whole and its Member-states". Where whatever is needed could comprise anything: bailouts, huge bailouts, even multiple bailouts. All the above, the argument goes, are evidence that bailing out Greece in May 2010 sent signals that other countries could be rescued as well. All the above, some pledge, must have led to moral hazard in investors' behaviour.

That EMU had to rescue more member-states after Greece does not per se imply that there was moral hazard. More so, causes and conditions surrounding the defaults in EMU-states vary across countries. The Irish default for example, was according to Roberts (2010) not caused by typical government over-spending or traditional domestic fiscal sustainability problems. The country's ruin came from a different source. The Irish state guaranteed bonds issued by banks that had financed a property bubble. To finance these bad loans, the country borrowed money from the ECB, putting their own public finances at risk. Eventually, the mechanism collapsed and in 2010, the Irish budget deficit ran to 32% of its GDP, then, the highest recorded budget deficit in the history of the EMU. Without statistical defendable evidence, claiming that there is investor moral hazard merely because other countries were bailed out after Greece is simply an opinion, not a scientific accurate fact.

In addition, even if bailouts were game, the scot free argument still applies. There will only be moral hazard if those concerned by the default go scot free from the crisis. There will only be (worrying) investor moral hazard if investors go or think they will go scot free in the event of a bailout. As long as private creditors take losses, as long as the haircuts are large enough, bailouts will be undesirable events for investors. As long as international investors are not free-riding on tax-payers, there will be little incentives for them to behave in excessive risky ways (or even precipitate a default by speculating). As long as the bailout-stigma frightens governments and investors; as long as strict conditionality and austerity measures push governments to maintain sound fundamentals, financial crises will be unlikely and bailouts unnecessary. In fact, if bailouts do occur, they will be only pyrrhic victories. At the end, if suffering the damage, no country wants to be Greeced and no investor enjoys haircuts.

Investor Moral hazard boils down to this: That investors go scot free in the event of a crisis, which lowers their incentives to be precautious in the future, making a crisis (even) more likely. The scot free element being the prerequisite, sine qua non, there is no rum for excessive risk-taking. Note that this relies on the (strong) assumption that governments act in the best interest of their people, which is, perhaps, a strong requirement.

\[45\] See, statistics from the Irish Central Statistics Office, CSO.
7. Conclusion

This paper investigated whether the Greek bailout by the EMU and the IMF in May 2010 led to investor moral hazard in the European bond market. Bailouts, by implicitly insulating investors from losses, tend to alter their perception of risk. This usually leads to (more) excessive lending and reckless risk-taking than would have been the case without the insurance of being rescued. To detect a possible change in investors’ behaviour, I studied Eurozone’s ten-year government bonds, focusing on the level of spreads, the slope coefficients relating spreads to country-specific fundamentals and the cross-country variance of spreads.

I found significant change in the level, the sensitivity, and the dispersion of spreads in the period after the Greek bailout. These results reject the hypothesis that there were no moral hazard effects in investors’ behaviour. However, although a change in itself is a good indicator of possible moral hazard, it is not sufficient for determining if this occurred before or after a bailout. The type of change, whether an increase or a decrease, is the revealing element.

In that regard, my findings are striking. Instead of lowering the fitted variances as a reflection of the lower danger of loss in the period after the Greek bailout, fitted variance are strongly increasing. Moreover, the increase is larger for EMU-countries with weak fundamentals, notably Greece, Italy, Portugal, Spain, and Ireland (GIPSI). Thus, my results confirm the importance, beyond the possibility of being bailed out, of having strong fundamentals. Contrary to what the insurance of future bailouts usually lead to, investors seem, after the Greek bailout, to devote more attention to country-specific macroeconomic indicators, differentiating countries according to credit risk. Accordingly, their required interest rates (i.e. risk-premiums) for GIPSI in the post-bailout period are found to be much higher than for countries with stronger fundamentals. Moreover, contrary to how bailout induced-moral hazard usually manifests itself; the Greek bailout did not let investors go scot free from the crisis. Investors’ haircuts were as large as 50% of the original loans, making the prospect of future bailouts, far from desirable. Losing half the value of a bond amounts to a loss, (which is) to be considered high enough to offset excessive risky behaviour in the (nearest) future. This is the Greek paradox. That a bailout, instead of reducing, appears to have increased the need for investors to concern themselves with borrowers’ creditworthiness.

This (sudden) precautious behaviour of investors could indicate that they were, prior to the Greek bailout, taking excessive risks. Thus, their sudden change in behaviour could as well be attributed to stronger risk-awareness than was the case before the melodramatic Greek crisis. Therefore, the Greek bailout could be viewed as a wake-up call, which made investors (more) aware of the risk of lending to countries with weak fundamentals, even if those countries were developed economies of the (currently) strongest monetary union in the world. Thus, rather than confirming the existence of moral hazard after the bailout, my findings appear to indicate that investor moral hazard was present prior to the Greek crisis.

Further, rather than calming down the market by signalling that European and IMF’s financial safety nets were functional and efficient, the rescue-lending to Greece, set the entire Eurozone in turmoil. The Greek crisis unveiled that the severity of the crisis in the Eurozone was stronger than previously assumed. Many other EMU-states turned out to be in similar (or even
worse) financial and economic situations as Greece. Since the Greek default, many of these countries have undertaken substantial reforms to avoid an outcome similar to Greece.

There are many explanations to the Greek paradox. The most critical being the substantial haircuts and losses investors had to pull with despite the fact that Greece was bailed out. Besides, the fear of a possible dissolution of the EMU, or the letting-go of some problematic states, although strongly dismissed by EMU leaders, might have contributed in increasing investors’ perception of risk in the EMU. The role of the Greek bailout, in regard of moral hazard is therefore of particular interest. Interpreted in this paper as leading to an increase in the probability of future bailouts, thereby lowering incentives for investors to be precautious, it turned out to have the reverse effects. Thus, the Greek rescue-lending is not to be viewed as a traditional bailout as it led to more precautious investors’ behaviour in the aftermath of the Greek bailout.

More so, the Greek crisis showed that fundamentals, good fundamentals, remain the key determinant of good creditworthiness. The Greek crisis showed that, being a developed economy or a member-state of a monetary union does not per se eliminate the risk of a default or guarantee a bailout. Perhaps more importantly, the Greek crisis showed that, bailouts do not have to be painless and let investors go scot free. Of course, this relies on the assumption that EMU and member-states’ governments act in the best interest of their people. Without this assumption, investors will free-ride on tax-payers’ public finance and will have no incentives to alter an excessive risky behaviour.

Although this paper has provided novel information about rescue-lending in the European market, some parts of the puzzle are still missing. In particular, the possibility of reverse causation, a common problem in applied economics, remains undetermined. For instance, do bailouts lead to morally hazardous behaviour or is excessive risky behaviour fostering countries’ defaults and bailouts? It is difficult to establish cause and effect with many of these variables at play, and in many cases, they may interact.

Equally, my results do not explain whether the increase in spreads is solely due to the risk-reduction effect of future EMU and IMF rescue-lending (prior to the Greek bailout) or the perception that the Eurozone was a riskier place despite the regional and international safety nets established since 2008.

In addition, due to sample limitations, the results from this paper should be treated cautiously. The number of observations is one particular constraint. Moral hazard could prove even greater (or lower) if the sample size, the time frame, data frequency and the choice of fundamentals were to obey different standards.

Besides, as the Greek and the European debt crisis are still ongoing issues, it is, at this point, difficult to fully assess their causes and effects. There could be, beyond moral hazard, other significant factors affecting investors’ investment decisions. It could be that, European financial safety nets made crises in Europe unlikely and less deep, without necessarily causing moral hazard. There could also be, other aspects of the Greek crisis and regional rescue-lending that have been omitted in this paper. Covering every possible aspect of the Greek bailout and large-scale rescue-lending in general, was never my ambition. This paper should therefore be read, set, and understood in its context, remembering that reality is, as always, much more complex than portrayed in economic papers.
Nevertheless, even if the presence of moral hazard after the Greek bailout can be questioned, this does not mean that rescue-lending can no longer cause moral hazard. Because the bailout of Greece appears as a pyrrhic victory, it does not imply that 50% investors’ haircuts is the magic key to a world with (only) good incentives.

Thus, the limitations of this thesis and the scope for which it has been analysed leaves several dimensions along which moral hazard can be explored. One could, more formally, perform a two-stage testing approach by first testing whether there is a change in the fitted variances, and in the second stage, test for the direction of the change.

Given that financial safety nets reduce (perceived) risk, it will be of particular interest to analyse whether the newly established financial safety mechanisms in Europe provide the necessary insurance without inducing excessive risky behaviour. At the end, the issue boils down to a trade-off between a reliable framework for crisis management and minimizing moral hazard. A balance between efficient liquidity and conditionality. How to provide insurance without lowering the incentives to avoid being in a liquidity trap in the first place? How to increase private sector involvement and share of the burden without making it commercially unfair? How to increase financial stability without making crises more likely? How to protect tax-payers (from investors’ recklessness) without going against the rules of the free market? Insurance benefits versus the costs of moral hazard. Which is worse, credit collapse or moral hazard? How financial safety nets and bailouts should, when they take place, be designed as to reconcile (so far) incompatible economic and political ambitions?

Further, as the number of empirical studies concerned with investor moral hazard in the bond market in EMU is quite small, future studies on these and related topics are certainly warranted. Such are for example research that increases our understanding of how government decisions affect investors’ behaviour (and vice versa). Future research could also look at the right extent of private sector involvement in crisis intervention to help determine whether bailouts at no moral hazard costs can be made standard.

In addition, there is a perception that Europeans, both politicians and tax-payers are strongly adverse to moral hazard. A comparison of social attitude between Europeans and Americans for example, could shed a light on this issue. As other EMU countries were bailed out after Greece, one could study more explicitly whether a different event, say the Irish bailout, which lacks the wake-up call interpretation, leads to the same findings as of this paper.

More to add, there are those (see for example Mussa, 2002; Jeanne and Zettelmeyer, 2004) who argue that creditors’ losses by far exceed the potential value of IMF rescue-packages, making worrying moral hazard unlikely. Besides, according to Nunnekamp (1999) and Lane and Phillips (2000), IMF loans in themselves, are too small to generate significant moral hazard. It is worth exploring whether this is true for EMU bailout packages as well.

Clearly, much needs to be done before my conclusions can be incorporated in policy analysis. Until then, moral hazard remains a suitcase of memories.
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[www.bpportugal.pt](http://www.bpportugal.pt) - The webpage of the Portuguese Central Bank.
[www.bde.es](http://www.bde.es) - The webpage of the Spanish Central Bank.

[www.bloomberg.com](http://www.bloomberg.com) - The web publication of the news corporation “Bloomberg”.
[www.economist.com](http://www.economist.com) - The web publication of the magazine “The Economist”.
[www.ft.com](http://www.ft.com) - The web publication of the magazine “Financial Times”.
www.guardian.co.uk - The web publication of the magazine “the Guardian”.

www.standardandpoors.com - The webpage of the Credit Ratings Agency “Standard and Poors”.

www.fitchratings.com - The webpage of the Credit Ratings Agency “Fitch”.

www.moodys.com - The webpage of the Credit Ratings Agency “Moody’s”.

www.transparency.org - The webpage of the Transparency International Organisation.
Appendix 1: Tables and Figures

Figure A.2a. - Current account balances 2010

Germany had a significant trade surplus, one of the remaining rare net exporters in Europe after the global financial crisis of 2008. The problem-states GIPSI and France all have trade deficits.

Figure A.2.b – Ten-year government bond spreads over Germans’
Figure A.2.c. – Two- and Ten-year government bond spreads over Germans’

Figure A.2.d – Bailouts costs in the EMU
<table>
<thead>
<tr>
<th>Country</th>
<th>Rating (Standard and Poor's as of Dec 2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Austria</td>
<td>AAA</td>
</tr>
<tr>
<td>2. Belgium</td>
<td>AA</td>
</tr>
<tr>
<td>3. Finland</td>
<td>AAA</td>
</tr>
<tr>
<td>4. France</td>
<td>AAA</td>
</tr>
<tr>
<td>5. Germany</td>
<td>AAA</td>
</tr>
<tr>
<td>6. Greece</td>
<td>CC</td>
</tr>
<tr>
<td>7. Luxembourg</td>
<td>AAA</td>
</tr>
<tr>
<td>8. Ireland</td>
<td>BBB+</td>
</tr>
<tr>
<td>9. Italy</td>
<td>A</td>
</tr>
<tr>
<td>10. Nederlands</td>
<td>AAA</td>
</tr>
<tr>
<td>11. Portugal</td>
<td>BBB-</td>
</tr>
<tr>
<td>12. Spain</td>
<td>AA-</td>
</tr>
</tbody>
</table>

Table A.2.b. - Partial and semi-partial correlations of rating residuals

<table>
<thead>
<tr>
<th>Variable</th>
<th>Partial</th>
<th>Semi-partial</th>
<th>Partial ^2</th>
<th>Semi-partial^2</th>
<th>Sign.Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>External debt</td>
<td>-0.0910</td>
<td>-0.0821</td>
<td>0.0083</td>
<td>0.0067</td>
<td>0.2883</td>
</tr>
<tr>
<td>Inflation</td>
<td>-0.3234</td>
<td>-0.3068</td>
<td>0.1046</td>
<td>0.0942</td>
<td>0.0001</td>
</tr>
<tr>
<td>Reserves</td>
<td>0.1961</td>
<td>0.1796</td>
<td>0.0385</td>
<td>0.0322</td>
<td>0.0211</td>
</tr>
<tr>
<td>Current account</td>
<td>0.3336</td>
<td>0.3177</td>
<td>0.1113</td>
<td>0.1009</td>
<td>0.0001</td>
</tr>
<tr>
<td>Fiscal balance</td>
<td>-0.4406</td>
<td>-0.4406</td>
<td>0.1941</td>
<td>0.1941</td>
<td>0.0000</td>
</tr>
<tr>
<td>Real GDP</td>
<td>0.2002</td>
<td>0.1835</td>
<td>0.0401</td>
<td>0.0337</td>
<td>0.0185</td>
</tr>
</tbody>
</table>
Appendix 2: Supplementary Information

A.3.1 European crisis mechanism

The European Financial Stability Facility (EFSF) was created by member-states of the Eurozone in June 2010. The EFSF is Europe’s main bail-out fund with the mandate to safeguard financial stability by providing financial assistance to the member-states. To raise the funds needed to provide loans to member-states and recapitalize banks or buy sovereign debt, the EFSF issues bonds and other debt instruments on the capital markets. It has a lending capacity of €440 billion and is backed by guarantee commitments from Eurozone member-states for a total of €780 billion (with a gold-plated AAA credit rating). So far, the EFSF has been activated two times: In November 2010, after a request from Ireland, it raised funds amounting to €17.7 billion (of the total €67.5 billion rescue package for Ireland) and in May 2011 after a request from Portugal. The EFSF contributed to approximately one third of the €78 billion rescue-package for Portugal. It has been debated whether or not the EFSF is big enough to shield the bigger economies and handle future contingencies. The fear for the recapitalization of many banks in Europe, that Italy and Spain might have to refinance bonds worth up to €1 trillion, not to mention the worrying sizes of deficits that will need to be financed one way or another has put the question at the center of the discussion. The EFSF has tenure of three years and is thereby set to expire in 2013, running one year parallel to the European Stability Mechanism (ESM).

The European Stability Mechanism (ESM) is a permanent bailout mechanism to succeed the European Financial Stability Facility (EFSF) and European Financial Stabilization Mechanism (EFSM) in July 2012. The Treaty (paragraph 3 of article 136 of the Treaty on the Functioning of the European Union) reads: “The member states whose currency is the euro may establish a stability mechanism to be activated if indispensable to safeguard the stability of the euro area as a whole. The granting of any required financial assistance under the mechanism will be made subject to strict conditionality.” The ESM is to have a lending capacity of €500 billion. Although the ESM is primarily for member-states of the Eurozone, it will also be open to non-euro area EU countries. Source: www.esfs.europa.eu

A.3.2 ECB measures during the Euro-crisis

The ECB has used a series of so-called “nonstandard” measures to promote credit creation in the Eurozone and ensure that liquidity continues to flow, thereby preventing a seizing-up of financing flows and a disruption of the European financial system as a whole. Some of these special measures include:

1. A reduction of the minimum threshold for some loan deposits from AAA to a single A credit rating. In fact, on 3 May 2010 the ECB announced it will accept as collateral all outstanding and new debt instruments issued or guaranteed by the Greek government, regardless of the nation’s credit rating.
2. Allowing individual national central banks to buy government debt using open market operations (of course, to prevent a rise in inflation, the ECB had to sterilize the same amount of liquidity).
3. Allowing individual national central banks of the Eurozone to take bank loans as collateral and allowing commercial banks to use a wider range of assets as collateral when raising funds from central banks.
4. Cutting the reserve ratios required of banks by half to 1%.
5. Cutting the ECB key market interest rate by a quarter point.
6. Two long term refinancing operations running 36 months, with an option of repayment a year later.
7. Reactivate the dollar swap lines with the American Federal Reserve.

Source: www.ecb.int

A.3.3 More on the CPI

The following information is directly taken from Transparency International webpage www.transparency.org:

The 2010 CPI measures the degree to which public sector corruption is perceived to exist in 178 countries around the world. It scores countries on a scale from 10 (very clean) to 0 (highly corrupt). The 2010 results are drawn from 13 surveys and assessments published between January 2009 and September 2010. The data is collected by 10 independent institutions. All sources measure the overall extent of corruption (frequency and/or size of bribes) in the public and political sectors, and all sources provide a ranking of countries, i.e. include an assessment of multiple countries.

Steps to calculate the CPI:
1. The first step to calculate the CPI is to standardize the data provided by the individual sources (that is, translate them into a common scale). We use what is called a matching percentiles technique that takes the ranks of countries reported by each individual source. This method is useful for combining sources that have different distributions. While there is some information loss in this technique, it allows all reported scores to remain within the bounds of the CPI, i.e. to remain between 0 and 10.
2. The second step consists of performing what is called a beta-transformation on the standardized scores. This increases the standard deviation among all countries included in the CPI and makes it possible to differentiate more precisely countries that appear to have similar scores.
3. Finally, the CPI scores are determined by averaging all of the standardized values for each country.

A.3.4 Definitions and Additional information

A developed economy typically refers to a country with a relatively high level of GDP, industrialization, general standard of living and a high amount of widespread infrastructure. An emerging market economy (EME) on the other hand, is defined as an economy with low to middle per capita income. EME are sought by investors for the prospect of high returns, as they often experience faster economic growth. Investments in emerging markets come with much greater risk due to political instability, domestic infrastructure problems, currency volatility and limited equity opportunities. Source: www.investopedia.com

Government bonds are bonds issued by a national government and denominated in the country’s own currency. They are usually considered as risk-free bonds as the government has the power to raise taxes to redeem them at maturity.
The risk premium is the difference between the rate of return and the risk free rate of return.

The yield spread is the difference in yield between two bonds, or a bond yield and a recognized benchmark yield of comparable maturity. A country’s bond spread is thus the weighted average of all the spreads of all the bonds.

The EMU or Eurozone is an economic and monetary union (EMU) of seventeen European Union member-states that have adopted the Euro (€) as their common currency.

The four Asian Tigers are Hong Kong, Singapore, South Korea and Taiwan.

International investors are for example foreign banks, bondholders and other financial institutions and multinationals.

Although providing an implicit guarantee to the investors, the IMF does formally only bailout countries.

Bailout expectation can also impact on the spreads by affecting the country’s fundamentals such that \( X_i = X_i(b) \). For example through unsound monetary expansion or other governmental policies. In the literature, this is referred to as “country moral hazard” because it leads to the deterioration of the debtor country’s policies in the presence of a financial safety net, which an expected bailout undeniably represents.

Some may claim that it is the default and no the bailout of Greece that was unexpected. Once it was defaulted, the bailout was rather given. Some, like me, will argue that given the macroeconomic indicators, a Greek default in itself was a logical continuation of the crisis. Its (first) bailout by the EMU, on the other hand, was rather unexpected. This is, I agree, a questionable view; I leave to the readers to form their own opinion.

Although German Chancellor Angela Merkel and French President Nicolas Sarkozy have, on several occasions publicly said that they would not allow the Eurozone to disintegrate and have linked the survival of the Euro with that of the entire EU. See for example the "Merkel makes Euro Indispensable Turning Crisis into Opportunity". Bloomberg Business week. MacCormaic, Ruadhan (9 December 2011). "EU risks being split apart, says Sarkozy". Irish Times.