GREECE VS. THE EUROZONE:

THE EXIT PUZZLE

BY

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I think we are miserable partly because

we have only one god, and that is economics.

— *James Hillman*

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ABSTRACT

As a result of the worsening nature of the Greece sovereign debt crisis, the idea of expulsion or exit of a member state from the European Monetary Union (EMU) has been widely discussed since May 2011. Although there are many research that investigate the possible causes and consequences of the crisis, to the best of my knowledge, none examines the evolution of expectations that the idea of the exit is altered within the zone. This thesis analyzes the uncertainty that surrounds Greece's membership to the EMU. The idea behind the research is as follows: The evolution of expectations about Greece's exit is an unobservable movement that is in relation with the public opinion on the subject; moreover financial markets, specifically sovereign bond yields and credit default swap spreads, yield noisy information about this behaviour. Therefore both societal and financial determinants are incorporated in the analysis. In order to capture the viewpoint of the European society, news statements from Bild (Germany), The Guardian (England), Le Parisien (France) and Reuters are compiled. By using this news compilation, following the common quantification methods of a qualitative data, a sentiment index is built that captures the European society's approach to the expulsion of a member state. Modelling the expectations as an unobservable variable in relation with sentiment index, and analysing cds spreads with 5-year-maturity, and bond yields with 3 and 5 years of maturities as noisy observations, I build a state space and solve it recursively by using kalman filter. The resulting expectation index captures some important events about the exit of Greece from the union that occurred between May 2011 and February 2012, which is the time span for the analysis due to data restrictions...

Keywords: Quantification, State Space Modelling, Kalman Filter, Expectations, Greece, European Monetary Union, Indexing, Debt Crisis

ÖZET

Yunanistan borç krizinin derinleşen yapısının bir sonucu olarak ortaya çıkan, üye bir ülkenin Avrupa Parasal Birliği'nden ayrılması fikri Mayıs 2011 tarihinden itibaren tartışılmaktadır. Kriz ile ilgili yapılan araştırmalar krizin sebepleri ve sonuçları üzerine yoğunlaşmaktadır. Bu tez ise, ayrılma fikrinin ortaya çıkışı ile Avrupa Birliği'nde değişmekte olan beklentilerin değişim davranışları ve özellikleri üzerine bir araştırmadır. Beklentiler, konu ile ilgili toplumsal görüş ile ilişki içerisinde, gözlemlenemez bir değişken olarak ele alınmıştır. Bununla birlikte finansal piyasalarda kullanılan cds ve bono ürünlerinin marj ve oran değişikliklerinin, beklentilerin değişimi ile ilgili bilgi taşıdığı öngörülmüştür. Bu kapsamda beklentiler, hem sosyal hem de ekonomik etmenler göz önüne alınarak incelenmiştir. Beklentiler ile ilgili toplumsal görüşü yansıtabilmek amacı ile Alman Bild, İngiliz The Guardian, Fransız Le Parisien ve Uluslararası Reuters haber kaynakları aracılığı ile haberler toplanmıştır. Bu haberler kullanılarak, nitel datanın nicel dataya çevrilmesi için kullanılan genel teknikler kapsamında bir duyarlılık endeksi yaratılmıştır. Beklentiler, duyarlılık endeksi ile ilişkili olarak düşünülmüş, finansal araçlardan elde edilen bilgiler ile bir durum uzayı oluşturulmuş, ve kalman filtresi kullanılarak çözülmüştür. Sonuç olarak elde edilen beklenti endeksi, Yunanistan'ın Avrupa Parasal Birliği'nden çıkışı ile ilgili görüşme sürecinde yaşanan önemli olayları yansıtabilmektedir. Araştırma, data kısıtlamaları sebebi ile, Mayıs 2011 – Şubat 2012 sürecini kapsamaktadır....

Anahtar Sözcükler: Nicelleştirme, Durum Uzayı Modellemesi, Kalman Filtresi, Beklentiler, Yunanistan, Avrupa Parasal Birliği, Endeksleme, Borç Krizi

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To my father, mother, sister, and p.w.

Part I

EXPECTATION INDEX

INTRODUCTION

The sub-prime mortgage crisis originated at the United States and spread around the globe as a global financial turmoil. Since the beginning of the crisis, late 2008, global economic agenda has been on recovery and restructuring of the damaged economic system. The degree of the regulation on the financial system has been widely discussed as well. Although most of the discussion started on the periphery of the U.S. economy, in time, shaken structure of the global economic system has revealed another weak spot at a different continent, Europe.

Namely the Eurozone crisis, The European sovereign debt crisis started in the late 2009 when the European governments faced with difficulties in repayment and refinancing of their outstanding loans. Similar to the asset bubble that was created by unrestrained securitization in the U.S., the European governments used various financial tools, including off-balance sheet transactions and complex derivatives, to increase their debt amounts without violating the Maastricht Criteria (Brown and Chambers (2005)). Moreover converging long term interest rates before the crisis led some countries to borrow a lot cheaper than they could, and resulted in excessive borrowing. Figure 4 is widely used in the literature to point out this phenomena. The problems in this scheme began to unravel when refinancing of the existing debts started to be difficult due to lack of liquidity and trust in the financial markets that were in a severe meltdown. The severity of its debt brought forth a state to the shores of bankruptcy. As an unexpected result, policy makers of the Eurozone started to mention expulsion of a member state from the European Monetary Union (EMU).

Once considered a taboo, politicians, investors, public, and economists now discuss Greece's alleged exit from the EMU assiduously. Even though the European treaties do not specify a procedure for expulsion of a member state from the EMU (Athanassiou (2009)), the European countries' decreas-

ing support raises doubts about the country's future in the union. These doubts have been augmented by the claims that advise exit and default as a way out of the Greek debt crisis. About Greece's exit from the union, public statements have oscillated between exit and unity.

The reason behind the policy makers' and investors' attention in the discussion is that a potential exit engenders financial contagion(Kouretas and Vlamis (2010)), and begets questions about the integrity of the union (Blundell-Wignall and Slovik (2010)). Financially, an exit will result in the introduction of a national currency, which will be less valuable than Euro, culminating in an increase in the debt burden since 96.1% of Greece's debt is in Euro.[1]. This composition of the debt burden is the basis of the belief that a default is expected following an exit scenario (Alcidi et al. (2012)). Table 2 presents percentage ratios of countries' claims on Greece to their GDP at the end of 2012 and illustrates a loss of Eurozone wide 0.18% of GDP in case of a default. Moreover, in a default scenario, it is evident that some other countries, especially Portugal, would take large hits. Thus, there are reasons for lenders to turn their eyes to other periphery countries who are in turmoil as well, even though they are not as indebted as Greece (for example as of 2012, Greece's Public Debt to GDP ratio is 170.3 whereas that of Portugal's is 108.3, please see Figure 5)[2]. Therefore, the likelihood of Greece's exit is closely linked to the investment choices on the other troubled countries. A high likelihood of Greek default may increase the risk of investing in the other countries, which increases their borrowing rate, which in turn may generate a series of crises throughout the Eurozone. Hence, by altering the risk perceptions of investors about the other EMU countries, Greece's exit would cause a financial contagion (Gerlach (2010)). Furthermore, an exit would also shift the perception of social integrity in the union. Hitherto, expectations about the integrity of the union have been firm because a member country cannot be expelled from the union. Although rumors of Greece's exit are likely to fracture the expectations feebly, the occurrence of an exit would certainly alter them (Buchheit and Gulati (2013)). An exit would cause investors to question the unity of the zone whenever they face a Eurozone member with such an economic trauma. Once a country is expelled from the zone, altered

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1 Source: Greece Public Debt Management Agency
2 Source: Eurostat

expectations will lead markets to contemplate a similar expulsion in the future crises as well. Therefore an expulsion would damage the reputation of the zone in terms of its integrity. In this sense, Greece's exit also has social costs for the zone that may be difficult to recover. These points suggest that the possibility of Greece's exit generate additional costs to be priced at the financial markets. Therefore understanding the behaviour of the changing expectations about the exit from the union is a noteworthy indicator for policy makers and investors alike.

Table 3 presents claims of banks of some major European countries on Greece. We observe an increasing exposure of European banks to Greek debt until 2009. However thereafter, when worries about the Greek crisis began to disseminate around the Eurozone, it is apparent that the European banks started to pull their financial support from Greek borrowers. All European countries, without an exception, reduced their exposure to Greek debt during 2010. This first reaction to escape from the sovereign risk would be expected since signs of a crisis would certainly displease the risk appetite of investors. However, even though European policy makers made statements to support Greece in these financially difficult times, and loans from international lenders, such as the IMF, were provided through rescue packages, the decline in exposure to the Greek debt as bank loans continued in 2011 and 2012 as well. This is an indicator of European policy makers' inability to signal their willingness to help Greece eloquently (De Grauwe (2010)). The table indicates that European lenders still avoid acquiring Greek debt. Moreover, during the crisis, Greece's credit rating faced a gradual downgrade from A to its current value B- after collapsing down to CCC, Table 4 presents the downgrades done by Fitch Ratings. These downgrades, amalgamated to decreasing European exposure to Greek debt, raises worries about Greece's capacity of debt renewal. As Figure 6 illustrates, the bulk of the Greek debt matures within the next two years. Considering the current financial turmoil that Greece faces, a failure to rollover its maturing debt would risk sovereign default. Financial institutions in lender countries have already signaled their unwillingness to rollover by reducing their debt exposure continually. Thus the likelihood of rollover failure is substantial. Given that understanding the effects that alter the expectations about the exit is also important to estimate

a likelihood for Greece's exit.

Despite its importance, there exist many research that analyze various aspects of the crisis but none sheds light on the expectations that agents in the euro economy have about the exit. With this work, I aim to contribute to the literature by deriving the effects that alter the expectations about the exit of Greece from the EMU. This is achieved through building an index to quantify the behaviour of the expectations over time and analyzing it. In this quantification, I use the sentiment that is revealed by economic figures and policy makers, such as central bankers and politicians, and the private information that is revealed by investors through Greek sovereign bond yields and credit default swap (cds) spreads. Therefore I combine qualitative and quantitative information to obtain the expectations about the exit. There are various reasons for applying this methodology. For example, Stanton and Wallace (2011) analyze cds spreads as a benchmark tool. Their findings suggest, during a financial crisis and used alone, cds spreads fail to represent future default risks. Pastor and Veronesi (2009) suggest, financial instruments respond better to learning models instead of those built with rational expectations, thus laws of price formation are mostly violated. Moreover, some other articles, such as Duffie (2010) or Garleanu and Pedersen (2011), shows deviations from law of one price and rational expectations in financial markets with slow moving capitals and liquidity shortages. Therefore, considering Greece's inability to access foreign capital and liquidity, solely using prices of financial assets as benchmarks to analyze the expectations regarding the exit possibility would be misleading. This thesis tries to overcome this challenge by combining prices of two financial assets and extracting exit related information from them by solving a state space model through application of kalman filter.

The rest of the thesis proceeds as follows: Section 2 summarizes a list of important events that took place related to Greek sovereign debt crisis, and an extensive literature review regarding the crisis. Section 3 describes the data used in the analysis, the construction of sentiment index, the state and measurement equations of the model, and the kalman filter steps that provide a solution to the state space. Section 4 presents the resulting expectations index, the comparison of the index's movements with the important

events and some other indices, and a discussion about the implications of the results. Section 5 concludes.

LITERATURE REVIEW

The financial crisis that Greece faces is in an unprecedented scale and most of the literature is about explaining why the crisis started and what kind of lessons we can learn from it. Yet first, understanding how the crisis began and evolved over the years is important to capture the essence of the discussion on the subject. Moreover, listing important events regarding the crisis is crucial to see the performance of the data and to analyze the resulting index. The following timeline is compiled from BBC and Bloomberg and summarizes the important events related to the crisis up to the last elections in June 2012.

2.1 GREECE SOVEREIGN DEBT CRISIS TIMELINE

1991 November, 1 : Maastricht Treaty was agreed. The treaty set up a monetary union without a legal clause that clarifies how to exit from the Eurozone.

1999 January, 1: The euro was established as a currency.

2001 January, 1: Greece joined the zone.

2008 September, 15: One of the U.S.'s leading investment banks, Lehman Brothers, bankrupted. This event is seen as the start of the global financial crisis.

2009 January, 14: Standard & Poor's announced Greece's first credit rating downgrade from A to A-.

2009 October, 4: George Papandreou's PASOK party won the general elections. Papandreou's campaign pledges were on boosting spending and increasing wages. At the time, Greece's debt to GDP ratio was 113% (by the Maastricht Criteria, the upper limit of debt to GDP ratio is 60%).

2009 October, 20: Irregularities in Greece's accounting procedures was discovered. Fiscal deficit revised to 12.7% from 3.7% .

2010 February, 2: Papandreou announced a series of measures to reduce the deficit levels to their aim 3%.

2010 February, 11: The first emergency summit about Greece's debt situation was held. The leaders announced that they aimed to perform a coordinated action against instability in the zone.

2010 March, 25: Eurozone leaders agreed with IMF to establish a joint safety net. The support package was designed to worth 20 - 22 billion euros to be released in emergency. Petros Christodoulou, Head of the Greek Debt Management Agency, stated that the help wiped out the risk of default.

2010 April, 12: Eurozone finance ministers agreed to provide Greece with up to 30 billion euros of loans over a year. IMF also announced its support to the loan package with another 15 billion euros.

2010 April, 27: Greece's credit rating, for the first time in the Eurozone's history, was downgraded to the junk level by Standard and Poor's.

2010 May, 2: Eurozone leaders confirmed a rescue package of 110 billion euros in exchange of 30 billion euro cut in spending over the next three years.

2010 May, 3: The European Central Bank stated that it will accept Greek collateral in spite of the country's credit rating.

2010 May, 10: Eurozone finance ministers agreed to set up a rescue mechanism worth 750 billion euros for the EU members who are in distress. ECB pledged to buy government and private debt. The European Financial Stability Facility (EFSF) was founded with 440 billion euros of initial capital.

2010 May, 18: Greece received the first package from the bailout fund.

2010 July, 11: The European Stability Mechanism was founded as a permanent bailout fund. The worth of the fund was around 500 billion euros.

2011 May, 6: Finance minister of Italy, Germany, France, and Spain organized an unannounced meeting in Luxembourg. This meeting raised the question for the first time in an official setting that if the Greece will leave the Eurozone.

2011 July, 21: EU leaders agreed on the second bailout package.

2011 September, 2: The EU, IMF and ECB suspended the Greece's review due to the delays in the implementation of the medium term fiscal plan and structural economic reforms.

2011 October, 4: The Eurozone finance ministers delayed their decision to release the new bailout package.

2011 October, 11: New bailout package was announced to be around 8 billion euros.

2011 October, 26: Euro Summit results were announced. The EU leaders confirmed their support to the troubled countries, including Greece, and emphasized the role of EFSF.

2011 October, 31: Papandreou called a referendum on the second bailout package demanding a series of wage and pension cuts.

2011 November, 2: The EU disbanded the monetary help until Greece decides.

2011 November, 3: Papandreou canceled the call for a referendum.

2011 November, 6: Papandreou resigned.

2011 November, 11: Lucas Papademos, a former ECB vice president, became the new prime minister.

2011 December, 5: Standard & Poor's announced a Eurozone wide rating cut, including Germany and France.

2011 December, 9: The EU leaders decided on new fiscal arrangements, strengthened the rescue fund with an additional 200 billion euros and announced that the flow of the rescue funds will accelerate.

2011 December, 16: IMF announced that the implementations of necessary reforms were behind the schedule.

2012 February, 10: The Greek government passed the demands of international lenders regarding the debt restructuring.

2012 February, 21: Greece officially asked its investors to swap their bond holdings. This is the biggest sovereign restructuring in history whose worth was around 206 billion euros.

2012 March, 1 : Greece parliament approved the necessary cuts for the next bailout package.

2012 March, 2: The EU leaders made statements and implied that the crisis was over.

2012 March, 9: Greece debt restructuring ended successfully with participation of 95.7% of Greek debt holders.

2012 March, 13: Euro area finance ministers serviced the second bailout package of 130 billion euros in worth.

2012 May, 6: Syriza won the elections. The party was not in support of the bailout fund.

2012 May, 15 : Talks did not succeed to form a coalition. New elections was scheduled.

2012 June, 17: New elections was held. Pro-bailout party New Democracy won the elections.

2.2 RELATED LITERATURE

Although the main reason of the Greek debt crisis was mostly referred as the global spillover of the U.S. sub-prime mortgage crisis, Kouretas and Vlamis (2010) emphasize that the global crisis is not the sole reason. They, and De Grauwe (2010), suggest that the overall debt level in the Eurozone was also unsustainable. Kouretas and Vlamis (2010) suggests that there are endogenous and exogenous factors that caused the crisis. They list the endogenous factors as continually increasing public deficit, false reporting, and increasing current account deficit as a result of a decrease in competitiveness. Exogenous factors of the crisis are Eurozone leaders' lack of ability to signal

a strong willingness to rescue, lack of funds in the EU to provide supranational financial support, and the U.S. sub-prime mortgage crisis. Combined with the high amount of Greek public debt, these factors resulted in a large scale financial crisis. Most of these point are the revealed weak points of the European financial system. Ali (2012) adds under-capitalization of the European banking system to this list as well.

Other than the weaknesses in the economic system, De Grauwe (2010) mentions different factors. He suggests that financial markets, with their unstabilizing structures, first saw no risks and then overreacted. Moreover, he claims, rating agencies have become famous for their history of systematic failing to detect economic weaknesses. De Grauwe (2010) also supports the idea that a Greece bankruptcy precipitates a contagion in the bond markets and would drive spreads upward.

Gerlach (2010) suggests that the crisis introduced a high amount of uncertainty in the Eurozone financial markets. Moreover the financial support that was given to Greece also amplified this uncertainty by raising doubts about its source and its future prospects. Uncertainty is economically deteriorating but, he claims, a default on Greek debt would generate higher costs by causing a Eurozone wide contagion. Moreover a default in the sovereign is likely to cause Greek financial institutions to collapse as well. Blundell-Wignall and Slovik (2010) supports the idea of financial collapse by reporting that the Greek banking system is heavily indebted to their sovereign (226% of their Tier 1 capital) thus likelihood of a full blown bankruptcy that precipitates a sovereign default is high.

Furthermore, Katsimi and Moutos (2010) points out flaws in the Maastricht criteria and suggests that it focuses on numerical figures instead of the quality of fiscal adjustments. They claim Greece succeeded in hitting the target numbers by implementing unsustainable fiscal adjustments like excessive tax increases instead of spending cuts. By doing so, they identify institutional weaknesses as a source of the crisis. Busch et al. (2013) also criticizes the austerity centered macroeconomic policies that are prioritized by the Maastricht system and suggests that these policies only deepened the crisis. They compile changes in some macroeconomic variables, especially

those that are related to the work force, and show the erosion in PIGS[1] countries' labor forces and purchasing powers.

Another research that gives a different insight is done by Nechio (2010). She compares the Argentina case to the Greek case. She suggests, although both cases are fairly similar in terms of the status of their fiscal and monetary fundamentals, their ongoing currency regimes are fairly different. She suggests that the use of Euro protects Greece from speculative attacks. Moreover, she claims, Greece has an immense political protection by the European Union, thus suggests that the political ties are important in devising ways to end the crisis.

Buchheit and Gulati (2013) summarizes the response of the zone to the crisis and presents five options: keeping expectations high, intervention of official sector (ECB, ESM alike), bailout, extending the maturity of the outstanding debt, and full debt restructuring. He suggests if the first two options fail, then the sovereign looses its market access and it requires external aid. The Greek case was an example to the last option which, he proposes, should only be applied at extreme circumstances.

Alcidi et al. (2012) investigate the reasons behind the exit talks. They suggest that the main reason is the ongoing deposit flight from Greece to abroad as investors try to insure their wealth. As a result of this deposit flight, which caused as much as 20% reduction in deposits per annum since the beginning of 2010, the financial system itself is close to bankruptcy.

Regarding the legality of the exit, De Grauwe (2010) notes that Article 100, Section 2[2] allows the Eurozone to bail out Greece without legal restrictions yet the threat of moral hazard should be accounted for. Athanassiou (2009) presents the possible ways of an exit from the union and points out that an expulsion is not directly possible by the clauses in the treaties. However he also adds that the EU is successful in overcoming structural difficulties, thus

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1 Portugal, Ireland, Greece and Spain

2 "Where a Member State is in difficulties or is seriously threatened with severe difficulties caused by natural disasters or exceptional occurrences beyond its control, the Council, acting by a qualified majority on a proposal from the Commission, may grant, under certain conditions, Community financial assistance to the Member State concerned."

concentrating the exit discussions around legal boundaries is not informative.

Grubel (2012) compares the possible costs and benefits of a bail-out and exit. He suggests a bail-out has three major benefits: avoidance of the financial turmoil, avoidance of recession and unemployment, and keeping the appeal of joining the zone intact. In return, he claims three major costs as well. These costs are inflation as a result of the expanded monetary base, fiscal burdens on other national treasuries, and moral hazard. He concludes, by pointing out the small size of the Greek economy, even though these costs and benefits, especially the benefits, cannot be quantified, intuitively benefits of a bail-out exceeds the costs and the zone should show its utmost determination to end the crisis as a unified structure.

Kouretas and Vlamis (2010) claims that, as a result of the crisis, there will be a substantial loss of confidence in the EU's ability to deal with fiscal issues. Moreover, they also support the idea of contagion and spillover to the other Eurozone financial markets in case of an exit. Alcidi et al. (2012) supports Kouretas and Vlamis (2010) by suggesting that contagion and spillover is to be expected in case of an exit but, they claim, these are only immeasurable costs. They suggest that an exit from the EMU precipitates introduction of a local currency, which is less valuable than euro. This less valuable money would increase Greece's debt burden, which it is not able to pay even in the current amount. Thus a default on the remaining foreign debt is certain following an exit.

De Grauwe (2012) criticizes the Eurozone response to the crisis. He claims that the EU policymakers, by imposing tight austerity measures on the debtor countries and letting the creditor countries continue to follow standard procedures, alienate the economies of the union members. This asymmetric policy applications polarizes macroeconomic structures. He suggests that this polarization pushes the zone into a double dip recession and for a solution, lender countries should increase spending in contrast to the debtor countries. Koumparoulis and Wong (2012) also point out that the lack of coordination in the zone and emphasize the role of the ECB and the IMF to create the necessary coordination to keep the fiscal policies intact. They also suggest

Greece needs its own currency to recover its economy and regain competi-
tiveness, which can be achieved through a temporary leave of absence.

Regarding answers to the crisis, Halikiopoulou and Vasilopoulou (2012)
claims macroeconomic measures itself cannot solve the problems as long
as the institutional advancements, i.e. elimination of nepotism, are not pro-
moted. Thus they point out that to reduce the uncertainty that surrounds
the Eurozone, institutions should be restructured as well. Chrysoloras (2013)
criticizes the European hostility towards the Greek society. He suggests, to
recover from the crisis, Greek economy must gain its competitiveness back,
socially-just institutional changes must be implemented, and the uncertainty
must be eliminated through social solidarity. Fouskas (2013) approaches to
the issue from a political science perspective; suggesting that considering its
historical past and politicians from a narrow elite class who is not transpar-
ent, Greek society should not be blamed for the country's debt level. More-
over, he claims, excessive defense spending and tax evasion were two major
factors of Greece's worsening economy.

Considering index building and usage of similar data, there are various
articles such as Illing and Liu (2003), Baker et al. (2013), and Binder (1985).
Illing and Liu (2003) measures financial stress by using various financial
instruments from equity markets, bond markets, foreign exchange markets,
and the banking sector. Their findings suggests combination of these various
tools yield a better tool in capturing some important events that generated
financial stress in Canadian economic history. Baker et al. (2013) research
the uncertainty about the future macroeconomic policies by building an in-
dex. Similar to my analysis, they use news about financial uncertainty from
ten different newspapers as an indicator. They combine these news with tax
code provisions set to expire, and the disagreements of economists about
economic forecasts. Their findings suggest an increasing uncertainty about
policy measures and a significant negative effect on firm and national lev-
els during the economic crisis. Work of Binder (1985) is an example of the
literature that uses financial data to research expectations. He analyses ef-
fects of regulations by using stock market data. Similar to my comparison
of matches in the timing of index's movements and the important events, he

compares the timings of significant changes in stock prices and unexpected changes in regulations.

DATA, MODEL AND METHODOLOGY

As Denzin (1978), Jick (1979), Hussein (2009) and other researchers in the field refer it, this thesis is a methodological triangulation study in the sense that it combines qualitative and quantitative techniques to analyse the subject of its interest. As qualitative data, I compile statements given by important economic figures such as politicians, and central bankers. This qualitative data is quantified by using the common quantification methodologies suggested by Guttman (1944) and incorporated into analysis. As quantitative data, I use Greek and German cds spreads with 5-year-maturity and bond yields with 3 and 5 years of maturities.

My underlying assumption in building the model is as the following: although the evolution of the expectations is an unobservable series, I am able to obtain noisy information about the process from financial instruments that are linked to the risk that is assigned to Greece's default by financial investors. There are various macro indicators that are widely used in economic and econometric analysis. Two of them mostly yields the default risk of a country, cds spreads and sovereign bond yields. Although a default does not necessitate an exit, most of the literature (De Grauwe (2010), Alcidi et al. (2012), Fouskas (2013) are some examples) seem in conjunction with the idea that an exit precipitates a default. Following this conjunction, I use these default measures, namely cds spreads and sovereign bond yields, as noisy indicators about changing expectations over time. In this aim, throughout the thesis, an increase or a decrease in expectations will mean the relevant change in expecting an exit.

Another underlying assumption is that an exit is only possible if the expected cost of bailing Greece out exceeds the expected cost of expelling Greece from the union. Considering that the exit of Greece will be decided by policy makers of the Eurozone, it is reasonable to assume that their revealed sentiments towards the subject is an indicator of this relative cost. By

following this assumption, capturing their sentiments becomes a necessity to observe the evolution of expectations. To obtain a measure of sentiment, I compiled published statements about Greece's exit from news databases of Reuters, The Guardian, Bild and Le Parisien with the keywords "Greece, Exit, Grexit, Eurozone". Compiled sample consists of 512 different statements from May 2011 to July 2012.

To process the noisy information that is obtained from cds spreads and sovereign bond yields in a way that yields the evolution of expectations, I model the behaviour as a state space model with two noisy indicators. The unobservable expectation itself is modeled as in relation with policy maker sentiment. To solve the state space, I use the kalman filter methodology.

Due to data restrictions, the analysis is done for the period between 06 May 2011 and 20 February 2012. This period is rich with different events that affect exit uncertainty in various ways. Some examples of these events are present under Section 2.1: Greece Sovereign Debt Crisis Timeline.

3.1 DATA

In the analysis, Greek and German cds spreads and bond yields are used. The cds spreads have 5-year-maturity whereas bond yields have 3 and 5 year maturities. The data is obtained from Bloomberg database. Although Greek cds spreads and bond yields, by themselves, would be a measure to incorporate in the analysis alone, there might be other factors that drive their prices upwards. To refine these external factors that affect the prices, I take German cds spreads and bond prices as risk free values. Subtracting the risk free spreads and yields from the Greek values, I obtain adjusted cds spreads and bond yields as the following.

$$
\begin{aligned}
cds &= cds_{greek} - cds_{german} \\
bond &= bond_{greek} - bond_{german}
\end{aligned}
$$

In the rest of the thesis, the terminologies cds and bond will refer to the adjusted values unless otherwise stated. This elimination allows us to operate on Greece related risk carried on the financial instruments. Descriptive

statistics for adjusted bond and cds values which are used in the analysis are present in Table 5. The spreads and yields that are used in the analysis are dated from 06 May 2011 to 20 February 2012. The values are quoted in percentages[1].

Bonds with different maturities are used to account to obtain more information. In order to combine the information that is carried on the both bond yields, I generate the first principle component of bond yields with the different maturities. In the analysis, the principle component value is used to represent the information that is carried in the bond yields[2].

In order to capture the sentiment of politicians towards the exit of Greece from the EMU, I construct an index called "Sentiment Index". The statements in the index are compiled from the databases of Reuters (International), The Guardian (United Kingdom), Bild (Germany) and Le Parisien(France) by using the keywords "Greece, Exit, Grexit, Eurozone". While choosing the newspapers, influence of the country of origin on the Eurozone economy and market shares of each news source in their own country is taken into account. I compiled and analyzed the news one by one. Repetitive statements that is present in different sources are dropped to prevent double counting. Sentiment analysis is done at a longer time period than the time that is spanned by the quantitative variables to analyze its explanatory power more efficiently, however in the analysis, only the index values between May 2011 and February 2012 are used.

While quantifying a statement, in line with the literature and following Guttman (1944), I classified the attitude of each statement. To quantify an attitude, or tone, I assigned a score to each statement. I classified tones as "unity, neutral and exit" and assigned scores to these tones as "0, 0.5 and 1", respectively. Thus, every statement in the sample is represented by one of these numbers that I name as a "tone score" and higher tone scores represent a higher expectation for occurrence of an exit by construction. Thus, in the analysis, even neutral news generate a possibility for exit compared to

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1 1% = 100 basis points(bps)
2 For further information on principle component analysis, please see Jolliffe (2005)

having no news at all.

I clustered news to the three tones by the following criteria.

- Unity: News that state Greece must stay in the Eurozone

- Neutral: News that do not state a clear opinion on Greece's exit however that point out to the possible outcomes of the exit for Eurozone or Greece

- Exit: News that state Greece must exit the Eurozone

Of 512 statements we have, 190 were statements that favor unity whereas 218 were statements that favor exit. The remaining 104 news are neutral. Considering the close number of the news in the opposite nature, we see that during the time of the crisis talks, policy makers and professionals were divided in their opinion about exit. After all statements are scored with their respective tone scores, I obtain the mean of the tone scores of all statements that are serviced on the same day to get a daily tone score.

In quantification of the qualitative data, we also assume each statement has the most impact on the day it is served and looses its importance over time. Let N_t^i denote the score of statement i at day t. Then agents are assumed to have the below exponential discounting scheme (Green and Myerson (1996)).

$$N_t^i = N_{t-1}^i e^{-r} \tag{3.1}$$

where r is the discount factor. In line with the research in the area, the discount factor is selected as 0.12 (Facorro and Defleur (1993)). Thus each statement affects the consecutive days by its discounted tone score . The cumulative tone score, which is the series I use as sentiment index, is obtained through summation of discounted scores over each day. Let N_t denote the cumulative tone score at day t. Then it is,

$$N_t = \sum_i N_t^i$$

Notice that daily tone score is the mean score of the statements that are made on the same day, whereas the cumulative tone score of a day represents the cumulative effect of the past statements and the statements made on that day.

Note that there are two factors that reduces the expectations about an exit, statements that favour unity in the zone, and time. The resulting index is the sentiment index (Figure 9). The series captures how some important events affected the public sentiment. It begins with a sharp increase at 2011, May 06, when the finance ministers secretly met to discuss Greece's exit for the first time. Some important matches in the movement of the index and the related events are summarized in the Table 6.

Example

The following statements are made on May 7, 2011.

- *Greece's exit from euro would be manageable and it toughens Eurozone's stance. Greece's debt trajectory is unsustainable and an action needs to be taken sooner rather than later before the long-term costs become far greater, German taxpayers should no longer be held liable for the obligations of other Eurozone allies. - A leading figure in the Free Democrats Party of Germany*

- *No Eurozone country should want to leave Euro, nor Eurozone should want to expel a member. - Erkki Liikanen, European Central Bank Governing Council*

It is clear that the first statement suggests the politician prefers Greece out of the Eurozone and the second statement suggests the European Bank council member prefers it to stay in the zone. Considering the tone scores, the first statement is assigned with a tone score of 1, and the second statement is assigned with 0. Since these news are serviced on the same day, I take their mean to obtain a daily tone score. In this example, the daily tone score of May 7, 2011 is 0.5.

By discounting assumption, these statements' effects persist over consecutive days. The effect of the statements on the next day is calculated as the following,

$$N^i_{May\,8,2011} = 0.5e^{-0.12} = 0.4435$$

The discounting continues to apply each consecutive day to the effect of the statement.

The daily tone score of May 8, 2011 in the compilation is 0.1667. Therefore, if May 7, 2011 is the only day with a tone score before May 8, 2011, the cumulative tone score of May 8, 2011 is calculated as the following,

$$N_{May\,8,2011} = \sum_i N^i_{May\,8,2011} = 0.4435 + 0.1667 = 0.6102$$

3.2 MODEL

Let S_t denote the expectations at time t, and N_t denote the cumulative tone score at time t. Since the occurrence of an exit is assumed to be related to the difference between its expected costs and benefits, it is important to model S_t in a relation with N_t. The underlying idea in forming the model is as the following: I am able to obtain information about unobservable formation of expectations from credit default swaps and bonds. The prices of these financial instruments yield a cumulative private information that is revealed by the investors. Moreover my measure of sentiment captures revealed private beliefs of economic agents about exit.

Considering these points, there are two main factors that affect the formation of expectations: private investor information that is revealed through cds spreads and bond yields, and beliefs of the policy makers alike in the Eurozone that is revealed through their statements. It is important to notice that the sentiments revealed by economic agents constitute a part of expectation formation since they reveal their expectations and affect the expectations of others through their statements. Thus, the real unobservable is

the deviation of social expectations from the sentiment of economic agents.

Following this result, the unobservable state is defined as $S_t - N_t$, the deviation of the expectations from the sentiment at time t. Assuming that the sentiment plays a role in shaping the expectations, a time series analysis of sentiment index is done to obtain a law of motion for the deviation. This analysis, and BIC test, suggests an AR(4) representation is suitable to analyze the process[3]. Therefore the deviation of expectation from the sentiment is modeled as the following:

$$S_t - N_t = \alpha + \phi_1(S_{t-1} - N_{t-1}) + \phi_2(S_{t-2} - N_{t-2})$$
$$+ \phi_3(S_{t-3} - N_{t-3}) + \phi_4(S_{t-4} - N_{t-4}) + \epsilon_t^S \quad (3.2)$$

where α is the intercept, and ϵ_t^S is the gaussian error term with mean 0 and the standard deviation δ_s.

Let cds_t and $bond_t$ denote the values of the risk adjusted cds spread and bond yield at time t, respectively. I model the information measured by these variables as the following.

$$cds_t = \beta_1(S_t - N_t) + \epsilon_t^c \quad (3.3)$$
$$bond_t = \gamma_1(S_t - N_t) + \epsilon_t^b \quad (3.4)$$

where ϵ_t^c and ϵ_t^b are the gaussian error terms with mean 0 and the standard deviations δ_c and δ_b.

In order to solve the model through application of kalman filter, I should first write the model in its state space format to obtain coefficient matrices. The following form is the representation of the above model in the state space format.

---

3 For more information on time series analysis and BIC test, please see Hamilton (1994)

Transition Equation

$$\begin{pmatrix} S_t - N_t \\ S_{t-1} - N_{t-1} \\ S_{t-2} - N_{t-2} \\ S_{t-3} - N_{t-3} \end{pmatrix} = \begin{pmatrix} \alpha \\ 0 \\ 0 \\ 0 \end{pmatrix} + \begin{pmatrix} \phi_1 & \phi_2 & \phi_3 & \phi_4 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix} \begin{pmatrix} S_{t-1} - N_{t-1} \\ S_{t-2} - N_{t-2} \\ S_{t-3} - N_{t-3} \\ S_{t-4} - N_{t-4} \end{pmatrix} + \begin{pmatrix} \epsilon_t^S \\ 0 \\ 0 \\ 0 \end{pmatrix}$$

$$(3.5)$$

Measurement Equation:

$$\begin{pmatrix} cds_t & bond_t \\ cds_{t-1} & bond_{t-1} \\ cds_{t-2} & bond_{t-2} \\ cds_{t-3} & bond_{t-3} \end{pmatrix} = \begin{pmatrix} S_t - N_t \\ S_{t-1} - N_{t-1} \\ S_{t-2} - N_{t-2} \\ S_{t-3} - N_{t-3} \end{pmatrix} \begin{pmatrix} \beta_1 & \gamma_1 \end{pmatrix} + \begin{pmatrix} \epsilon_t^c & \epsilon_t^b \\ \epsilon_{t-1}^c & \epsilon_{t-1}^b \\ \epsilon_{t-1}^c & \epsilon_{t-1}^b \\ \epsilon_{t-1}^c & \epsilon_{t-1}^b \end{pmatrix}$$

$$(3.6)$$

3.3 METHODOLOGY

I apply the kalman filter methodology to estimate the unobservable $S_t - N_t$. Kalman filter is a methodology that uses different series of observations to estimate a series of unobservable by extracting information from the measurable values[4]. Therefore, as a methodology, it is an ideal fit for my purpose in this study. The notation used in the filter as the following[5].

$$\bullet \quad \zeta_t = \begin{pmatrix} S_t - N_t \\ S_{t-1} - N_{t-1} \\ S_{t-2} - N_{t-2} \\ S_{t-3} - N_{t-3} \end{pmatrix}, \zeta_{t-1} = \begin{pmatrix} S_{t-1} - N_{t-1} \\ S_{t-2} - N_{t-2} \\ S_{t-3} - N_{t-3} \\ S_{t-4} - N_{t-4} \end{pmatrix}, F = \begin{pmatrix} \phi_1 & \phi_2 & \phi_3 & \phi_4 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}$$

---

4 For further information, please see Nelson and Kim (1998), and Koopman and Commandeur (2007).

5 The following changes in previously stated notations is to incorporate common symbols that are used to explain kalman filter and simplify the notation in expressing the filtering process.

- $v_t = \begin{pmatrix} \epsilon_t^S \\ 0 \\ 0 \\ 0 \end{pmatrix}, \tau = \begin{pmatrix} \alpha \\ 0 \\ 0 \\ 0 \end{pmatrix}$

- $E(v_t v_t') = Q$

- $y_t = \begin{pmatrix} cds_t & bond_t \\ cds_{t-1} & bond_{t-1} \\ cds_{t-2} & bond_{t-2} \\ cds_{t-3} & bond_{t-3} \end{pmatrix}, H = \begin{pmatrix} \beta_1 & \gamma_1 \end{pmatrix}, w_t = \begin{pmatrix} \epsilon_t^c & \epsilon_t^b \\ \epsilon_{t-1}^c & \epsilon_{t-1}^b \\ \epsilon_{t-1}^c & \epsilon_{t-1}^b \\ \epsilon_{t-1}^c & \epsilon_{t-1}^b \end{pmatrix}$

- $E(w_t w_t') = R$

- $P_{t|t-1} = E(\zeta_t \zeta_t')$

- η_t: Prediction error

    - $\eta_t = y_t - \hat{y}_t$ where $\hat{y}_t$ is the estimated value of y_t.

- f_t: Conditional variance of the prediction error η_t

    - $f_t = E[\eta_t' \eta_t]$

Following this notation, the model is simplified as the following,

$$\zeta_t = \tau + F\zeta_{t-1} + v_t$$
$$y_t = \zeta_t H + w_t$$

The application of the filter is completed in two steps.

1. *Prediction*

    a) Predict the conditional mean of the state variable, $\hat{\zeta}_{t|t-1}$

    b) Predict the conditional variance of the state variable, $P_{t|t-1}$

$$P_{t|t-1} = FP_{t-1}F' + Q \tag{3.7}$$

c) Predict the measurement values, $\hat{y}_t$

$$\hat{y}_t = \hat{\zeta}_{t|t-1} H \tag{3.8}$$

d) Calculate the prediction error and its variance, η_t and f_t

$$\eta_t \ = \ y_t - \hat{y}_t \tag{3.9}$$

$$f_t = H' P_{t|t-1} H + R \tag{3.10}$$

2. *Update*

a) Calculate the *Kalman Gain*, K_t

$$K_t = P_{t|t-1} H f^{-1} \tag{3.11}$$

b) Update the conditional mean of the state variable with the new information,

$$\hat{\zeta}_{t|t} = \hat{\zeta}_{t|t-1} + \eta_t K'_t \tag{3.12}$$

c) Update the conditional variance of the state variable with the new information,

$$P_{t|t} = P_{t|t-1} - H K'_t P_{t|t-1} \tag{3.13}$$

As a Bayesian estimation method, the filter processes a prior value for $S_t - N_t$ and its covariance matrix P_t and updates these values by using measurement errors of previous predictions. As the unobserved value S_t is an index value, without loss of generality, the starting value S_0 is taken arbitrarily as zero. Since the starting point is an arbitrary value, we pick an extremely high variance and set P_0 equal to 1000. This value will quickly converge to more reasonable values through iterations of the filter[6]. Since the series N_t is known and the past values of P_t is estimated in previous steps, at each iteration, the filter updates the unknown expectation value S_t and its variance P_t which are present as the first element of the relevant matrices.

---

6 As Harvey (1990) suggests, since the variance value converges over iterations, initial variance choice is not critical as long $P_0 \neq 0$

Furthermore, in order to apply the procedure, I have to estimate the parameters of the model to form the transition and measurement equations. These values are estimated in a way that maximizes the log likelihood function of the unobserved series. Following the distributional assumption of ϵ_t^s, that the error term is Gaussian, the log likelihood function is formed as the following.

$$lnL = -\frac{1}{2}\sum_{t=1}^{T} ln(2\pi \mid f_t \mid) - \frac{1}{2}\sum_{t=1}^{T} \eta_t' f_t^{-1} \eta_t \qquad (3.14)$$

To obtain the likelihood maximizing values for the parameters and filtering, I used Oxedit 6.20[7]. The parameters that I estimated by using the maximum likelihood method are $\beta_1, \gamma_1, \delta_c, \delta_b, \delta_s, \phi_1, \phi_2, \phi_3, \phi_4$ and α.

---

7 The program can be freely downloaded from http://www.doornik.com/download.html

RESULTS

The maximization algorithm achieves a strong convergence, indicating that the following set of estimators indeed yield a maximum for the log likelihood function.

Table 1: Parameter Estimation

β_1	γ_1	δ_c	δ_b	δ_s
0.2832	0.0048	4e-5	0.9328	17.4574

ϕ_1	ϕ_2	ϕ_3	ϕ_4	α
1.0588	-0.2381	-0.0683	0.2351	3.8447

The first part of the table presents the estimates of coefficients for the measurement equation and standard errors of their respective error terms. The second part of the table presents the parameter estimates for the transition equation. Based on these results, the state space form that is used in the filtering takes the following form.

$$
\begin{pmatrix} \widehat{S_t - N_t} \\ S_{t-1} - N_{t-1} \\ S_{t-2} - N_{t-2} \\ S_{t-3} - N_{t-3} \end{pmatrix} = \begin{pmatrix} 3.8847 \\ 0 \\ 0 \\ 0 \end{pmatrix} + \begin{pmatrix} 1.0588 & -0.2381 & -0.0683 & 0.2351 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix} \begin{pmatrix} S_{t-1} - N_{t-1} \\ S_{t-2} - N_{t-2} \\ S_{t-3} - N_{t-3} \\ S_{t-4} - N_{t-4} \end{pmatrix}
$$

$$
\begin{pmatrix} \hat{cds}_t & \hat{bond}_t \end{pmatrix} = \begin{pmatrix} \widehat{S_t - N_t} \\ S_{t-1} - N_{t-1} \\ S_{t-2} - N_{t-2} \\ S_{t-3} - N_{t-3} \end{pmatrix} \begin{pmatrix} 0.2832 & 0.0048 \end{pmatrix}
$$

After incorporating the above coefficient estimates to the model, the index that captures the changes in expectations over time is obtained as a result of the kalman filter procedure. Figure 1 presents the index. The beginning point of the index is 2011, May 6. From thereon, we see different periods of stable movements, ups and downs. I will analyze these movements in three different subsections. First, I will evaluate the index's performance by comparing its fluctuations with the important events that are summarized under Section 2.1: Greece Sovereign Debt Crisis Timeline. Second, I will compare the index with sentiment index. Third, I will examine the monthly mean values of the index and compare them with Baker et al. (2013)'s Economic Policy Uncertainty Index (EPU). Last, I will discuss the outcomes of the analysis and their implications.

4.1 ANALYSIS

4.1.1 *Expectation Index*

Figure 1: Expectation Index
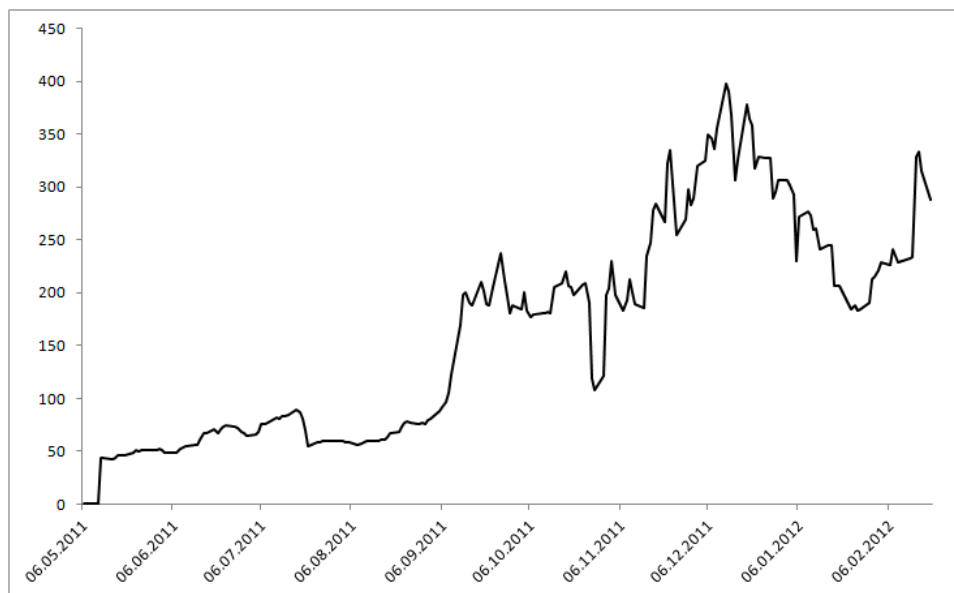
The index yields four different time periods with observable up and down patterns that exhibit level differences. First, I will examine these periods to

see which events are captured within the time periods and how the index responded to these events.

May 2011 - August 2011

May 2011 begins with the first enunciation of Greece's exit from the zone. The event happens in May 6, yet the expectations respond with an increase to the index value 44 in May 12. The reason of the first response to be late than the event itself is the 4 period lagged nature of the movement and closure of the financial markets during the weekends. From thereon, expectations move pretty straightforward with a small upward trend until mid July where it reaches to the index value 87.

On July 20, we see a fall in the level of expectations as the index value decreases to 80 from 87. This decrease precipitates another fall in the index value to 69 on the next day. On July 22, the index falls to 54 and we see another stable period from thereon. Thus between July 20 and July 22, we see a sharp decrease as opposed to the previously upward trending movement. When we investigate these days we see that on July 21, the second bailout package is agreed and announced to the financial markets. This suggests, as a reaction to an easing news, the index falls and yields decreasing values from 87 to 54.

The second stable period ends with the beginning of September where we can observe a rally around 200.

September 2011 - October 2011

September begins with a grim news for Greece. The Members of the European Commission who are responsible for observing Greek government's ability to complete the necessary reforms announce that they suspend the review of the country since the government was unable to pass the required reforms imposed by the creditors. This was an official announcement done by ECB, IMF and the EU correspondents and it affects the expectations significantly. The index moves sharply from its value 79 on September 1 to 105 in a week, an increase much more than it did for the previous six weeks. One week later, we see that expectation index hit to 200 on September 14,

never to return again to levels below 150. Thus, this movement shows that Greece's inability to keep its promises to implement necessary reforms altered the perceptions towards its exit.

Especially October 2011 is marked with important events, yet we see the index is mostly stable around 200 with little oscillations. October 2011 opens up with an expected announcement following the September events. The EU ministers delay their decision on the bailout amount since the necessary reforms were not completed as announced on September. One week later, the size of the bailout package is decided, yet the expectations do not change significantly, indicating an announcement without adequate signal of commitment does not affect the index value.

The importance of commitment in affecting the index value is more clear in the end of October events. The end of October is marked with a noteworthy movement of the index: a sharp decrease just before another sharp increase just within a week. The expectations fall to 190 from 210 on October 26, to 119 on the following day which precipitates another decrease to 108 on October 28. It then starts to increase again to 121 on October 31, and returns to levels around 200 on November 1. This weekly unusual movement is exactly matched by some important events. On October 26, the Euro Summit press release is announced. The press release states the EU's dedication to support the troubled countries and emphasizes the supportive role of EFSF. The index captures this official announcement and the level of expectations falls significantly. On October 31, the Prime Minister George Papandreou calls for a referendum to accept the second bailout package. This referendum call was a shock to the markets. This shock is captured by the index at the right time as well, and results in a sharp increase back to pre Euro Summit levels.

November 2011 - December 2011

The beginning of November 2011 is the follow up of Papandreou's call for referendum. The opening index value for the month is 197. We observe some important events that took place at the first days. On November 2, the EU leaders announce they will cancel their aid if Papandreou insists on the

referendum. The index value jumps to 230 on the next day. The same day, on November 3, Papandreou cancels the referendum. This cancellation is followed by a decrease in level of expectations and the index value falls to 197. On November 6, Papandreou resigns. Although Papademos becomes the new Prime Minister in just five days, and has a decreasing effect on the index, this political turbulence moves the index to a new level. The increase starting with Papandreou's resignation lasts until the end of November. Therefore the political uncertainty introduced by the elections, right after the Papandreou government's inability to signal efficient cooperation with the EU, was a worsening effect that drove expectations towards exit.

The first two weeks of December is mixed with good and bad news for Greece. On December 5, S&P announces a Eurozone-wide downgrade by criticizing the leaders' responses and measures to end the crisis. On December 9, the fiscal pact is announced. With the fiscal pact, the rescue fund is strengthened. On December 16, IMF announces that necessary reforms which are required for the next bailout package to be serviced are still not implemented.

The index value on December 1 is 289. We see that the S&P announcement drives the index to 349. The increase that starts with the Eurozone-wide downgrade persists until December 13. From thereon, we see that the index follows a downward trend with small ups and downs. The only significant increases in the index are on December 16 and December 19 where the index increases to 378 from 306. The lag in the responses to the EU and IMF announcements share a similar attribute that they are both done in Fridays. Considering the index is based on movements in financial markets that cds and bonds are traded, the lag in the response is not surprising as the index updates its values in the expected direction on the next business day.

January 2012 - February 2012

A mild January passes without notable news. The index follows a downward trend during the month. Contrary to January, February is an important month as it was the month that the largest sovereign debt restructuring in the history was organized. With its additional uncertainty and tension in the

markets, we see that the index starts to increase with the end of January. On February 10, Greece passes the demands of its debtors from the parliament yet we see that the increase in the expectations continues to rise. The upward trend continues until the last day in our sample, February 20, where the index falls to 287 from 315 and closes at that value. One day later, that we do not have data for, Greece announces its agreement with its debtors and the restructuring happens.

4.1.2 *Expectation Index vs. Sentiment Index*

Figure 2: Expectation Index vs. Sentiment Index
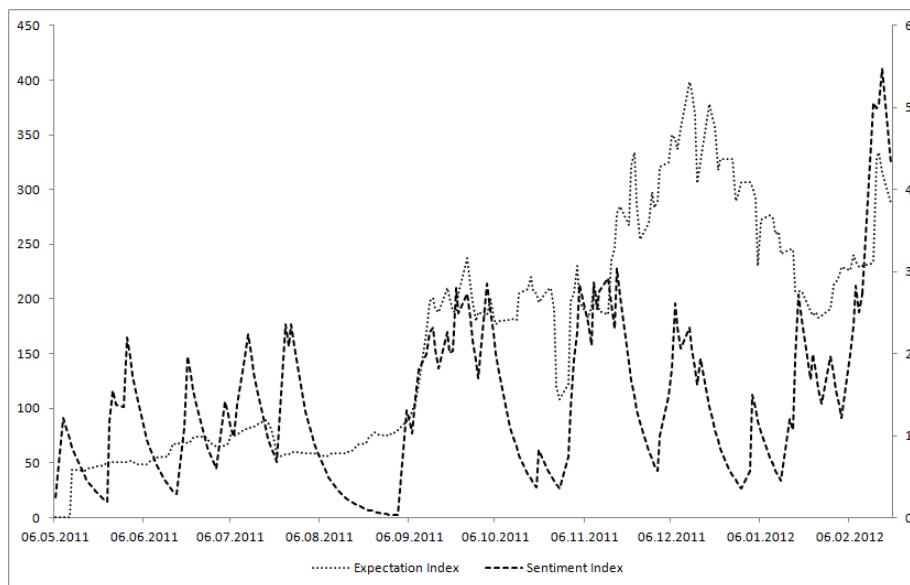
Recall that sentiment index is formed with the public statements from various sources which are as important to be quoted by important local or international newspapers. Therefore, comparing the movement differences of sentiment and expectation indices brings us the points that are different than the statements of different interest groups and affect the unobservable changes in expectations.

Figure 2 reports both indices as expectation index on the left, and sentiment index on the right axes. We see that until September, expectation index

does not move in harmony with the sentiment index. Oscillating movement of the sentiment index between 0.5 and 2 informs us that this period was subject to ambiguous statements that were favouring Greece's exit from the zone. Yet, expectation index does not respond to these news much, and keeps its level approximately stable. At the end July and on August 2011, when the sentiment index nearly falls to zero, again, we see no response from expectation index as well.

Despite the initial disconnect, we see a significant similar increase on September in both indices. September 2011 is marked with the EU announcement on Greece's inability to complete the necessary reforms. The similar movements continue until mid-November with the exception of the first half of October. This co-movement period includes some important events such as the Euro Summit announcement for provision of further support to Greece, Papandreou's call and cancellation of referendum, his resignation, and Papademos' appointment. A couple of points to note in this period is that the announcement of the new bailout package has much less impact on expectation index compared to sentiment index. This difference in impacts generate the disconnect in movements that is observed in the first half of October.

The major disconnect between the both indices occur in mid November where they move to the opposite directions. This period, the follow up of Papademos' appointment, shows us that expectation index accounts political uncertainty a lot more than the sentiment index. Another disconnect occurs at mid January, when again, the both indices move in the opposite directions. This period is not marked with any important events for Greece, yet when we examine the news compilation, we see that the most of the statements in the period are done by the German officials such as Angela Merkel and Volker Kauder, and they coincide with the announcement of 0.7% growth rate of the German economy, the lowest since 2009. Without loss of generality, this response in the sentiment index may as well be the politicians blaming of Greece for the poor numbers. Expectation index seems robust to these affects.

The both indices exhibit co-movements and disconnects over their courses. However these movements inform us about some characteristics of expectation index. When we look at the co-movement periods, we see that expectation index is mostly susceptible to official announcements done by international organizations that play a role in the crisis. Moreover it is robust to political announcements solely done by local leaders. I find both traits as plausible to have for such an index.

4.1.3 Expectation Index vs. Economic Policy Uncertainty Index

Figure 3: Expectation Index vs. EPU Index
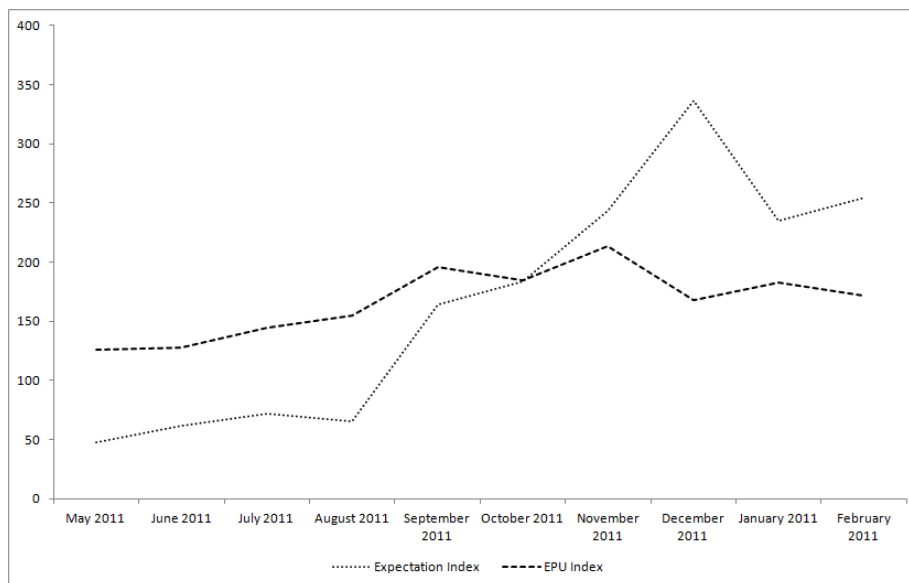
In a recent research, Baker et al. (2013) investigates the uncertainty in policy measures in the European countries by building an Economic Policy Uncertainty Index (EPU) from newspaper references to economic indicators. As a part of the Eurozone, it is reasonable to assume that Greece's exit uncertainty is also in partly related to policy uncertainties in Europe which in turn affects expectation formation through economic environment. Therefore the comparison of two indices may yield additional clues towards the traits of expectations.

Figure 3 plots EPU index with monthly averages of expectation index. Analysis of the indices yields a correlation coefficient of 0.6809. Thus a positive correlation is present. Indeed, on most of the months in the sample, both indices move fairly similar with the exception of November, December and February. Recall that November is marked with political uncertainty that was caused by Papandreou's resign, December was the month of second announcement of Greece's failure to accomplish necessary reforms, and February was the month of debt restructuring.

Table 7 also classifies events by their origins. An analysis of this classification indicates that the months that opposite movements of indices occur are also the months that expectation index becomes more driven by local events instead of international political announcements. This result shows that expectation index successfully distinguishes important events solely on Greece's exit, and refines the effect of European caused uncertainty.

This result is plausible by the structure of the index since sentiment index is built by news statements solely on Greece's exit, and financial market data is used in contrast with EPU which does not include Greek data. The comparison shows that average monthly movements in expectation index shows a similarity to the movements in EPU if the source of the events taking place in the corresponding months are abroad. If not indices does not move in harmony.

4.2   DISCUSSION

An analysis of expectation index, both its matches with important events that took place during the period and its comparison with the other indices, yields some traits of evolution of expectations over time. It is directly observable that the index follows different trends in different time periods. Under the analysis section, I reported that changes in these trends coincide with important events that took place indicating that some events are trend setters. Moreover, the index shows responses in varying degrees to different events. Table 9 summarizes the trend setters and the events that generate the highest responses. Changes reported in the table are not daily changes but changes

of the index values from the date of the event to the end of the trend set by that particular event, or to the next important event, whichever comes first.

A quick glance in this summary shows the index significantly responds to 12 of the 15 events reported under subsection 2.1 and 11 of them are in the expected direction. One would expect that strengthening of the rescue fund would cause a decrease in setting expectations towards Greece's exit yet we see an increase in the index. There may be two explanations of this reverse movement. First, it may be that the index simply fails to capture the event. Second, effects of the previous events that set an increasing trend, political turmoil in Greece and Eurozone-wide credit rating downgrade of S&P, overwhelms the easing effect of the strengthened fund. A further analysis capturing the post-February period, which I could not obtain data for, would allow me to answer that question since such an analysis would yield valuable information about effects of political turmoil on formation of expectations. In light of the available data, considering the political turmoil was the event with the highest positive change and the index's otherwise successful capture of the important events, I argue that political instability has a considerable effect on forming exit favoring expectations.

Moreover, differences in level changes also reveal some features of expectation formation related to Greece's exit from the Eurozone. First of all, we see that the highest four responses are positive and the lowest response is negative. In absolute value terms, considering the other negative responses as well, the index shows greater increases and milder decreases. This behavior is in line with the research in the area and supports Soroka (2006) who argues that public responses are greater to negative economic outcomes than they are to positive economic outcomes. Indeed bad news produce greater changes in the index than the good news generate on average.

In the time period that I make the analysis, announcement on Greece's inability to implement necessary reforms are the only item that is repeated. When we compare the responses to both events, we see that the response to the first announcement done on September 2, 2011 is much greater than the response to the second announcement done on December 16, 2011. There may be various reasons for this difference. One explanation is predictability.

The first event was an unexpected event that caused a disbelief in Greece's commitment to take required regulatory actions to stabilize the crisis whereas the repetition of the event was not surprising following the political turmoil experienced after Papandreou's referendum and resignation. The first announcement was close to the beginning of discussions when there was a greater lack of information about Greece's economic situation and commitment. Increased level of the index from September 2 to December 16 indicates that until the second announcement, expectations were already formed by incorporating more information about Greece's situation. Therefore an event has a greater impact if it is unpredictable. Considering that a part of the index is driven by financial data, the result is unsurprising and supports research such as Kim and Verrecchia (1991) which suggests degree of price responses to announcements are proportional to previously available information about the announcement.

Most of the literature on Greek sovereign debt crisis criticizes European commitment to rescue. These articles claim politicians could not reveal enough commitment to a unified Eurozone that will overcome the crisis together[1]. Some of the events that took place during the analysis period can be classified as examples to commitment issue. For example, of the 15 events that are reported under Table 7, Greece's inability to reform and Papandreou's call for a referendum on the second rescue package are examples of lack of commitment of Greek government to rescue agreements. The index's responses to these events are among the highest. Other examples are the Euro Summit announcement that explicitly states a commitment to save Greece, and strengthening of the rescue fund just before February 2012 debt restructuring and April 2012 elections. Both events show commitment of the Eurozone to save Greece and we see a strong easing effect in the first one. Since the index response to rescue fund development is unexpected as explained before, we fail to see the same in this case. Yet, there is evidence to argue that expectations about Greece's exit are affected by degree of commitment of Greece and the Eurozone to keep the zone intact.

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[1] Some examples of such critics are Alcidi et al. (2012); Katsimi and Moutos (2010), and Chrysoloras (2013).

Therefore we can summarize factors that affect expectation formation as susceptibility to political instability, predictability of events related to Greece's economic performance and commitment to the unity of the zone. In a political economic point of view, these characteristics have some implications to take into consideration. First, a growing literature discusses how the Eurozone will emerge after the crisis. Onis and Kutlay (2012) summarizes and explains three options that are widely discussed in the literature as multi-speed Europe, a la carte Europe and variable geometry Europe. All these models infer a different kind of unity based on different factors. Whatever the outcome would be, characteristics of expectation formation suggests, revealing a strong commitment is a necessity to obtain milder responses from society and financial markets. Moreover, it is apparent that, to stand in the zone, during the economic and social restructuring process, Greece should be transparent and communicative with the other members of the zone and financial markets about its economic well being to reduce the fluctuations in expectations about its stay in the zone.

5

CONCLUSION

The U.S. sub-prime mortgage crisis raised questions about the sufficiency of regulations on the financial markets, and shook beliefs on the current economic foundations. Yet, the European sovereign debt crisis, specifically the Greek case, unveiled state level imbalances, and turned markets' attention not only to financial but also to social outcomes of an economic crisis. In this sense, the developed world unearthed the concept of sovereign default after a long time. As an unanticipated result, exit of a European country from the European Monetary Union was discussed for the first time in the zone's history. In line with these developments, this thesis researches the evolution of expectations regarding Greece's exit from the zone. Analyzing the social sentiment and financial response to the idea of exit, I contribute to the literature by investigating different traits that have the most impact on expectation formation about the subject.

As explained in Section 4.1.1, expectation index is fairly successful in capturing the milestone events. Given that, the responses of the index to these events and their comparisons to sentiment and EPU indices reveal valuable information about the behaviour of the expectations. I observe that significant responses of the index are mostly to the events whose sources are official organizations and if the events reflect a commitment towards exit or unity. Moreover the movements of the index are mostly robust to political statements done by foreign leaders, but they are affected by political risks idiosyncratic to Greece. These points indicate that, in a political economic point of view, both leaders of the zone and Greek politicians should show dedication, and be transparent to the utmost degree in order to transform European idea to its new structure in a milder economic environment.

These results imply that local events affect the uncertainty surrounding Greece's exit from the Eurozone only if their scale is large, such as elections. Besides local factors, most of the level differences in the index fit with inter-

national events, indicating that the commitment of the other union members are important in altering expectations. This effect is puzzling since, legally, an expulsion is not possible but a voluntary exit is. Yet, my results indicate that Athanassiou (2009)'s claim on the union's ability to devise policies to overcome legal challenges are inherently valid in the mechanism that drives the expectations. Thus not only local, but international politics will play a decisive role in shaping the exit decision, as Nechio (2010) suggested.

Since the index is based on information obtained from cds spreads and bond yields, bond restructuring completed at the end of February 2012 limits the timespan of the analysis. Due to this data restriction, I am unable to extend the analysis to March - July 2012 which is a period of political turmoil in Greece. This period would be an ideal candidate to measure the effect of local political developments on the exit discussions. Yet the analysis can only be done with additional data, or by using a different methodology. The current method fails to account for the large time periods with missing values in the data sample. Moreover, if the timespan could be extended, it would be interesting to see lag-lead relationship of expectation index with other economic indicators. Since most of these indicators are reported monthly, or even quarterly, there is not enough data to conclude if such a relationship exists.

This research indicates that Greece's foreign reputation in its dedication to overcome the local economic and institutional challenges is at least as important as maintaining the political stability to end the crisis. Indeed, a peruse on the evolution of the exit talks indicates that the topic is less heated after the 2012 elections and dedicated attempts by both Greece and the European Central Bank to end the crisis. Hence it is plausible to assume that the index would yield lower values if I were able to construct it to the day. Yet, there are still varying ideas about if the idea of an exit is off the table or not. It seems like the dedication of the Eurozone in keeping its structure intact will continue to be questioned until the crisis is over, which does not seem to happen in the near future. Recalling the maturing debt amount and the sovereign's reduced access to debt markets, the uncertainty of Greece's exit will continue to remain as a subject of interest for the near future as well.

Part II

APPENDIX

FIGURES

s

Figure 4: Long Term Interest Rates
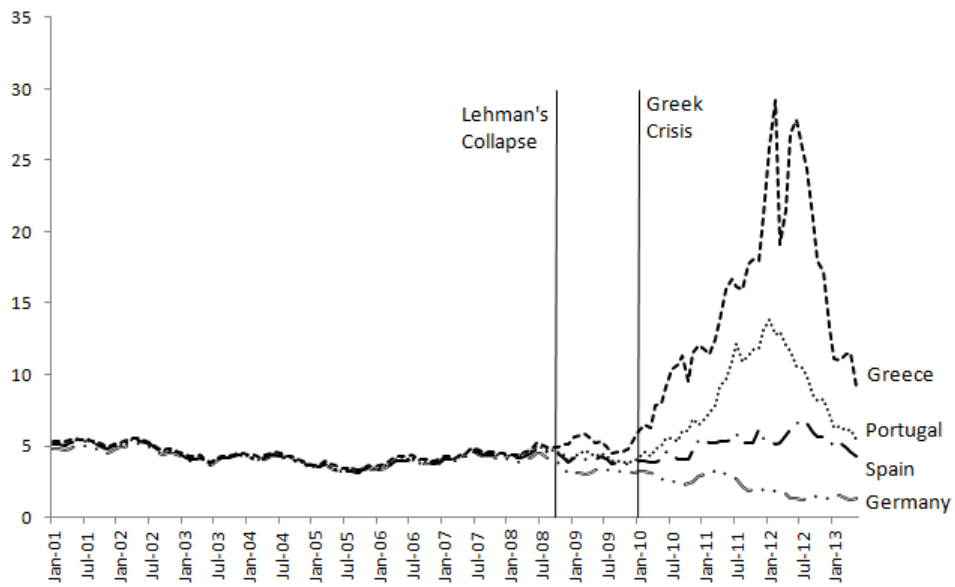
Source: Eurostat

Figure 5: Debt to GDP Ratios
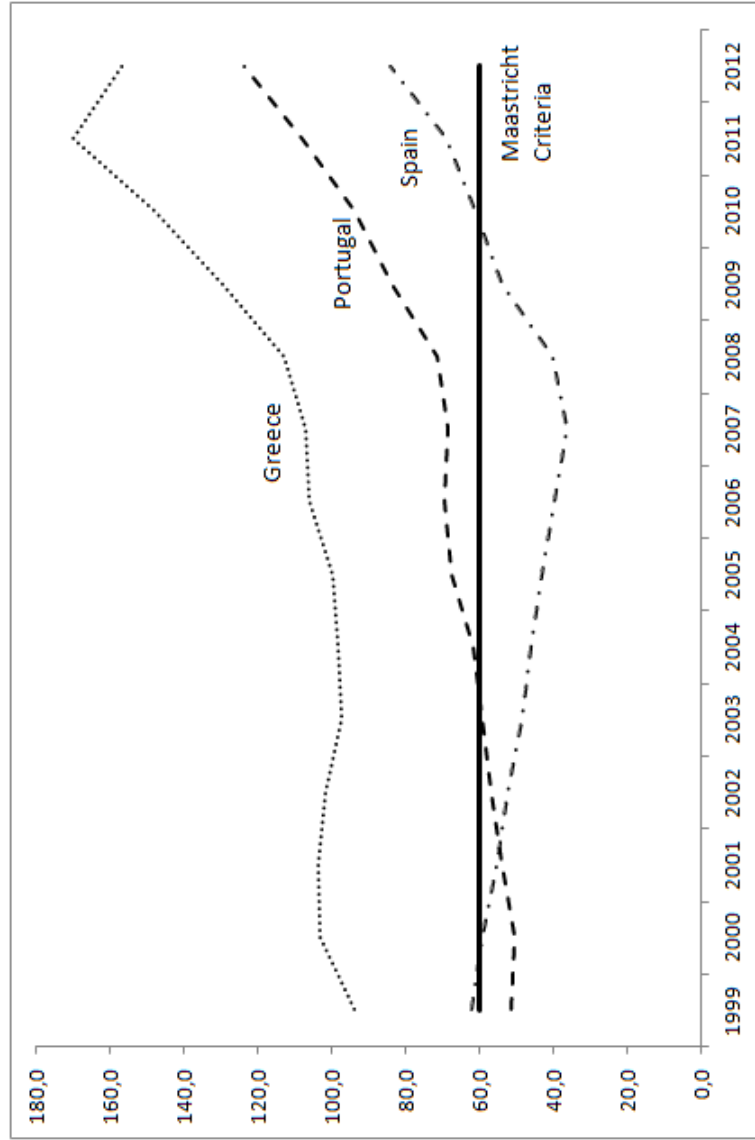
Source: Eurostat

Figure 6: Greece Central Government Debt Maturity Profile (in Millions of €)

Source: Greece Public Debt Management Agency

Figure 7: Adjusted Greek Cds Spreads, 5 Years Maturity (%)
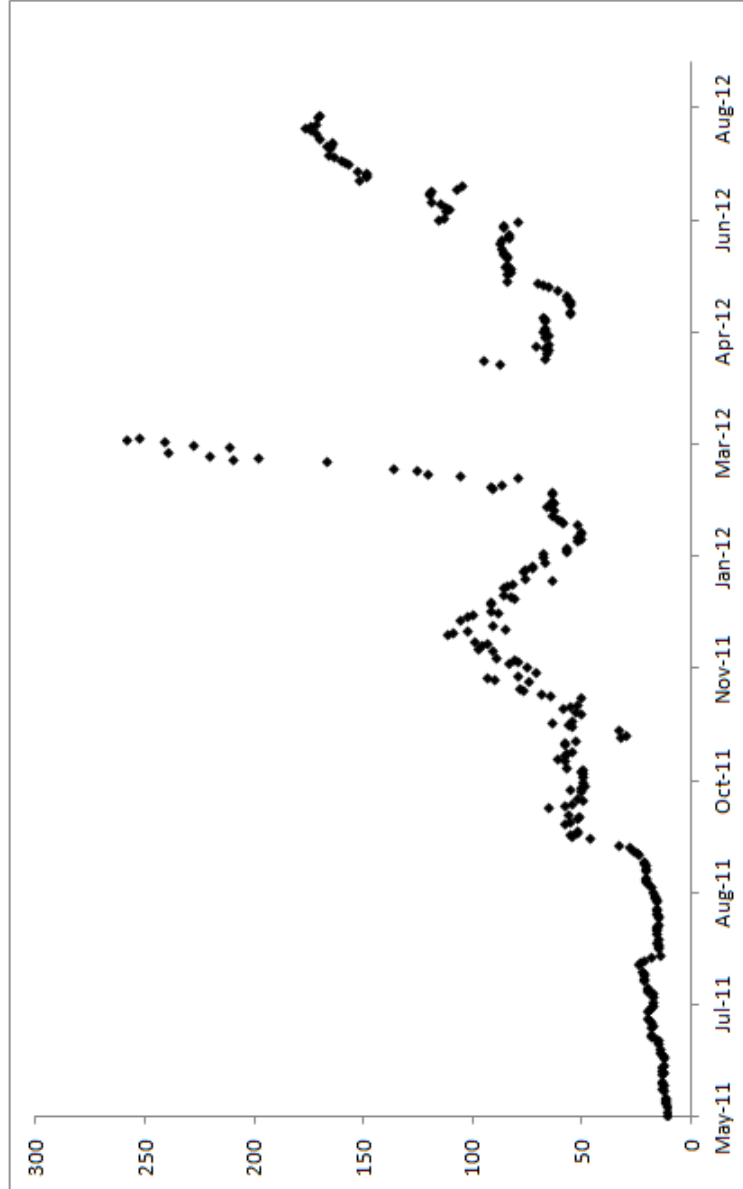
Source: Bloomberg

Figure 8: Adjusted Greek Sovereign Bond Yields, 3 and 5 Years Maturity (%)
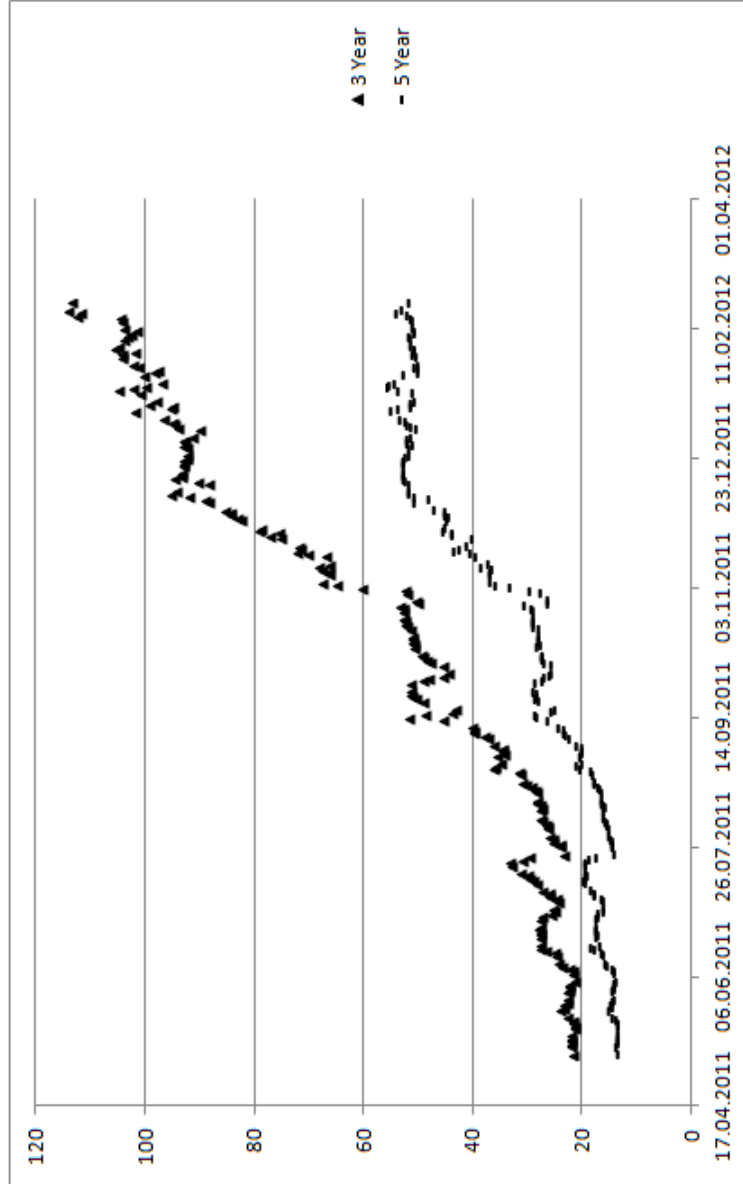
Source: Bloomberg

Figure 9: Sentiment Index
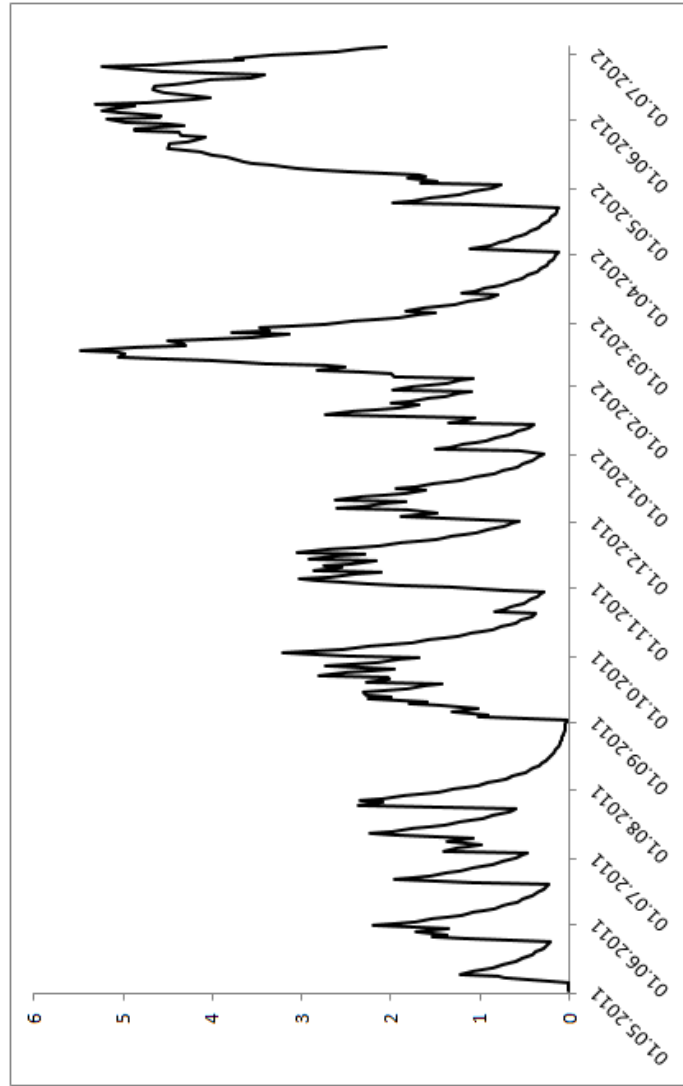
TABLES

Table 2: Outstanding Claims of European Banks on Greece to GDP

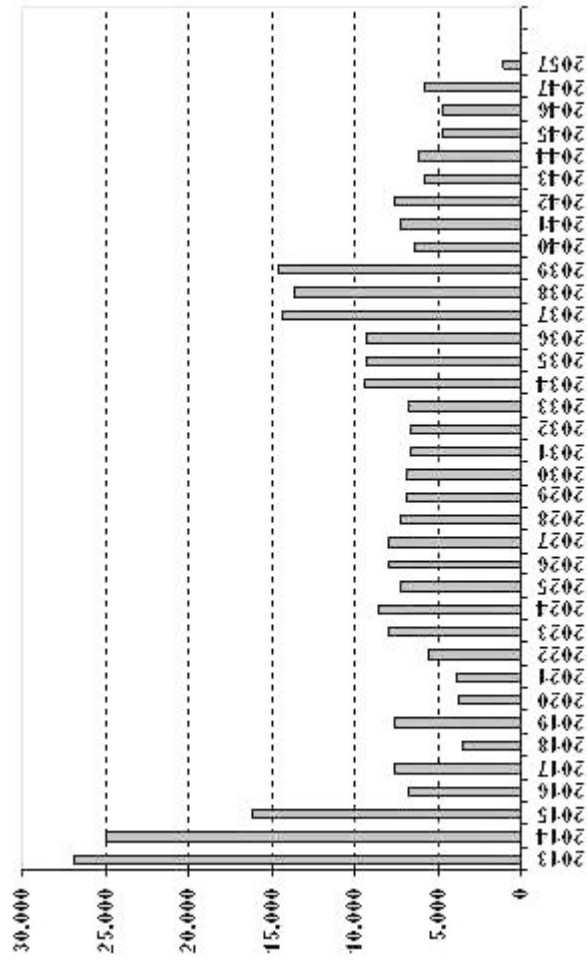| Country	% of GDP as of 2012 end	2012 GDP (in millions of $)
Austria	0.08%	399,461.10
Belgium	0.01%	484,959.18
France	0.11%	2,619,629.54
Germany	0.16%	3,408,373.80
Ireland	0.05%	210,873.96
Italy	0.04%	2,018,465.72
Netherlands	0.30%	774,222.38
Portugal	3.47%	213,212.20
Spain	0.06%	1,352,837.73
Sweden	0.01%	526,513.96
Eurozone (all)	0.18%	16,627,004.35

Source of Claims on Greece: The author's own elaboration from www.bis.org
consolidated banking statistics Table 9D
Source of GDP Values: Eurostat

Table 3: Outstanding Claims of Foreign Banks on Greece

Country / Year (as of December) (in Millions of USD)	2007	2008	2009	2010	2011	2012
Austria	6.329	5.617	4.767	3.351	2.321	331
Belgium	15.061	10.175	4.207	1.909	722	32
France	64.024	75.224	78.818	56.740	44.353	2,801
Germany	41.835	38.389	45.003	26.059	13.355	5,293
Ireland	9.494	8.480	8.574	835	192	113
Italy	11.395	9.513	6.858	4.085	2.186	902
Netherlands	20.833	12.868	12.209	5.003	3.485	2,343
Portugal	6.541	6.376	9.800	10.286	8.121	7,400
Spain	973	1.012	1.206	974	969	779
Other EU Countries	70,782	85,672	22,079	19,033	14,743	9,183
Total EU Claims	247.267	253.326	193.521	128.402	90.473	29,177
Switzerland	54,635	69,552	3,725	2,864	1,940	1,527
Turkey	67	135	391	107	65	90
United Kingdom	14,342	12,713	15,352	14,060	10,537	5,631
United States	8,824	6,753	16,358	7,320	4,455	3,201

Source: The author's own elaboration from www.bis.org consolidated banking statistics Table 9D

Table 4: Greece Long Term Credit Ratings in Local Currency (€)

Date	Rating
14.05.2013	B
26.03.2013	CCC
01.03.2013	CCC
28.02.2013	CCC
26.10.2012	CCC
07.09.2012	CCC
17.05.2012	CCC
14.03.2012	B-
22.02.2012	C
28.12.2011	CCC
26.10.2011	CCC
13.07.2011	CCC
20.05.2011	B+
14.01.2011	BB+
21.12.2010	BBB-
09.04.2010	BBB-
08.12.2009	BBB+
22.10.2009	A-
12.05.2009	A
20.10.2008	A

Source: Fitch Ratings

Table 5: Descriptive Statistics for Adjusted Bond and Cds Values

	Adjusted Cds Spreads	Adjusted Bond Yields	
	5-Year-Maturity	3-Year-Maturity	5-Year-Maturity
Mean	46.35%	51.70%	29.13%
Standard Deviation	28.54	27.34	13.76
Min. - Max.	11.99% - 112.07%	20.92% - 103.78%	13.19% - 51.38%
Min. Date - Max. Date	16.05.2011 - 12.12.2011	17.05.2011 - 20.02.2012	17.05.2011 - 19.01.2012

Source: Bloomberg database

Table 6: Performance of Sentiment Index

Date	Event	Index Response
2011, May 6	First exit talks	Increase
2011, July 21	Agreement on the second bailout package	Increase
2011, September 2	Announcement on Greece's inability to reform	Increase
2011, October 4	Delay on decision on the second bailout package	Increase (e.r.)
2011, October 11	Announcement of the new bailout package	Decrease
2011, October 26	Euro Summit announcement supporting Greece	Decrease
2011, October 31	Papandreou's call for referendum	Increase
2011, November 2	The EU disbands its monetary aid	Increase
2011, November 3	Papandreou cancels the referendum	Increase
2011, November 6	Papandreou resigns	Increase
2011, November 11	Papademos becomes the new prime minister	Decrease (l.r.)
2011, December 5	S&P's Eurozone wide downgrade	Increase (e.r.)
2011, December 9	Strengthening of the rescue fund	Decrease (l.r.)
2011, December 16	Announcement on Greece's inability to reform	Increase
2012, February 10	Agreement of debt restructuring	Increase
2012, February 21	Official announcement for debt restructuring	Decrease
2012, March 1	Adjustments to obtain the new bailout package	Decrease
2012, March 2	Positive statements about the end of the crisis	Decrease
2012, March 9	End of Greece debt restructuring	Decrease
2012, March 13	Servicing of the second bailout package	Decrease
2012, May 6	Anti-bailout party wins the election	Increase (e.r.)
2012, May 15	Coalition talks to form the government fails	Increase
2012, June 17	Pro-bailout party wins the election	Decrease (l.r.)

Note: *e.r.* indicates an early response whereas *l.r.* stands for a late response.

Table 7: Event Origins

Date	Event	Origin
2011, May 6	First exit talks	Foreign
2011, July 21	Agreement on the second bailout package	Foreign
2011, September 2	Announcement on Greece's inability to reform	Local
2011, October 4	Delay on decision on the second bailout package	Foreign
2011, October 11	Announcement of the new bailout package	Foreign
2011, October 26	Euro Summit announcement supporting Greece	Foreign
2011, October 31	Papandreou's call for referendum	Local
2011, November 2	The EU disbands its monetary aid	Foreign
2011, November 3	Papandreou cancels the referendum	Local
2011, November 6	Papandreou resigns	Local
2011, November 11	Papademos becomes the new prime minister	Local
2011, December 5	S&P's Eurozone wide downgrade	Foreign
2011, December 9	Strengthening of the rescue fund	Foreign
2011, December 16	Announcement on Greece's inability to reform	Local
2012, February 10	Agreement of debt restructuring	Local
2012, February 21	Official announcement for debt restructuring	Local
2012, March 1	Adjustments to obtain the new bailout package	Local
2012, March 2	Positive statements about the end of the crisis	Foreign
2012, March 9	End of Greece debt restructuring	Local
2012, March 13	Servicing of the second bailout package	Foreign
2012, May 6	Anti-bailout party wins the election	Local
2012, May 15	Coalition talks to form the government fails	Local
2012, June 17	Pro-bailout party wins the election	Local

Note: Events with local origin are related to decisions and actions taken by the Greek government, whereas events with foreign origin are related to decisions and actions taken by international institutions and the other Eurozone countries.

Table 8: Descriptives of Expectation Index

	S
Mean	164.16
Standard Deviation	102.42
Min. - Max.	0 - 398.08
Min. Date - Max. Date	06.05.2011 - 12.12.2011

Table 9: Expectation Index - Highest Responses & Trend Setting Events

Date	Event	Index Response		
		From	To	Level Change
May 6, 2011	First enunciation of exit	0	44	44
July 21, 2011	Second bailout package is agreed	80	58	- 22
Sept. 2, 2011	Announcement of Greece's inability to reform	80	200	120
Oct. 26, 2011	Euro Summit announcement supporting Greece	190	108	-82
Oct. 31, 2011	Papandreou's call for referendum	121	204	83
Nov. 2, 2011	The EU disbands its monetary aid	204	230	26
Nov. 3, 2011	Papandreou cancels the referendum	230	182	-48
Nov. 6, 2011	Papandreou resigns	182	334	152
Dec. 5, 2011	S&P's Eurozone wide downgrade	324	355	31
Dec. 9, 2011	Strengthening of the rescue fund	355	398	43
Dec. 16, 2011	IMF announcement of late reforms	326	378	52
End of Jan. & February	Debt restructuring	183	288	105

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