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Διερεύνηση παραγόντων που επηρεάζουν τις αποδόσεις των CDS

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Εγκρίνουμε την εργασία του
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ΒΕΒΑΙΩΣΗ ΕΚΠΟΝΗΣΗΣ ΔΙΠΛΩΜΑΤΙΚΗΣ ΕΡΓΑΣΙΑΣ

«Δηλώνω υπεύθυνα ότι η συγκεκριμένη πτυχιακή εργασία για τη λήψη του Μεταπτυχιακού Διπλώματος Ειδίκευσης στη Λογιστική και Χρηματοοικονομική έχει συγγραφεί από εμένα προσωπικά και δεν έχει υποβληθεί ούτε έχει εγκριθεί στο πλαίσιο κάποιου άλλου μεταπτυχιακού ή προπτυχιακού τίτλου σπουδών, στην Ελλάδα ή στο εξωτερικό. Η εργασία αυτή έχοντας εκπονηθεί από εμένα, αντιπροσωπεύει τις προσωπικές μου απόψεις επί του θέματος. Οι πηγές στις οποίες ανέτρεξα για την εκπόνηση της συγκεκριμένης διπλωματικής αναφέρονται στο σύνολό τους, δίνοντας πλήρεις αναφορές στους συγγραφείς, συμπεριλαμβανομένων και των πηγών που ενδεχομένως χρησιμοποιήθηκαν από το διαδίκτυο».

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ΒΛΑΧΑΚΟΣ ΚΛΕΑΡΧΟΣ

Contents

Abstract

This thesis investigates the factors which determine the price of CDS. We analyzed all the micro and macro fundamentals related to the CDS yield .All of our inputted data is available at Datastream and Eurostat. The econometric model which matches this type of analysis is the log-log model .The results at most of the cases was the same as expected. In our conclusion it is given a general analysis as long as the outcomes for the case of Greece and the impact on the investor sentiment after the bail-out. Furthermore some recommendations are proposed concerning the policies which have to be considered in order to protect credit trustworthiness of one country and in general to create shields in order to protect credit capability.

Chapter 1 Introduction

1.1 General Information

The emergence of the activity on developed sovereign CDS is a relatively recent phenomenon .Initially, the majority of the protection traded through CDS concerned corporate reference entities .Prior to the crisis, participants had little incentives to negotiate CDS on developed countries, as sovereign risk was considered to be insignificant for highly-rated countries. Yet, the modification of the perception of sovereign risk, following the set up of massive rescue plans and the deterioration of public balance, has led to an increasing activity on this segment of the CDS market. Notional amounts outstanding of sovereign CDS increased by 76% between December 2006 and December 2009 according to the BIS semiannual Over-The-Counter (OTC) market derivatives statistics.

An important development in derivatives markets since the late 1990s has been the growth of credit derivatives. In 2000, the total notional principal for outstanding credit derivatives contracts was about $800 billion. By December 2009, this had become $32 trillion. Credit derivatives are contracts where the payoff depends on the creditworthiness of one or more companies or countries .Credit derivatives allow companies to trade credit risks in much the same way that they trade market risks. Banks and other financial institutions used to be in the position where they could do little once they had assumed a credit risk except wait (and hope for the best). Now they can actively manage their portfolios of credit risks, keeping some and entering into credit derivatives contracts to protect themselves from others. Banks have been the biggest buyers of credit protection and insurance companies have been the biggest sellers .Credit derivatives can be categorized as ‘‘single-name’’ or ‘‘multi-name.’’ The most popular single-name credit derivative is a credit default swap. The payoff from this instrument depends on the creditworthiness of one company or country. There are two sides to the contract: the buyer and seller of protection. There is a payoff from the seller of protection to the buyer of protection if the specified entity (company or country) defaults on its obligations.

The rate of payments made per year by the buyer is known as the CDS spread. Suppose that the CDS spread for a 5-year contract on Ford Motor Credit with a principal of $10 million is 300 basis points. This means that the buyer pays $300,000 per year

and obtains the right to sell bonds with a face value of $10 million issued by Ford for the face value in the event of a default by Ford. 1 The credit default swap market has grown rapidly since the International Swaps and Derivatives Association produced its first version of a standardized contract in 1998.

Many major banks have also been entering OTC trades on CDS index options during the last few years. Their clients include hedge funds, proprietary trading desks, insurance companies, investment managers and CDS index traders who use options for risk management of their positions. Last but not least the arbitrage relationship between the derivative and the underlying market raises the issue of which market influences the other.

In April 2010, Greece requested a European Union/International Monetary Fund (EU/IMF) bailout package to deal with the worst fiscal crisis since Second World War. A few days later standard and poor's decreased Greece's rating to BB and downgraded its view of Portugal, a move that affected stock markets around the world(sharp price decreases in Athens, London, New York, Paris and Frankfurt). In May 2010,after a series of austerity measures was proposed by the Greek Government and amides ,fears that a potential default would disrupt the eurozone financial markets, affect European banks that held Greek bonds, and eventually spill over to other European countriess as a result a 110 billion EU/IMF loan package over three years was provided. During the following months, and despite austerity policies that were imposed in countries with fiscal imbalances, European governments agreed an 85 billion aid package for Ireland (November 2010) and European finance ministers endorsed a 78 billion bailout for Portugal (May 2011).

The bailout packages and the fiscal policies were not enough to reassure financial markets and restore investor confidence. For instance, at the time of the bailout package, Greece was expected to return to the markets and refinance its debt in 2012. In May 2011, however, the 3-year Greek sovereign CDS yield stood at approximately 1678 basis points, up from approximately 23 basis points in 2008. At the same time, the 3-year sovereign CDS yield s for Ireland and Portugal rose to around 680 and 480 from 80 and 40 respectively in 2011, from approximately 2 percent in 2009. Even the

CDS yields for Spain and Italy increased significantly between 2008 and 2011. Since CDS yield reflect the probability of default of one country or company, the significant increase in yields indicates that financial markets do not consider the bailout packages and the policy measures enough to lead to economic stability. Furthermore, the high yield levels imply economically unviable borrowing rates and undermine future economic development. As a result, what started as a fiscal crisis of a small peripheral economy that represents only about 2 percent of the European economy has escalated to the most serious financial crisis in the European Union for a long time, and especially since the introduction of the common currency, the euro. Since CDS yields reflect the probability of default of one country) in order to reach a viable solution and decide the appropriate policies in solving the crisis it is crucial to fully understand the factors that drive investor expectations and determine sovereign yield spreads, especially during periods of financial turmoil.

1.2 Purpose of thesis

The purpose of this thesis is to investigate the determinants which may or not affect the prices of CDS in the light of the recent financial crisis. Understanding the determinants of credit spreads is important for financial analysts, traders and economic policy makers. Consequently, over the last few years a large body of academic research has used corporate bond prices or single name CDS spreads to determine the drivers of movements in credit spreads. This thesis represents an effort in a systematic investigation of the impact of market conditions along with liquidity conditions on credit default spreads. It also bridges the two strands of literature on credit risk that tend to focus separately on the macro and micro determinants and hence allows us to assess the relative explanatory power of macro and micro variables for credit spreads and examine the interaction between market , liquidity general conditions and country characteristics. Previous research (e.g. Yu, 2005) indicates that single-name CDS spreads may behave quite differently during volatile CDS periods compared with their behaviour in tranquil periods. This is the case for us ,our investigation is divided in 2 discrete periods (2007-2012 and 2013-2016) in order to assess the same determinants in different circumstances (in the beginning of financial crisis and after the bail-out packages).

1.3 Structure of the thesis

The structure of the thesis is consisted of 3 major parts:

I. Literature Review

   In this section it is compared and contrasted different authors' views on the cds regime, criticized aspects of methodology, highlighted exemplary studies and finally showed how my study relates to the literature in general

II. Data and Methology

   In this section,it is analyzed the method we used in order to collect the appropriate data in order to fulfill our regression’s requirements. The main supplier of our data is Datastream and Eurostat.The logical process for the data collection is fully analysed in this section

III. Results and Conclusion

In this section we analyse the results of our regression and we go into further investigation of the outcomes in order to identify in a more specific basis the determinants of the CDS for the SWEAP countries (Portugal,Ireland,Spain,Greece,Italy)

Chapter 2 Literature Review

2.1 General empirical research

In general, credit derivatives are financial contracts that work as a protection against financial losses related to credit default. The financial instruments called credit default swaps (CDS) are among the most important credit derivatives products. This is a bilateral contract in which the buyer pays a periodic fee or premium in exchange for a contingent payment by the counterparty (the seller) in the case of credit event occurs (a review about the CDS market can be seen in Moorad (2006)). The literature presents a lot of works related to credit default swaps, covering several aspects and approaches of this instrument such as spillovers, correlations and determinants (see for example Bruyckere et al., 2013; Oliveira, Curto, & Nunes, 2012; Naifar, 2011; Arce, Mayordomo, & Pena, 2013).

Among the several types of credit default swaps the sovereign CDS is an important instrument that represents the default risk of an underlying country. The studies on the sovereign CDS and their relationships with global, local and risk variables, are relevant inputs for investors who are interested in the sovereign credit derivatives market. Many works in the literature have studied the impact of financial variables (as market index and CDS index) on sovereign CDS. Particularly, Tokat and Murat (2009) analyze the impact of the CDS index of high-yield corporate bonds (called iTraxx Crossover– iTraxx XO), on sovereign CDS of emerging markets (Brazil, Turkey and South Africa). The study shows a significant impact of the iTraxx XO index on the pricing dynamics of the sovereign CDS prices.

A study between European sovereign debt crisis and CDS market is presented in Atrissi and Mezher (2010). They analyze the data from the SWEAP countries (Portugal, Ireland, Italy, Greece and Spain), France and Germany for the period from November 2009 to April 2010. The results show that these countries CDS are influencing one another, due to high correlations observed between them. In the same sense, Mayer (2013) studies the impact of the European debt crisis on the valuation of sovereign debt in the euro area, for the period from July 2007 to April 2012, where the

results show a structural break in the valuation of sovereign debt at the beginning of the European debt crisis.

So far, empirical studies on sovereign CDS have focused on emerging countries because this is where the CDS were originally traded. Evidence in these markets mostly converge towards a lead of the CDS market. On a sample of 8 emerging countries, Bowe et al. (2009) conclude to the lead of the CDS market. Ammer and Cai (2007), on a different sample of 7 emerging markets , find that the price discovery process occurs on the CDS when underlying CDS are relatively illiquid. To our knowledge, few articles have focused on CDS of developed countries, due to their recent emergence. Jarrow and Turnbull (2000) suggest that incorporating macroeconomic variables may improve a reduced-form model of credit spreads. Duffie et al. (2007) use macroeconomic variables, such as industrial production growth, to help better predict corporate default.

Following this market growth, the emergence of CDS as an asset class, and motivated by the role of the CDS market in the global financial crisis, academic research on CDS instruments and spreads flourished. Also, as Ang and Longstaff (2013) argue, there is an important advantage in using CDS spreads compared to debt spreads when studying credit risk: debt spreads are deter-mined by a plethora of other factors apart from credit risk. The literature on sovereign CDS, however, developed less rapidly compared to the literature on corporate CDS (Doshi et al., 2014). For instance, many recent studies focus on bank or corporate CDS spreads (e.g. Chiaramonte and Casu, 2013; Galil et al., 2014; Annaertet al., 2013; among others), or emerging market CDS spreads (see Hilscher and Nosbusch, 2010; Ammer and Cai, 2011; Fender et al.,2012; among others). Furthermore, the early literature on credit spreads mainly concentrates on bond yield spread determinants and documents the role of common global and financial market factors (Edwards, 1986; Berg and Sachs, 1988; Boehmer and Megginson, 1990; Eichengreen and Mody, 1998; Remolona et al.,2008; among others). In terms of empirical approaches employed to study the CDS market, Doshi et al. (2014) point out that there are two different strands in the recent literature. Many studies employ reduced-form latent models to model credit risk (e.g. Panand Singleton, 2008; Longstaff et al., 2011), while other studies regress CDS spreads on variables that

capture fundamental macroeconomic spread determinants (e.g. Dieckmann and Plank, 2012).For example, spillover effects are often examined with global vector autoregression (GVARs) models of sovereign debt across countries.

Longstaff et al. (2011) examine monthly 5-year CDS for 26 countries between 2000 and 2010 and find that sovereign CDS spreads can be explained to a large extent by U.S. equity, volatility, and bond market risk premia. In addition, they find that important determinants are global financial market variables or a global risk premium, while the contribution of local macroeconomic variables is of minor importance; this implies that systemic sovereign risk is more related to financial markets than to country-specific variables. Heinz and Sun (2014) use a panel GLS error correction frame-work and find that European sovereign CDS spreads are largely driven by factors such as global investor sentiment, macroeconomic fundamentals and liquidity conditions in the CDS market,with their relative importance changing over time (see also Beirne and Norden (2008) finds that firms with high media coverage exert greater abnormal CDS spread changes and higher long-term run ups when downgrades or revisions for downgrades are announced,but the CDS market's short-term surprise is stronger for firms with low media coverage). Additionally, the anticipation of negative events increases with the amount of private information (proxied by the number of banking relationships) spilled over to the CDS markets. Using stock market and CDS data, Jorion and Zhang (2009) examine the impact of a borrower's bankruptcy on its creditors and report that creditors experience significant negative abnormal stock returns and increases in CDS spreads in the 3-day and 11-day event windows. Acharya and Johnson (2007) investigate the existence of insider trading in CDS markets. They find that significant information (exclusively bad news) flows from the CDS market to the stock market for entities that have high CDS premium levels or experience a decline in credit quality. The degree of information flow increases with the number of banking relationships, but no evidence that the degree of insider activity adversely affects prices or market liquidity is found.4 Forte and Pena (2009) also study the dynamic relationship between CDS and stock markets, and report that stock markets play a leading role in price discovery.

Moreover Longstaff et al. (2003), using the Treasury rate as the benchmark risk-free rate, and find significant differences between credit default swap spreads and bond yield spreads. Blanco et al. (2003) use the swap rate as the risk-free rate and find credit default swap spreads to be quite close to bond yield spreads. They also find that the credit default swap market leads the bond market so that most price discovery occurs in the credit default swap market.

Analysts and commentators often use ratings as descriptors of the creditworthiness of bond issuers rather than descriptors of the quality of the bonds themselves. This is reasonable because it is rare for two different bonds issued by the same company to have different ratings. Indeed, when rating agencies announce rating changes they often refer to companies, not individual bond issues.Their results for positive rating events were much less significant than John Hull Mirela Predescu and Alan White (2004) results for negative rating events. This is consistent with the work of researchers who have looked at the relationship between rating events and bond yields, but may be influenced by the fact that there were far fewer positive rating events in their sample.

Many studies also focus on price discovery. Fontana and Scheicher (2010) study the relationship between the relative pricing of euro area sovereign CDS and the underlying government bonds and find that, since September 2008, market integration for bonds and CDS varies across countries: in half of the sample countries, price discovery takes place in the CDS market, while in the other half, price discovery takes place in the bond market. Ammer and Cai (2011) find evidence that CDS premia and bond yield spreads are linked by a stable linear long-run relationship, while Palladini and Portes (2011) find that the CDS market moves ahead of the bond market in terms of price discovery. (JFS 2016)

Alessandro Fontana and Scheicher argue that variables, which previous research has identified as key drivers of credit spreads (cf. Collin-Dufresne et al.,2001, Campbell and Taksler, 2003; Raunig and Scheicher, 2009; Ericsson et al. 2009), do not affect CDS premia during the credit crisis in the same manner. In the credit risk literature, a commonly used theoretical framework is the structural model of Merton (1974), which has been extended towards sovereign credit risk by Gapen et al. (2008).Their analysis

show that, in the cross-section, for both CDSs and bond spreads, the signs of the coefficients of country-specific covariates, which are significant, correspond to their hypotheses. In the time-series perspective, CDSs correlate with country-specific covariates and with proxies for risk premium. Overall, CDS premia are more sensitive to country specific drivers of credit risk. They found that both CDSs and bond spreads are correlated positively with measure of the risk premium ,but CDS exhibit a ‘’stronger’’ correlation with country specific drivers of credit risk.

By contrast, the dependence on fundamentals equips the structural approach with a wide set of empirically testable determinants of default. In structural credit risk models for instance(Merton, 1974; Black and Cox, 1976; Longstaff and Schwartz, 1995; or Zhou, 2001) default is triggered when the firm value falls below a certain threshold, which is commonly modelled as an increasing function of firm leverage. Also, assuming a particular stochastic process for the firm value allows risk neutral valuation to be used for pricing credit risk sensitive instruments.

Sovereign debt markets in a number of euro area countries came under unprecedented stress from the first half of 2010 onward. This period of stress significantly affected the market pricing of government debt. Before the global financial crisis, valuation of debt issued by developed country governments had typically treated a default as a very low probability event. In fact, empirical modelling (e.g. in term structure analysis) was mainly oriented towards interest rate risk or liquidity risk, rather than default risk.

John Hand and David A.Lesmond (2008) suggest that future research into determinants of sovereign and corporate emerging market spreads should incorporate liquidity effects, and that incorporation of liquidity components into pricing and risk management models (as in Duffie, Pedersen, and Singleton,2004) is of critical importance. They also confirm at least a necessary condition for liquidity based contagion in emerging markets, namely the existence of significant liquidity premia embedded in emerging market bond returns .

2.2 Previous work on investor sentiment

Dragon Yongjun Tang and Hong Yan 2009 identify that investor sentiment at the aggregate market level and implied volatility at the firm level as the most important credit spread determinants. Firm-specific cash flow characteristics such as growth rate, growth volatility, and beta also have stand-alone explanatory power. Moreover, they provide evidence on the importance of the interaction between market conditions and firm specific characteristics. Specifically, during economic expansions , firms with high cash flow betas have lower credit spreads, ceteris- paribus, than firms with low cash flow betas. This relation reverses during economic recessions. Several economists present formal theoretical models on the role of investor sentiment and how it affects investor behavior and asset prices. For example, Daniel et al. (1998) assume that investors are overconfident and (in the case where self-attribution bias is also present) the subsequent arrival of information that either confirms or disconfirms investor private information will lead to asymmetric reaction. That is, in the short-term the overconfidence increases following the arrival of confirming news and that leads to further overreaction and return momentum; in the long run, as investors realize their errors, a return reversal is observed. Furthermore, since on average investors hold long positions an increase in market prices will result in higher overconfidence and greater return momentum. Hong and Stein (1999) assume two type of investors that either rely exclusively on their own private information (news watchers) or rely exclusively on past price information (momentum traders) and develop a model that predicts initial underreaction to information and a subsequent overreaction. Barberis et al. (1998) present and solve a one-asset one-investor model where the investor's beliefs reflect consensus forecasts (the investor also believes that earnings are either mean-reverting or trending) and where the solution generates both underreaction and overreaction for a wide range of parameter values.

In addition, during the past decade the results of many empirical studies indicate that investor sentiment has a significant effect on asset returns: Fisher and Statman (2003), use the consumer confidence measures of the University of Michigan and the Conference Board as proxies of sentiment and find that consumer confidence has some predictive ability on stock returns; a negative relationship is found between the level of consumer confidence and subsequent Nasdaq and small cap stock returns. Schmeling

(2009) also examines consumer confidence as a proxy for individual investor sentiment for 18 industrialized countries and finds that sentiment negatively forecasts aggregate stock market returns, on average, across countries (Brown and Cliff, 2004; Baker and Wurgler, 2007). Note also, and this may be particularly relevant during the European financial crisis, investors seem to overreact to bad news but underreact (or not react) to good news: Schnusenberg and Madura (2001) report, among other findings, evidence consistent with the hypothesis that equity prices react more strongly to bad news rather than good news (Brown et al., 1988). Bovi (2009) further argues that psychological biases affect both the subjective probability of future economic events and their retrospective interpretation; using a unique dataset covering ten European countries .Bovi reports that psychologically driven distortions affect people's judgments and expectations formation.

Chapter 3 Methology and Data

3.1 General approach

This thesis tries to examine all the determinants of CDS spreads for a sample of European markets during the debt and worldwide financial crisis for the SWEAP countries (Spain, Italy, Ireland, Portugal, and Greece); its main contribution to the literature is that it examines, for the first time, along with fundamental economic variables, the role of investor sentiment during the financial crisis. As we have already showed in the chapter 2, previous empirical work suggests that CDS spreads reflect mainly three different types of risk: general market risk, default risk, liquidity risk. Previous studies, however, neglect variables that may capture other aspects of market behavior, such as behavioral biases and sentiment-driven mispricings that may be present in bond markets. Note that the idea that sentiment may affect asset prices is not new as many economists present formal theoretical models on the role of investor sentiment and how it affects investor behavior and asset prices. To that end, I estimate models of the yield spread where the explanatory variables proxy not only for economic fundamentals (such as economic activity, default risk, liquidity risk, and general market conditions) but also for biases in investor behavior (such as proxies for investor sentiment). To anticipate the results, fundamental variables are examined for their significance regarding their determination of the level of CDS yields.

Although theory does not provide any specific priors with respect to the variables that determine cds yields, previous empirical work suggests that CDS yields reflect (provided that CDS and bond yields are correlated) mainly three different types of risk

(1) general market risk (Codogno et al., 2003; Haugh et al., 2009);

(2) default risk, i.e. the possibility that a debtor will not fulfil the bond obligations; and

(3) liquidity risk, i.e. the possibility that investors will not be able to liquidate their investments without significantly affecting prices in secondary markets.

As a first step we collected all the relative data regarding the price of 3-year CDS of the examined countries (Greece,Italy,Portugal,Spain,Ireland).There is no CDS data available for Greece as of 2012, so the price stayed unchanged from the last one.

- **General Market Risk**

In order to capture the effect of general market conditions two variables are employed. The first variable is the Eurozone Consumer Price Index (denoted as CPI; all items, harmonized; a positive coefficient sign is expected for the former variable, as higher consumer prices may suggest worsening economic conditions and thus a larger spread) and the second variable is a proxy for general market volatility and it is associated with VIX index (denoted as VIX). Since credit spreads are assumed to also compensate investors for pure expected losses (Hull et al., 2005), they may be sensitive to changes to investor risk aversion. The VIX is often considered as a measure of market expectations of near-term volatility conveyed by S&P500 stock index option prices. It is based on the weighted average of the implied volatilities for a wide range of strikes and is considered as a market estimate of future volatility. Implied volatility has the potential to reflect information that a model-based forecast could not; for instance the VIX index reflects information related to both past jumps and future jump activity. (Becker et al.,2009).

To gain further insight of the effect of general market conditions one more variable is also employed. This variable is a proxy for market liquidity (denoted as (_3m_ecb_rate). This variable is estimated as the difference between the European Central Bank (ECB) reference rate and the three month Euribor .The expected coefficient for this variable is negative since liquidity is negatively correlated with the probability of default.

Furthermore in order to complete our investigation we will employ the investment sentiment parameter as variable of the general market risk. Previous studies employ a number of different proxies for investor sentiment. For example, among the different variables used are survey data on consumer/investor sentiment, derivative market data (such as the volatility index and the put – call discounts), flows of closed-end/mutual

funds, the daily content from financial newspapers, retail investor transactions (Schmeling, 2009; Fisher and Statman, 2003;Kumar and Lee, 2006; Kurov, 2008; Neal and Wheatley, 1998; Tetlock, 2007). This thesis employs two variables; one to capture local sentiment and one to capture sentiment in major markets. More specifically, as a proxy for investor sentiment in major markets the University of Michigan Consumer Sentiment Index (MCSI) (denoted as ESIG) is used. The MCSI uses telephone surveys to gather information on consumer expectations regarding the overall economy and is compiled monthly by the University of Michigan and Thomson Reuters. (Fisher and Statman, 2003)

Investor sentiment for local securities is captured with the economic sentiment indicator (ESI), which is supplied by the European Commission for each country(denoted as ESIL). The only exception is Ireland where the ESRI and IIB Bank Survey Consumer Sentiment Index is employed due to unavailability of data.(all indexes are available at Data-stream). The ESI used for the sample markets is a composite index, based on surveys, that is composed of five sectoral confidence indicators: industrial confidence, services confidence indicator, consumer confidence indicator, construction confidence indicator, and retail trade confidence. The indicators are arithmetic means of seasonally adjusted balances of survey questions. The surveys are defined within the Joint Harmonized EU Programme of Business and Consumer Surveys and the data are compiled according to the statistical classification of economic activities in the European Community. (Source: Datastream).

The ESRI and IIB Bank Survey Consumer Sentiment Index is based on monthly surveys in Ireland that aim to track the consumer attitude towards trends in the economy (Source: Data-stream). As for the sign on this variable, there are no priors. Assuming that negative monthly changes in sentiment indicates increased pessimism about the macroeconomic outlook and future economic prospects of a country, it is logical to expect that this will lead to higher uncertainty and higher risk, and to higher yields; thus a negative sign is expected for sentiment changes. The same may hold for levels: higher levels of sentiment may suggest investor optimism and thus lead to an increased demand or a country's debt securities, increasing the price and thus lowering the yield level.

- **Default Risk**

Important macroeconomic covariates are real GDP growth, industrial production growth, and the unemployment rate. In order to capture the effect of default risk we will employ the industrial production as reference variable (denoted as IND). The macroeconomic variables tend to be highly correlated across countries as is well documented in the large literature on global business cycles; see, e.g., Kose , Otrok, and Whiteman (2003).

3.2 Quantitative approach

Following Edwards (1984) who shows that, assuming competitive markets and risk neutral investors, the relationship between spread determinants is log-linear, the following time-series regression for the yield spread is estimated as:

$$\log s_{it} = \alpha + \sum \beta_{jt} X_{jt} + \varepsilon_{it} \qquad (1)$$

In equation (1) s_{it} is the is the CDS yield of country i at month t, a is an intercept coefficient, b's are the slope coefficients, and J are the explanatory variables (log levels); 1it are the i.i.d. disturbance terms. As discussed above, the explanatory variables that enter the above regression are variables that capture the three commonly reported sources of spread risk (default risk, liquidity risk, and general market conditions). The sample period for the empirical analysis is between January 2007 and December 2016, the frequency of observations is monthly, and all data are available at Datastream and Eurostat.We have gathered date regarding the 3-year CDS contracts for each of our examined countries. The variables are outlined below and their selection satisfies two criteria: is consistent with theory and prior empirical work and the variables can be estimated with publicly available monthly data.

At the first stage, the long-run model is to be estimated includes only the fundamental variable as follows:

$$\log(cds)_{it} = a_i + \beta_1 \log(cpi)_t + \beta_2 \log(ind)_{it} + \beta_3 \log(\_3m\_ecb\_rate)_t + \beta_4 \log(vix)_t \qquad (2)$$

At the second stage, the two variables that proxy for local and general investor sentiment are added to the model, as follows:

$$\log(cds)_{it} = a_i + \beta_1 \log(cpi)_t + \beta_2 \log(ind)_{it} + \beta_3 \log(\_3m\_ecb\_rate)_t + \beta_4 \log(vix)_t + \beta_5 \log(esig)_t + \beta_6 \log(esil)_{it} \qquad (3)$$

Further, in order to
investigate the short-run dynamics (4) and (5) are also estimated in first differences as follows:

$$d(cds)_{it} = a_i + \beta_1 d(cpi)_t + \beta_2 d(ind)_i + \beta_3 d(\_3m\_ecb\_rate)_t + \beta_4 d(vix)_t \quad (4)$$

$$d(cds)_{it} = a_i + \beta_1 d(cpi)_t + \beta_2 d(ind)_i + \beta_3 d(\_3m\_ecb\_rate)_t + \beta_4 d(vix)_t + \beta_5 d(esig)_t + \beta_6 d(esil)_{it} \quad (5)$$

To gain further insight, a non-structural approach is also employed and the relationships in equations (3) and (5) are estimated as a vector auto-regression (VAR) system where yield is treated as variables endogenous to the system and lags are allowed, while the rest of the variables are treated as exogenous. That is, the following equations (6) and (7) are estimated simultaneously as a VAR system for levels:

$$\log(cds)_{it} = a_t + \beta_1 \log(cpi)_{it} + \beta_2 \log(ind)_i + \beta_i \log(\_3m\_ecb\_rate)_{it} \; \beta_4 \log(vix)_t \; \beta_5 \log(esig)_t + \beta_6 \log(esil)_{it} + \beta_6 \log(cds)_{i,t-1} + \beta 7 \log(cds)_{i,t-1} + \beta_8 \log(cds)_{i,t-2} + \beta_9 \log(esil)_{i,t-1} + \beta_{10} \log(esil)_{i,t-2} \; \beta_{11} \log(esig) \quad (6)$$

$$d(cds)_{it} = a_i + \beta_1 d(cpi)_t + \beta_2 d(ind)_i + \beta_3 d(\_3m\_ecb\_rate)_t + \beta_4 d(VIX)_t + \beta_5 d(esig)_t + \beta_6 d(esil)_{it} + \beta_7 d(cds)_{i,t-1} \; \beta_8 d(cds)_{i,t-2} + \beta_7 d(esil)_{i,t-1} + \beta_8 d(esil)_{i,t-2} \quad (7)$$

The models are estimated , in order to examine the stability of the results over-time, for two sub-periods: an early-crisis period (2007-2013) and a crisis period (2013-2016).

Chapter 4 Data Results and Reasoning

4.1 Data Interpretation

The results for the long-run model (equation 2) are presented in Table I. The results are presented for two discrete sub-periods the sub-period 2007-2013, while the last five columns present the results for sub-period 2013-2016.

The findings for the log levels of CDS yield for each sub period reveal that, overall, general risk factors are important determinants for the level of the CDS yields. In addition, for all variables the sign of the estimated coefficients is as expected. For the default risk factors the results indicate that industrial production is negatively related with the level of CDS yield and statistically significant for some markets, while the level of consumer prices in the Eurozone is positively related to yield and statistically significant for all markets. For example, CPI has an estimated coefficient of 57,59 and a t-statistic of 9,48 for Greece and an estimated coefficient of 40,92 and a t-statistic of 9,81 for Portugal; European CPI has an estimated coefficient of 24,014 and a t-statistic of 8,03 for Italy and an estimated coefficient of 20,53 and a t-statistic of 5,00 for Spain. As far as Ireland is concerned ,the CPI is statistical important accounting for 16,43 and a t-statistic 4,22.From the local variables, industrial production is also statistical important at 5% for Greece and Ireland with coefficients -4,36 and -4,28 with t-statistic -3,19 and 1,64 respectively , while liquidity is statistically significant for Greece and Italy. Regarding the general risk the VIX factor has an estimated coefficient of 0,016 and a t-statistic of 2,11 for Greece and an estimated coefficient of 0,029 and a t-statistic 44,48 for Italy. The adjusted-R 2 of the regressions ranges between 61 percent (Italy) to 85 percent(Greece) indicating that the chosen variables explain a large part of the CDS yields(except for Ireland having and R^2 in the scale of 30 percent).

	Period 2007-2012				
	Greece	Italy	Spain	Portugal	Ireland
Constant	**-235,38 (-7,4)**	**-103,18 (-6,55)**	**-82,33 (-2.89)**	**-188,64 (-8,05)**	**-88,84 (-4,292)**
CPI	**57,59 (9,48)**	**24,014 (8,03)**	**20,53 (5,00)**	**40,92 (9,81)**	**16,43 (4,22)**
Industrial Production	**-4.36 (-3,19)**	-0.40 (-0,43)	-1,36 (-0,55)	1,71 (1,20)	**-4,28 (1,64)**
Liquidity	**-0.229 (1,86)**	**-0.18 (1,85)**	0,113 (0,9801)	-0.14 (-0,94)	-0.073 (-0,49)
VIX	**0.016 (2.11)**	**0.029 (4,48)**	**0.012 (1,76)**	0.0062 (0,631)	0.0033 (0,359)
Adjusted R^2	0,85	0,61	0,62	0,61	0,3

	Period 2013-2016				
	Greece	Italy	Spain	Portugal	Ireland
Constant	-	**54,06 (2,34)**	**81,39 (3,06)**	44,05 (1,35)	15,38 (0,55)
CPI	-	-5,77 (-1,06)	-8,56 (-1,33)	-7,68 (-1,06)	-1,059 (-0,17)
Industrial Production	-	**-4,99 (-1,96)**	**-8,29 (-5,39)**	-0.68 (-1,109)	**-1,35 (-7,23)**
Liquidity	-	**0.62 (9,54)**	**-0.66 (9,84)**	**-0.682 (7,89)**	**0.59 (7,88)**
VIX	-	0.0069 (0,801)	0.024 (2,508)	0.0021 (0,17)	0.009 (0,92)
Adjusted R^2	-	0,703	0,81	0,68	0,84

Table I.
Long run yield spread
determinants (log levels)

Period 2007-2012					
	Greece	Italy	Spain	Portugal	Ireland
Constant	**-105,3387 (-3,014)**	-9,15 (-0,41)	-14,75 (-0,47)	-76,28 (-2,75)	**-113,22 (-6,35)**
CPI	**35,43 (5,36)**	3,71 (0,787)	**11,62 (2,83)**	**16,81 (3,17)**	**22,18 (6,10)**
Industrial Production	**-3,75 (-3,57)**	2,83 (1,05)	**-8,237 (-3,05)**	0,43 (0,44)	2,72 (1,25)
Liquidity	-0,13 (-1,10)	**-0,28 (3,39)**	0,086 (0,86)	0,009 (0,08)	0,177 (1,32)
VIX	**0,013 (1,60)**	**0,012 (1,87)**	0,023 (3,533)	**0,029 (3,47)**	**0,025 (2,60)**
Local Sentiment	**-10,25 (-5,20)**	**-2,48 (-1,76)**	**-3,91 (-1,76)**	**-8,76 (-5,19)**	**-2,87 (-3,25)**
General Sentiment	**2,86 (2,82)**	-1,03 (-0,43)	**4,77 (3,40)**	**9,25 (7,50)**	**3,62 (4,38)**
Adjusted R^2	0,91	0,82	0,73	0,86	0,52

Period 2013-2016					
	Greece	Italy	Spain	Portugal	Ireland
Constant	--	-9,15 (-0,41)	**56,75 (2,22)**	4,16 (0,74)	-9,80 (-0,37)
CPI	--	3,71 (0,78)	-4,08 (-0,67)	0,74 (0,08)	5,99 (0,97)
Industrial Production	--	2,83 (1,05)	-2,711 (-0,95)	-0,24 (-0,38)	-0,48 (-1,34)
Liquidity	--	**0,28 (3,39)**	**-0,43 (3,2)**	**-0,36 (2,12)**	**-0,41 (4,80)**
VIX	--	**0,012 (1,87)**	**0,022 (2,57)**	-0,0007 (-0,05)	0,01 (1,17)
Local Sentiment	--	**-2,48 (-1,76)**	0,090 (0,04)	**-4,77 (-1,78)**	**-1,22 (-1,58)**
General Sentiment	--	-1,03 (-0,43)	**-4,75 (-2,61)**	4,52 (1,25)	-1,35 (-0,71)
Adjusted R^2	--	0,82	0,84	0,63	0,86

Table II.
Long run yield spread determinants (log levels) with sentiment variables

	Period 2007-2012				
	Greece	Italy	Spain	Portugal	Ireland
Constant	**306,72 (2,35)**	5,21 (0,69)	4,98 (0,69)	17,68 (0,78)	3,17 (0,24)
CPI	-216,52 (-0,74)	-21,08 (-1,38)	-13,64 (-0,99)	-38,75 (-0,87)	-9,60 (-0,38)
Industrial Production	-10,3 (-0,629)	0.01 (0,022)	0.813 (0,19)	-0.95 (-0,51)	1,59 (0,68)
Liquidity	-784,15 (-1,04)	5,22 (0,11)	18,60 (0,44)	-106,54 (-0,78)	35,13 (0,45)
VIX	8,99 (0,66)	**2,85 (3,45)**	**1,93 (2,45)**	**5,56 (2,05)**	**3,29 (2,15)**
R^2	0,05	0,22	0,06	0,09	0,13

	Period 2013-2016				
	Greece	Italy	Spain	Portugal	Ireland
Constant	--	-1,27 (-0,56)	-2,73 (-1,21)	2,32 (-0,41)	-1,55 (-1,207)
CPI	--	-1,94 (-0,46)	-2,67 (-0,64)	-9,07 (-0,87)	-3,32 (-1,37)
Industrial Production	--	-0.07 (-0,03)	-2,42 (-0,88)	0.19 (0,35)	-0.10 (-0,94)
Liquidity	--	10,81 (0,47)	-6,05 (-0,27)	33,65 (0,59)	5,13 (0,40)
VIX	--	**0.85 (1,88)**	0.46 (0,97)	1,34 (1,14)	0.16 (0,65)
R^2	-	0,09	0,05	0,07	0,07

Table III.
Short run yield spread determinants (first differences)

Period 2007-2012					
	Greece	Italy	Spain	Portugal	Ireland
Constant	285,79 (2,11)	4,90 (0,63)	6,00 (0,82)	15,27 (0,66)	6,07 (0,47)
CPI	-217,35 (-0,71)	-19,90 (1,26)	-15,37 (-1,09)	-49,023 (-1,07)	-6,45 (-0,26)
Industrial Production	-10,34 (-0,62)	0.041 (0,06)	1,27 (0,29)	-1,14 (-0,60)	1,411 (0,60)
Liquidity	-1082,44 (-1,31)	-1,16 (-0,02)	15,79 (0,37)	-69,25 (-0,47)	10,12 (0,12)
VIX	4,50 (0,28)	**2,58** **(2,77)**	**1,69** **(1,99)**	**7,10** **(2,36)**	**2,90** **(1,86)**
Local Sentiment	-50,82 (-0,77)	-0.62 (-0,16)	-4,05 (-1,03)	-8,99 (-1,09)	-7,51 (-1,51)
General Sentiment	-10,78 (-0,16)	-1,77 (-0,36)	0.43 (0,109)	14,96 (1,08)	-5,44 (-0,89)
Adjusted R^2	0,08	0,23	0,17	0,12	0,18

Period 2013-2016					
	Greece	Italy	Spain	Portugal	Ireland
Constant	-	-0.12 (-0,05)	-1,699 (-0,71)	-0.85 (-0,14)	-0.24 (-0,17)
CPI	-	-0.13 (-0,03)	-1,46 (-0,33)	-11,90 (-1,12)	-2,41 (-1)
Industrial Production	-	0.20 (0,09)	-2,43 (-0,86)	0.303 (0,54)	-0.048 (-0,44)
Liquidity	-	-8,44 (-0,35)	-17,78 (-0,75)	34,86 (0,57)	-4,88 (-0,37)
VIX	-	**0.84** **(1,92)**	0.45 (0,94)	0.99 (0,83)	0.160 (0,64)
Local Sentiment	-	-1,48 (-0,82)	0.035 (0,02)	-7,17 (-1,60)	-0.83 (-1,25)
General Sentiment	-	-2,31 (-0,66)	-3,31 (-1,29)	8,38 (1,21)	**-2,33** **(-1,73)**
Adjusted R^2	-	0,17	0,09	0,13	0,16

Table IV.
Short run yield spread determinants (first differences) with sentiment variables

	Period 2007-2012				
	Greece	Italy	Spain	Portugal	Ireland
CDS (-1)	**0.81**	**0.71**	**0,73**	**0.73**	**0.89**
	(4,59)	**(4,89)**	**(5,1)**	**(4,51)**	**(6,64)**
CDS (-2)	0.0072	0.021	0,023	0.09	-0.02
	(0,03)	(0,14)	(0,15)	(0,54)	(-0,12)
Constant	-3,39	-13,094	18,94	-13,17	-19,06
	(-0,13)	(-0,511)	(0,94)	(-0,49)	(0,17)
CPI	3,47	2,735	-1,95	1,45	1,46
	(0,56)	(0,53)	(-0,59)	(0,26)	(0,46)
Industrial Production	**-1,7115**	-0.148	**-3,85**	0.44	**1,92**
	(-2,37)	(-0,248)	**(-2,14)**	(0,69)	**(2,06)**
Liquidity	**-0.14**	0.014	-0,07	0.02	-0.023
	(-1,81)	(0,19)	(-1,20)	(0,12)	(-0,14)
VIX	0.009	**0.012**	**0,008**	0.008	**0.01**
	(1,52)	**(1,83)**	**(1,85)**	(1,11)	**(2,09)**
Local Sentiment	**-4,95**	-2,98	**-3,317**	-1,47	**-3,19**
	(-2,42)	(-1,27)	**(-2,092)**	(-0,84)	**(-3,02)**
General Sentiment	**1,16**	1,45	0,38	2,26	**1,41**
	(1,69)	(0,57)	(0,352)	(1,47)	**(3,41)**
Local Sentiment (-1)	**4,16**	-0.62	1,93	-0.81	**5,56**
	(1,77)	(-0,303)	(1,04)	(-0,48)	**(3,16)**
Local Sentiment (-2)	-1,205	2,67	**2,91**	1,17	**-2,98**
	(-0,66)	(1,51)	**(1,75)**	(0.94)	**(-2,76)**
R^2	0,97	0,88	0,92	0,95	0,94

Table V.
Vector autoregressive
(log levels): CDS and sentiment
as endogenous variables: 2007-2012

	Period 2013-2016				
	Greece	Italy	Spain	Portugal	Ireland
CDS (-1)	-	**0.47** **(3.31)**	**0.46** **(2,78)**	**0,864** **(5,02)**	**0,666** **(3,89)**
CDS (-2)	-	-0.02 (-0,13)	0.26 (1,54)	-0,207 (-1,16)	-0,11 (-0,64)
Constant	-	-3,72 (-0,23)	21,52 (0,97)	13,07 (0,50)	-21,57 (-0,80)
CPI	-	-0.555 (-0,16)	-3,63 (-0,70)	-2,564 (-0,43)	7,11 (1,14)
Industrial Production	-	3,45 (1,71)	2,34 (0,90)	0,13 (0,32)	-0.37 (-1,26)
Liquidity	-	0,13 (1,57)	-0,011 (-0,087)	0,09 (0,82)	**-0,20** **(2,24)**
VIX	-	**0,01** **(2,19)**	**0,011** **(1,75)**	0,009 (1,04)	**0.013** **(1,82)**
Local Sentiment	-	**-2,75** **(-2,42)**	0,329 (0,17)	-0,52 (-0,17)	0,10 (0,06)
General Sentiment	-	1,51 0,81	**-3,50** **(-2,35)**	1,40 (0,55)	-1,81 (-1,08)
Local Sentiment (-1)	-	**2,17** **(1,81)**	0,39 (0,17)	3,13 (1,14)	2,03 (1,16)
Local Sentiment (-2)	-	**-2,45** **(-2,32)**	-0,37 (-0,22)	**-4,07** **(-1,82)**	**-2,01** **(1,74)**
R^2	-	0,93	0,92	0,86	0,92

Table VI
Vector autoregressive
(log levels):CDS and Sentiment
as endogenous variables: 2013-2016

	Period 2007-2012				
	Greece	Italy	Spain	Portugal	Ireland
Constant	99,63 (0,75)	2,97 (0,39)	7,44 (0,96)	7,06 (0,28)	0.76 (0,95)
CPI	-267,12 (-1,01)	-13,19 (-0,85)	-17,99 (-1,19)	-34,32 (-0,68)	4,86 (0,18)
CDS (-1)	**0,500** **(2,77)**	0.13 (0,93)	0,019 (0,12)	-0.085 (-0,54)	0.19 (1,24)
CDS (-2)	**0,69** **(2,88)**	0.05 (0,40)	-0.13 (-0,884)	0.16 (1,03)	0,06 (0,38)
Industrial Production	-11,87 (-0,82)	-0.31 (-0,47)	1,50 (0,31)	-0.78 (-0,38)	1,77 (0,67)
Liquidity	-940,21 (-1,35)	15,29 (0,32)	22,86 (0,52)	-41,45 (-0,25)	-22,9 (-0,26)
VIX	16,243 (1,18)	**2,26** **(2,40)**	**1,83** **(2,09)**	**9,89** **(2,46)**	**3,99** **(1,85)**
Local Sentiment	-101,33 (-1,76)	0.70 (0,17)	-6,12 (-1,31)	-11,53 (-1,22)	**-15,91** **(-2,36)**
General Sentiment	32,98 (0,51)	-0.71 (-0,12)	3,15 (0,57)	22,095 (1,35)	-0,85 (-0,12)
Local Sentiment (-1)	40,074 (0,85)	**-6,61** **(-2,36)**	-3,74 (-0,93)	-2,16 (-0,26)	**17,10** **(1,99)**
Local Sentiment (-2)	40,508 (0,802)	5,094 (1,54)	0.60 (0,16)	-5,2 (-0,72)	-5,89 (-0,85)
R^2	0,45	0,36	0,21	0,22	0,28

Table VII
Vector autoregressive
(first differences): CDS and sentiment as
endogenous variables 2007-2012

	Period 2013-2016				
	Greece	Italy	Spain	Portugal	Ireland
Constant	-	-1,03 (-0,47)	-2,79 (-0,99)	1,30 (0,19)	0.08 (0,06)
CPI	-	-0,85 (-0,20)	-1,39 (-0,26)	-6,33 (-0,54)	1,41 (0,609)
CDS (-1)	-	-0,15 (-0,93)	-0,28 (-1,34)	**0,29** **(-1,77)**	-0.20 (-1,41)
CDS (-2)	-	**-0,33** **(-2,09)**	-0,24 (-1,29)	-0,29 (-1,77)	0.02 (0,21)
Industrial Production	-	-0,18 (-0,09)	-1,70 (-0,56)	0,33 (0,60)	-0.06 (-0,66)
Liquidity	-	20,74 (0,82)	0,60 (0,02)	-3,35 (-0,05)	6,13 (0,51)
VIX	-	0.417 (0,97)	0,38 (0,71)	1,41 (1,16)	0,17 (0,80)
Local Sentiment	-	**-3,32** **(-1,90)**	-0,40 (-0,22)	-4,27 (-0,92)	-0,23 (-0,37)
General Sentiment	-	3,74 (1,02)	-2,52 (-0,86)	9,21 (1,31)	**-2,59** **(-2,25)**
Local Sentiment (-1)	-	0,52 (0,48)	-0,88 (-0,47)	0,099 (0,02)	0.72 (1,105)
Local Sentiment (-2)	-	**-3,34** **(-2,77)**	-0,42 (-0,25)	**-7,86** **(-2,05)**	**-1,14** **(-1,805)**
R^2	-	0,4	0,17	0,27	0,36

Table VIII
Vector autoregressive
(first differences): CDS and sentiment
endogenous variables 2013-2016

The second sub-period (2013-2016) analysis suggests that the results may vary overtime .At this point we have to report that due to the fact that CDS data are not available as of 2012 there is no regression analysis concerning Greece for the examined period. Regarding the general risk (CPI Eurozone and VIX) the VIX becomes statistical important only fore the case of Spain with coefficient 0,024 and t-statistic (2,508). Liquidity appears significant for all the examined countries as well as the level of consumer prices in the Eurozone becomes statistically significant for all markets mainly during this period. From the default factors, industrial production is statistically significant for Italy ,Spain and Ireland.Note that the adjusted-R^2 of the regressions increases significantly during this period : Ireland it is raised to 0,84 from 0.30 in the first period, for Portugal it is raised to 0.68 from 0.61, for Spain to 0.82 from 0.61, for Italy to 0.702 from 0.61.

Table II reports the same results but with the two sentiment variables (local and general) added in the regression . We maintain the same strategy; our sample has been divided in two discrete periods (2007-2012 and 2013-2016).The level of the local sentiment is a statistically significant variable for the level of the yield spread for all the markets , while the level of the general sentiment is also a statistically significant for all the markets except for Italy. For the first period is also statistical significant the consumer price index which is not the case for the second period (2013-2016) For these sub-periods, the only variables that are statistically significant for both sub-periods and for the majority of the markets is the sentiment variables. It can be clearly seen that general sentiment is statistical significant only for the first period for Ireland and Portugal , while in Spain remains important for both periods.

As far as the explanatory factor is concerned we can clearly see that for the second examined period the R^2 is increased for most of our cases (Spain from 0,73 to 0,84, Ireland from 0,53 to 0,86) except for Italy which remains exactly the same (0,82) and the case of Portugal in which it decreases (from 0,86 to 0,63).

Table III reports the same results for the short-run dynamics, i.e. the results from estimating the regression in first differences (equation (5)). The findings indicate that, at the 5 percent level of significance for the first period (2007-2013), only changes in

the VIX for all markets (except for Greece) are an important fundamental determinant of monthly CDS changes; no other fundamental variable is significant at any period. When changes in the sentiment variables are added to the regression (equation (5) ,Table IV) the picture that emerges is the same . That is, the VIX variables are significant for four out of five markets: for Spain, Italy, Portugal and Ireland l while changes in global sentiment are significant for the Irish cds yield, during the second sub-period.

We realise that monthly changes in the CDS yield are not affected by general and local sentiment but only by the variable of VIX. When the local and general sentiment is added to our regression the adjusted R^2 is increased but due to the fact that general and local sentiment did not prove any correlation ,in terms of monthly changes, this increase is not high enough.

4.2 The VAR systems interpretation

Table V reports the results from equations (6) and (7), i.e. the VAR systems, for each country and for the full sample period. Tables V and VI, report the same results for the 2007-2013 and 2013-2016 sub-periods, respectively .The correct lag length is chosen for each market and sample period based on the Akaike Information Criterion (AIC).The analysis is divided in 2 discrete periods ,the same logical flow which is followed in previous steps.

The results in Table V mainly indicate that, when both spread and local sentiment are treated as endogenous variables and lags are allowed, the outcomes are: the previous period spread level is positive and statistically significant at the 5 percent level for the determination of current period spread level for all markets;. for Ireland and Greece, lagged sentiment is also statistically significant for the determination of CDS yield for the first sub-period;. industrial production is now significant for CDS yield for Greece Spain and Ireland for the first-period;. the VIX variable is statistically significant for the CDS equation for Spain, Italy, and Ireland;. general market conditions (CPI) are not significant determinants of current spread for the examined markets while general

sentiment seems to be significant for Greece an Ireland. CDS is mainly driven by its previous prices according to our regression.

For the second sub period (Greece is excluded), the same regime stands for our markets .CDS are mainly driven by its previous prices (but only for first lag).The VIX variable is significant at 5% for Italy Spain and Ireland. Regarding local sentiment, we can clearly see that previous prices affect only the marke of Italy. Consumer product index has no effect for this period as well as industrial production. General sentiment is also significant for Spain and local sentiment for Italy.

For the same examined periods we can realise that the R^2 has increased significantly (with addition of lags) ,for Greece from 85 percent to 97 percent ,for Italy from 61 percent to 88 percent, for Spain from 0,62 to 0,92,for Ireland from 0,3 to 0,94 and for Portugal from 0,61 to 0,95.The same regime stands for the second period but in a lower level ,(Greece is excluded) for Italy from 70 percent to 93 percent , for Spain from 81 percent to 92 percent ,for Portugal from 68 percent to 86 percent and for Ireland from 0,84 to 0,92.

The conclusions for tables VII and VIII change a bit .We use the first differences method to investigate for any correlation between CDS and monthly changes in our variables. For the first period (2007-2013) monthly changes in previous CDS prices affect only the market of Greece .Consumer product index seems to have no effect in terms of monthly changes. The same outcome stands also for industrial production which no effect is realised. Furthermore liquidity has no effect in our examined countries for the first period.The variable has correlation with the CDS price as far as monthly changes are concerned for all markets except for Greece. Local sentiment is significant at 5% level only for Ireland ,while general sentiment has no relation with the CDS yield. The lagged local sentiment is significant only for Italy and Ireland.

For the second period (2013-2016),the outcomes vary .Monthly changes in the CDS yield affect only the market of Portugal while second lag seems to be related with the market of Italy.Monthly changes in industrial production has no effect in our model .Liquidity behaves the same as industial producton with no effect at all.The VIX

variable presents a different relation with the previous examined period with no significance. Local sentiment is significant at 5 percent for Italy and general sentiment only for Ireland. The interesting finding is that for the 3 (except for spain)of our examined markets second lag of local sentiment (monthly changes) is important in defining the price of CDS.

In terms of explanatory factor ,it is clear that for both of the examined periods the adjusted R^2 is increased. For the first period,for Greece increased from 8 percent to 45 percent, for Italy from 23 percent to 36 percent ,for Spain from 17 percent to 21 percent ,for Portugal from 12 percent to 22 percent and for Ireland from 18 percent to 28 perent. The same logic is followed for the second period (2013-2016) ,for the increase of Italy accounting for 23 percent units ,for Spain 8 percent units ,for Portugal 14 percent units and for Ireland 20 percent units.

Chapter 5 Conclusion

This thesis examines the determinants of CDS spreads during the recent financial crisis in the EU. We employ a Panel Vector Autoregressive (PVAR) methodology that combines the advantages of traditional VAR modelling with the advantages of a panel-data approach. In addition to variables that proxy for global and financial market spread determinants we also employ variables that proxy for behavioral determinants. Note that the vast majority of previous studies focuses on macroeconomic and fundamental information in order to study the determinants of yield and neglect behavioral variables that may capture investor and economic sentiment.

Since 2010, when Greece received an EU/IMF bailout package to deal with its fiscal imbalances, the European Union is in a financial crisis. Ireland and Portugal soon received their own aid packages, while a further package was set up for Spain's banking system in June 2012, with the markets expecting Cyprus (the banking system needs refinancing due to losses from the Greek debt "haircut") and perhaps Italy to follow. Investors reacted to the Spanish aid package with debt sell-offs and the yield on the country's CDS increased to their highest levels since the introduction of the Euro, while Italy's CDS yields also increased significantly. During 2012 the second biggest economy in the Eurozone, France, lost its triple AAA rating from Standard and Poor's, and The Netherlands expect a deficit of 4.6 percent of GDP (well above the percent threshold required by the EU rules). On top of that, the euro area GDP decreased by 0.3 percent during the fourth quarter of 2011, according to Eurostat, while over 2011 GDP increased by 1.4 percent (1.9 percent in 2010).It becomes apparent that, despite numerous EU decisions, countless statements, aid packages , a "haircut" , and other important measures to tackle the debt crisis, the problem not only remains but significantly worsens. From a financial point of view, this is reflected primarily in the high government bond yields, i.e. the premium that investors require in order to hold certain European bonds. Furthermore, the significant increase in yields indicates that financial markets do not consider the bailout packages and the policy measures taken enough to lead to economic stability.

As a result we tried to examine the determinants of yield spreads for the European markets in crisis (Spain, Italy, Ireland, Portugal, and Greece). Its main contribution to

the literature is that it examines for the first time, along with fundamental economic variables, the role of investor sentiment in the determination of CDS yield during the financial crisis. More specifically, previous empirical work suggests that yield spreads reflect mainly three different types of risk:
(1) general market risk;
(2) default risk; and
(3) liquidity risk.

Previous studies, however, neglect variables that may capture other aspects of market behavior, such as behavioral biases and sentiment-driven mispricings that may be present in CDS markets; many economists present formal theoretical models on the role of investor sentiment and how it affects investor behavior and asset prices. This aspect is also evident in statements of market participants who consider investor sentiment as a variable that plays a role in the determination of yield spreads. The results of this thesis indicate that fundamental variables are indeed significant for the determination of the level of yield spreads; however, investor sentiment (both current and lagged) is also a statistically significant determinant for both the level and changes of yield spreads .

The above finding should be taken into consideration by all parties involved: government officials, private lenders, EU/ECB/IMF officials, and market participants. So the discussion is associated with the fail of the austerity measures to tackle financial crisis. As a result there are alternative paths which have to be tested in order to tackle any forthcoming crisis. For example, actions aiming at changing the economic climate, the market's negative sentiment, and investor pessimism about the future prospects of the Eurozone. Investors should receive positive signals which will undoubtfully lead to the reduce of CDS yields. For instance, policies aiming at fostering economic growth may produce a significant positive shift in investor psychology and convince markets that the debtor countries will be able to repay their debt.

Greece is the case of a crisis of confidence, indicated by a widening of bond yield spreads and rising cost of risk insurance on credit default swaps compared to the other Eurozone countries, particularly Germany. The government enacted 12 rounds of

tax increases, spending cuts, and reforms from 2010 to 2016, which at times triggered local riots and nationwide protests. Despite these efforts, the country required bailout loans in 2010, 2012, and 2015 from the International Monetary Fund, Eurogroup, and European Central Bank, and negotiated a 50% "haircut" on debt owed to private banks in 2011. After a popular referendum which rejected further austerity measures required for the third bailout, and after closure of banks across the country (which lasted for several weeks), on June 30, 2015, Greece became the first developed country to fail to make an IMF loan repayment. At that time, debt levels had reached €323bn or some €30,000 per capita.

Consequently the above described situation reduced significantly government revenue, since higher unemployment and smaller economic activity along with tax evasion led to less tax revenues. The “haircut” on Greece’s debt left Greek pension funds, banks, hospitals, and universities (among others who had invested in Greek Government bonds) severely undercapitalized and with significantly less revenues. This had a direct effect on health, pension, and education services. At the same time, according to final Eurostat data, the government deficit from 15.4 percent of GDP in 2009 (e36.3 billion) fell to 9.5 percent of GDP (e19.5 billion) in 2011.. The economic climate determines investor sentiment and the results of the paper imply that investor sentiment may matter for the determination of CDS yields. Positive sentiment changes can lead to lower yield spreads, and lower borrowing rates. Lower borrowing rates for troubled countries mean viable access to capital in order to finance sustainable growth policies, and thus, a possible way out of the debt crisis.

The first main finding that emerges from the analysis is that the determinants of CDS variance are neither uniform nor stable during different periods The effect of global market risk (VIX) is very important for the sweap countries between 2007 and 2012 in terms of monthly changes .However its significance declines for the period between 2013-2016 ,and its contribution to CDS yield is actually zero .As a result we should be aware a bit of the changes of the VIX variable in order to forecast any minor changes in the CDS spread despite the fact that is statistical significant. Since credit spreads are assumed to also compensate investors for pure expected losses (Hull et al., 2005), they may be sensitive to changes to investor risk aversion.

The second main finding is that sentiment seems to play an important role in CDS yield determination. Note that we employ two different proxies for sentiment, in other words, we capture different aspects of sentiment. More specifically, local sentiment can be considered as a 'local' forward-looking sentiment proxy (specific to each country); general sentiment can be considered as a 'regional' (Eurozone) proxy about six-month ahead expectations concerning the economy, inflation, interest rates, stock markets and exchange rates in the Eurozone as well as expectations concerning oil prices. More specifically ,for the first period has a significant impact for all markets, which leads to the fact that theres is strong correlation between local sentiment and cds yield. The same result stands and for the second period for most of the countries which reports that we should be aware and support local investment sentiment in order to avoid increases of CDS yield. It's obvious that information whithin one country can affect its own outlook and trustworthiness. Monthly changes in local sentiment do not seem to affect CDS yields ,but lagged local sentiment is strongly correlated with the price of CDS which makes sense. General sentiment appears both in the first period and second ,so we can conclude that it should be considered from now on in CDS explanation. The negative relation between CDS and local sentiment is as expected which means that positive increase of investor's attitude can really contribute in the decrease of the CDS yields.

The industrial production is negatively associated with the investigation of CDS yield,which is absulotely consistent with our expectations .Increases in the industrial production show a positive outlook of each economy. This variable has a more strong presence in the second examined period compared to the first one. However when the sentiment variable is added to our regression,the presence of industrial production becomes weak,the sentiment dominates.

When we employ the first difference model ,the industrial production is weak for both endogenous and non-endogenous model. Last but not least in the non-endogenous model in which lags of sentiment and CDS are added the industrial seems significant only for the first period which means that for the second period other information may take their attribute.

Liquidity although it seems statistical important ,their coefficients are relatively low which does not influence the yield of cds. Liquidity is statistically crucial mainly in the

first peridod in first case (when no sentiments variables are added) and in the second period for the second case (when sentiment variables are added),but when the non-endogenous model is applied their contribution is not important. Our expectations are consistent with the coefficient of liquidity which in most cases is negative.As a result liquidity should be not seriously taken in determing the price of CDS.

General risk which is associated with consumer products index has an important impact in the first period, it seems that is the major factor which affects the pricing of CDS.I t is a rationale due to the fact that the bail -out package applied in the beginning of 2012 ,as a result prices show a direct relation with the price of CDS ,but after the application of the bail-out other information took their contribution .As we can clearly see the replacement of CPI variable is the local investment sentiment which indicates one more time that is a crucial variable in the price mode of CDS derivative. Monthly changes in consumer product index should not be considered as correlated with the changes of CDS yield .Last but no least when the non-endogenous models is employed CPI does not correlate with the price of CDS .

As far as the endogenous and non-endogenous model are concerned we realise a direct relation between the first lag of CDS and the local sentiment .More precisely for the first period of the examined countries, for all markets previous prices of CDS really affect the current pricing of CDS and especially for Greece and Ireland the first lag of local sentiment has a significant impact in the yield of CDS .

In terms of policy implications, the finding is that determinants are neither uniform nor stable during different periods and different countries may imply limited financial market integration and homogeneity in the euro area. Also, the finding that sentiment is important suggests that, during crisis periods, policy makers should not only concentrate on economic indicators and ignore consumer and investor confidence but rather communicate effectively and signal their decisiveness to deal with the origins of the crisis and affect positively market expectations.

References

Acharya V. and Johnson T. (2007) ‘’Insider trading in credit derivatives’’

Aizenman J., Hutchison M and Jinjarak Y. (2012) ‘’What is the risk of European sovereign debt defaults? Fiscal space, CDS spreads and market pricing of risk’’

Ammer J. and Cai F. (2011)‘’Sovereign CDS and bond pricing dynamics in emerging markets: Does the cheapest-to-deliver option matter?’’

Atrissi N. and Mezher F. (2010) ‘’Sovereign debt crisis and credit default swaps: The case of greece and other PIIGS’’

Baker M. and Wurgler J .(2007) ‘’Investor sentiment in the stock market’’

Bakera M., and Stein J C. (2003)’’Market liquidity as a sentiment indicator’’

Bai-Pierre J. and Dufresne C. (2011) ‘’The Determinants of the CDS-Bond Basis During the Financial Crisis of 2007-2009’’

Barberis et al (1998) ‘’A model of investor sentiment’’

Brown G and Cliff M. (2004) ‘’Investor sentiment and the near-term stock market’’

Carol A. and Kaeck A. (2007)‘’Regime dependent determinants of credit default swap spreads’’

Chiaramonte L. and Casu B. (2013)‘’The determinants of bank CDS spreads: evidence from the financial crisis’’

Delatte A.L , Gex M. and Antonia López-Villavicencio (2011) ‘’ Has the CDS market influenced the borrowing cost of European countries during the sovereign crisis?’’

Duffie et al (2007)‘’Multi-period corporate default prediction with stochastic covariates’’

Fisher L. and Statman M. (2013)’’ Consumer confidence and stock returns’’

Fontana A. and Scheicher M. (2016) ‘’An analysis of euro area sovereign CDS and their relation with government bonds’’

Galariotis E.C , Makrichoriti P. and Spyrou S. (2016) ‘’Sovereign CDS spread determinants and spill-over effects duringfinancial crisis: A panel VAR approach’’

Galil K., Shapir M and Amiram M. (2014)’’The determinants of CDS spreads ‘’

Grandes M. and Peter M. (2004) ‘’The Determinants of Corporate Bond Yield Spreads in South Africa**:** Firm-Specific or Driven by Sovereign Risk?’’

Heinz M. and Sun (2014) Sovereign CDS spreads in Europe: the role of global risk aversion, economic fundamentals, liquidity, and spillovers’’ Book

Hilscher and Nosbusch Y. (2010) ‘’Determinants of sovereign risk: Macroeconomic fundamentals and the pricing of sovereign debt’’

Hull J. , Predescu M. and White A. (2004) ‘’The relationship between credit default swap spreads, bond yields, and credit rating announcements’’

Hull C.J (2008) ‘’OPTIONS, FUTURES,AND OTHER DERIVATIVES’’ pag 547-570

Hund J. and Lesmond A.D (1999)’’Liquidity and Credit Risk in Emerging Debt Markets’’

Ismailescu I. and Kazemi H. (2010)‘’The reaction of emerging market credit default swap spreads to sovereign credit rating changes’’

Jarrow R. and Turnbull S.(2000) ‘’Derivative Securities’’

Jorion P. and Zhang G.(2009) ‘’ Credit contagion from counterparty risk’’

Longstaff et al., (2011) ‘’ How sovereign is sovereign credit risk?’’

Malliaropulos D. and Migiakis P.. Bank of Greece (2016)‘’The re-pricing of sovereign risks following the Global Financial Crisis’’

Schwaab B,Koopman S.J and Lucas A. (2016) Global credit risk: world, country and industry factors N.1922 June 2016

Schnusenberg O. and Madura J. (2001)‘’Do Us Stock Market indexes over –or- under react’’?

Spyros Spyrou (2013) ‘’Investor sentiment and yield spread determinants: evidence from European markets’’

Yongjun D. and Yan H. (2009) ‘’Market conditions, default risk and credit spreads’’