European Integration online Papers ISSN 1027-5193

Vol. 15 (2011), Article 4

How to cite?

Výprachtická , Terezie (2011): 'Could the Stability and Growth Pact be substituted by the financial markets?' *European Integration online Papers (EIoP)*, Vol. 15, Article 4, http://eiop.or.at/eiop/texte/2011-004a.htm.

DOI: 10.1695/2011004

Could the Stability and Growth Pact be substituted by the financial markets?

Terezie Výprachtická , Institute of Economic Studies (IES), Faculty of Social Sciences, Charles University in Prague

Abstract: In the discussions on the need for fiscal rules and their usefulness in a monetary union, researchers have not agreed if financial markets have a sufficiently disciplining effect on governments, which would mean that the fiscal rules are not necessary. This paper investigates whether the European Union's main fiscal rule, the Stability and Growth Pact, could be substituted by financial markets, taking into account the effects of the latest financial and economic crisis. The findings presented in this paper suggest that there is certain interaction between financial markets and governments' decisions on fiscal policies and that this reaction has become stronger after the beginning of the crisis. However, the institutional setup and market conditions in the European Union are such that this interaction is biased and thus the paper concludes that the Union needs to have fiscal rules.

Keywords: Economics, EMU, Euro, financial markets, stability pact, fiscal policy, policy analysis, budget, European Commission, Maastricht Treaty

Table of Contents

Table of Figures

Introduction

The European Economic and Monetary Union (EMU) is a very unique project, both from a political and economic point of view. It is based on the Maastricht Treaty where, *inter alia*, the well-known limits on government deficit and debt ratios to GDP were set (3 percent and 60 percent, respectively).[1]

The establishment of the EMU necessitated many changes, such as a new currency, new institutions (especially the European Central Bank[2]) and a new set of fiscal rules designed to ensure that the monetary union functions properly: The Stability and Growth Pact (SGP). Ever since its adoption the SGP has been quite controversial. One reason for criticism of the Pact is the fact that certain economists have questioned the need for fiscal rules in the EMU at all. In their work, researchers have identified several reasons for the application or non-application of fiscal rules in a monetary union.

First, there is the issue of the credibility of the central bank and its commitment to price stability. Researchers dealing with this, such as Eijffinger & de Haan (2000), Beetsma et al. (2001), Buiter (2006), Lindbeck & Niepelt (2006), Ardy et al. (2006) and Fitoussi & Saraceno (2007), mostly share the opinion that the absence of fiscal rules and thus the existence of expansive fiscal policies could hamper the credibility of the monetary authority and weaken its commitment to keeping the price level stable.

Second, the impact of unsound fiscal policies on union-wide interest rates is often discussed. Most of the researchers dealing with this issue are of the opinion that this effect may be dangerous (see e.g. Feldstein (2005), Ardy et al. (2006), Lindbeck & Niepelt (2006), Catenaro & Morris (2008)). However, certain authors disagree, such as Wyplosz (2006) or Fitoussi & Saraceno (2007).

Third, governments have the tendency to run budget deficits. Researchers generally agree that this is a legitimate reason for the existence of fiscal rules (see e.g. Eijffinger & de Haan (2000), Kopits (2001), Stark (2001), Schneider & Hedbavny (2003), Wyplosz (2006), Catenaro & Morris (2008)).

Many arguments against using fiscal rules in a monetary union also exist. These are mentioned by Beetsma et al. (2001), Kopits (2001) and Woods (2008). They include the effects of fiscal rules, such as governments' limited scope for reaction to shocks and the

[1] One of the clauses of the Maastricht and later the Lisbon Treaty that is very important for this analysis is Article 125 of the TFEU that provides for a non-bailout clause: neither the Community, nor any of its members should be liable for the commitments of a member state's government or other public authorities.

[2] Its main task was set to ensure the stability of the price level (Article 127 TFEU). Furthermore it was decided that the ECB ought to be independent of the national and Community political authorities and is prohibited from providing any type of credit to the member states' governments or Community institutions.

incentive for governments to resort to “creative accounting” in order to hide possible breaches of the rules. An article criticising the SGP from the theoretical point of view is Kohler (2007), published as part of Breuss (2007) dealing with the 2005 reform of the Pact.

A claim has been made that fiscal rules are actually not needed, because the disciplining effect of the financial markets can act as a substitute. Fitoussi & Saraceno (2007) recall two papers (by Alesina et al. (1992) and Bernoth (2004)) that conclude that markets are able to monitor fiscal performance and put pressure on governments by forcing them to issue bonds at higher interest rates and that they have not lost this ability after the introduction of the EMU.

On the other hand, Eijffinger & de Haan (2000) claim that markets may not be disciplinary enough. They explain that the markets might not differentiate between a fiscally disciplined and undisciplined country within a monetary union by demanding different yields on their government bonds because they may expect that even if, in the case of the EMU, the Maastricht Treaty provided for a no-bail-out clause, the Union would help a member state in troubles for political reasons. We have witnessed this phenomenon since 2010 during the EMU debt crisis, as the Eurozone helped the members that got into financial problems The view of the above-mentioned authors is supported by Hedbavny et al. (2004) who, when comparing the EU with the US, claim that the markets have a higher probability of expecting a bail-out in the EU because this union has fewer member states than the US and thus all EU states have a greater influence on all important decisions. Contrary to Eijffinger & de Haan (2000), Schucknecht et al. (2008) claim that based on their findings. the no-bailout clause in the Maastricht Treaty seems to be credible.

Another argument for fiscal rules is presented by Eijffinger & de Haan (2000), according to whom markets tend to react slowly to an unsustainable fiscal position and then, when they finally (and often very strongly) react, such events can be contagious. This was in fact confirmed in 2010 when there was a sudden and significant increase in spreads of Greek bonds and then in other countries as well (especially Ireland and Portugal).

Woods (2008) agrees that, until 2008, the markets had not differentiated significantly among different Eurozone government bonds. He points out that the markets may not reflect the individual countries’ situation properly, but also that their reactions might be ‘abrupt and potentially very disruptive’. This is very much in line with the conclusions of Eijffinger & de Haan (2000) and also with the findings of Schucknecht et al. (2010), according to whom markets reacted three to four times more strongly to deficit differentials and seven to eight times more strongly to debt differentials after the beginning of the financial crisis.

Kopits (2001) argues that well designed fiscal rules could have the same effect as markets on the governments’ fiscal behaviour, but in a quicker and more efficient way and without adverse consequences such as high risk premiums or abrupt outflows of capital that come along with market reactions.

In this paper, the question of substitutability of the SGP by financial markets is investigated by analysing two different issues: first, the financial markets' reaction to changing fiscal behaviour of the states; second, the governments' response in terms of fiscal behaviour to the markets increasing their costs of borrowing. Also, the question of whether market conditions and institutional settings in the EMU do not hamper these reactions or do not make them biased and inefficient, is briefly discussed.

Therefore, government bond yield spreads are tested for change in reaction to increasing budget deficits and public debts, assuming that when a state's fiscal stance starts to deteriorate, financial markets begin to ask for a higher risk premium and thus the country's government bond yields (and therefore also the spread relative to a benchmark) increase. Then, tests are performed to find whether governments improve the structural primary balance when the spreads of their bonds increase, assuming that when the yields on government bonds increase, the costs of borrowing for a given country also grow and such a country's government reacts to this by increasing its structural primary balance, trying to reverse the trend. In order to do this, data until the end of year 2009 are used to see what the impact of the recent crisis was.

The paper is organized as follows: in Section 2 an overview of the related literature is provided and the institutional conditions in the EMU that may significantly influence the conclusions are discussed. In Section 3 the data used for the investigation of the financial markets' and the governments' behaviour are presented and tests of statistical properties of the data are performed. Also, the method used for the estimation is outlined. In Section 4 the estimation results are shown and Section 5 concludes.

1 Related literature

To tackle the question of whether the Stability and Growth Pact could be substituted by financial markets requires investigating two issues: first, whether financial markets react to a worsening fiscal stance of a government; and second, if governments change their fiscal behaviour appropriately in response to market signals. While many researchers have studied what drives yields (or spreads) of government bonds, only a few have explored the reaction of governments to market signals. The issue of whether these two reactions can be efficient in reality is also discussed.

1.1 Institutional setup and market conditions

At the beginning of their paper, Balassone et al. (2004) point out that there are many prerequisites for financial markets to be effective in disciplining the fiscal behaviour of governments. They mention eight important and partly overlapping conditions that were outlined by Bishop et al. (1989) and Lane (1993). These can be summarized as follows: first, there is free movement of capital. Second, governments do not have privileged access to the market. Third, markets have access to all necessary information on sovereign borrowers. Fourth, bail-out is not allowed, there is no external guarantee and debts cannot be monetized. Fifth, the financial system can absorb the bankruptcy of a sovereign borrower. Finally, borrowing governments do respond to market signals.

Balassone et al. (2004) argue that many of these conditions have already been fulfilled in the EMU, but several remain problematic. This can be confirmed today: first, information necessary for evaluating the financial reliability of governments is available to the markets with delay (e.g. in 2010 Eurostat released many important statistics for the first quarter of the year with a four months lag, i.e. in July), although rating agencies often evaluate countries' creditworthiness rather quickly. Furthermore, it is important to remember that the data is not fully reliable - for example in the case of Greece, the information available has been cast into doubt as the country's creativity in producing statistics was discovered, and the data had to be retroactively revised.

Second, it is unclear whether the markets would be able to absorb the bankruptcy of a sovereign borrower. Blundell-Wignall & Slovnik (2010) show that nearly 60 percent of the foreign-owned portion of Greek public debt is held by German and French banks, and if Greece were to default on its obligations, the banking systems of these two countries may be significantly weakened because the Greek debt represents 12 percent and 6 percent of the banks' Tier 1 capital, respectively.

Third, several countries in fact have privileged access to the market because they have been granted loans at rates much lower than they would get if they had to get funding from the financial markets. Fourth, the borrowers' response to market signals is uncertain but this is something that can be tested for.

Finally, the greatest problem seems to be the issue of bail-out and the non-existence of external guarantee. Bail-outs are prohibited in the EMU[3], but the credibility of this ban has become doubtful, given the situation in Greece and Ireland and the loans that have been granted to them by other EU countries and the IMF. This example would support the claim of Eijffinger & de Haan (2000) that fiscal rules in a monetary union are necessary.[4]

We have to bear all this in mind when drawing conclusions from the estimation results.

1.2 The markets' reaction

Researchers generally agree that government bond yield spreads are determined by several factors: default risk, exchange rate risk and liquidity premiums, and factors such as transaction costs and differences in tax treatment or different sensitivities to common shocks. To this Lemmen & Goodhart (1999) note that in a monetary union the default risk is higher as

[3] It was already banned by the Maastricht Treaty.

[4] However, recently we have seen discussions about the possible introduction of the "bail-in" of creditors which may be able to prevent investors from considering placing their money into the banks as risk-free (expecting that governments will always bail the banks out). This would be done e.g. in the way that when a bank gets into financial problems its debt held by third parties would automatically be converted into common equity. See European Commission (2010).

the countries cannot inflate their debts or devalue their currencies. However, as we could see after the introduction of the EMU, the higher probability of bail-out in a monetary union may go in the opposite direction as far as the default risk is concerned.

There are two main lines of research in the current literature that are connected with the issue of the reaction of the financial markets to the fiscal stance of governments. While the first one investigates the effect of fiscal variables on government bond yields, the second one tries to assess their effect on government bond yield spreads.

The first line of research is much less widespread than the second one. For this analysis the most relevant paper is Ardagna et al. (2004).[5] These authors work with a panel of 16 OECD countries and a time period of more than 40 years, using annual data. They analyse two different periods, one using OLS estimation with country specific fixed effects and one using the GLS estimator. The effect of both the primary deficit as share of GDP and the gross public debt as share of GDP on 10-year government bond yields was significant in most specifications and was estimated to be around 0.1 and 0.01, respectively.

However, as Gale & Orszag (2002) note, the overall level of long-term bond yields is affected by many factors, not only fiscal policy. It may therefore be better to investigate the bond yield spreads relative to another country if we want to trace the effect of fiscal policy on the markets' pricing of the costs of borrowing. This was confirmed by the recent development of government bond yields that is illustrated in Figure Figure 4 in the Appendix. We can see that after an increase in the bond yields of all governments between 2005 and 2007, many government bonds yields started to decrease in 2008, but the spreads among them have increased and this is the primary variable of interest.

The literature aiming to explain government bond yield spreads is very wide and usually Germany is used as a benchmark. It is generally accepted that the spreads in a monetary union are caused by differences in credit and liquidity risk premiums. Many researchers have also found that government bond spreads are driven by a common factor, usually referred to as *international risk aversion.* Manganelli & Wolswijk (2009) investigate what drives this international risk aversion and claim that it is related to the level of short-term interest rates.[6]

Codogno et al. (2003) work with monthly data for 10 EMU countries between 1995 and 2002. Because of the period chosen, the authors take into account the exchange rate risk components of the government bond yield spreads in the regression. They also include two variables that approximate risk premiums in their model. These are both related to the US economy (spreads between interest rates on US swaps and the federal government bond yields

[5] Other papers are e.g. Laubach (2003), Pesani and Strauch (2003), Tavares and Valkanov (2001).

[6] For a detailed description of how the interest rates affect the government bond spreads see Manganelli & Wolswijk (2009).

and spreads between the yields on AAA-rated US corporate bonds and the federal government bond yields). The authors come to the conclusion that government bond yield spreads in the Eurozone are mainly driven by credit risk and international factors and not so much by liquidity factors.

Bernoth et al. (2006) use yield-at-issue data on government bond yield spreads for 14 EU countries and the US federal government in the period from 1993 to 2005, taking into account only DM, then EUR issues and USD issues to avoid the influence of exchange rate risk on the yields. They use the 2SLS estimation technique adding both country- and time-specific fixed effects. The authors also include investors' risk aversion into the regression: they use the spread between BBB-rated US corporate bond yields and the US government bond yields as a proxy. The authors conclude that yield spreads do respond to government indebtedness, but that after the start of the EMU the markets' attention moved from government debts and deficits to debt service-to-GDP ratios.

Paesani et al. (2006) investigate the period between 1983 and 2003 for the USA, Germany and Italy, estimating a VAR model. They conclude that fiscal developments have influenced significantly the long-term interest rates.

Schuknecht et al. (2008) investigate the government bond risk premiums for the EMU and Canada using data on bond yield spreads at issue from 1999 to 2005. Schuknecht et al. (2010) review their previous findings for the EMU, extending the period until May 2009 and thus taking into account also the impact of the financial crisis. In both papers they use an OLS model with time-specific fixed effects, two proxies for international risk aversion being the BBB-rated US corporate bond yield spreads and the short-term interest rates (3-month EURIBOR concretely). Their conclusion in 2008 was that yield spreads over an appropriate benchmark do respond to indicators of fiscal performance. In 2010 they add to this that the markets' reaction to fiscal imbalances has become stronger after the fall of the Lehman Brothers. However, they do not account for the effect of the crisis itself (their crisis dummy is only included in the regression in interaction with other variables), which very likely has an impact on their results.

Alexopoulou et al. (2009) use monthly data for 8 new EU member states from 2001 to 2009 and do the estimation using a pooled mean group technique.[7] They also take into account the global financial conditions, using the stock market volatility of the Dow Jones Eurostoxx 50 index as proxy. They conclude that for most of the countries, government bond yield spreads responded significantly to fiscal fundamentals.

Haugh et al. (2009) estimate a simple panel model for 10 EMU countries over the period from December 2005 to June 2009, using quarterly data. These authors also include in their

[7] Quarterly or annual observations were linearly interpolated.

regression a proxy for risk in the form of spreads between high yield corporate bonds and government bonds. They conclude that differing fiscal policies have an important impact on government bond yield spreads. They note, however, that this was not so evident in the pre-crisis times when general risk aversion was very low.

1.3 The governments' reaction

Literature dealing with the second research question considered in this paper is rather limited. The only paper that the author is aware of is Balassone et al. (2004). These researchers test whether the governments change their structural primary budget balance in response to a change in the market price of public borrowing. They investigate different time periods (1981 – 2003, 1981 – 1991, 1992 – 1998 and 1999 – 2003), using the Arellano-Bond estimation technique. They come to the conclusion that the governments tend to react with a delay to changing market conditions and that the spreads have a different impact on the fiscal behaviour of the state depending on the chosen time period (the effect being the strongest after the introduction of the EMU).

2 Data and method

2.1 The markets' reaction

To investigate the issue of the financial markets' reaction, quarterly data from 1999 until the end of 2009 for 16 EMU countries is used.[8]

While many researchers work with data on bond yields at issue, in this paper data on (long-term) government bond yields provided by the IMF (International Financial Statistics) is used.[9] The rest of the data comes from the Eurostat except for data on US spreads that are also taken from the IMF database.

The beginning of the period investigated is 1999, the year the EMU was introduced. It has been shown (Blanco (2001) that the influence of the exchange rate risk on the yield spreads in the pre-EMU era was very significant. This is illustrated in Figure 1 where we can see that after the elimination of national currencies, the long-term government bond yield spreads, i.e. the difference between the long-term government bond yields of a given country and of Germany, decreased to very low numbers. The exchange rate risk is therefore something that has to be taken into account. Some researchers, such as Codogno et al. (2003), have treated the exchange rate risk component of the yield spreads using data on swap contracts

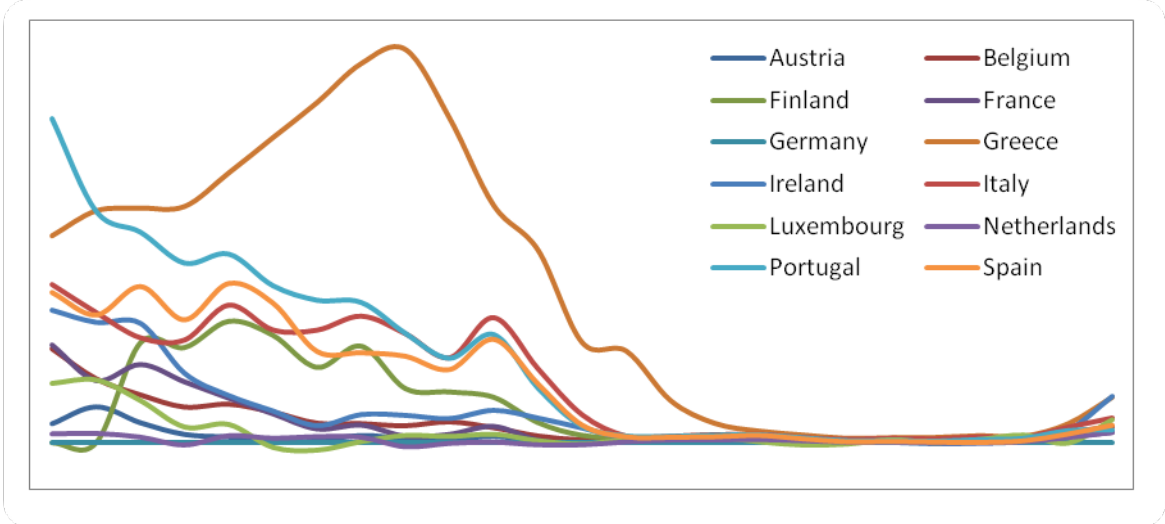
[8] Working also with data for the first quarter of 2010 would have been very interesting but they were not available when the empirical part of the paper was written.

[9] Note that in the International Financial Statistics database the IMF does not do a precise distinction between different maturities of government bonds. It explains that 'Government Bond Yield refers to one or more series representing yields to maturity of government bonds or other bonds that would indicate longer term rates' – see http://www.imfstatistics.org/imf/IFSIntRa.htm. The data used have IFS code 61…ZF.

denominated in different currencies. As the estimation in this paper begins in 1999, there is no need to proxy for the exchange rate risk.

Several countries from the sample used, namely Greece, Cyprus, Malta, Slovenia and Slovakia, did not join the EMU in 1999. These countries are only comprised in the estimation from their entrance into the EMU onwards.

Figure 1: Long-term government bond yield spreads of chosen EMU countries in 1985 – 2009 (in %)



Source: IMF, International Financial Statistics.

Looking at Figure 2, we can see that while until 2007 EMU long-term government bond yield spreads were very low, in 2008 they started to rise quite significantly. The Appendix includes the spread figures for each country separately (Figure 5).

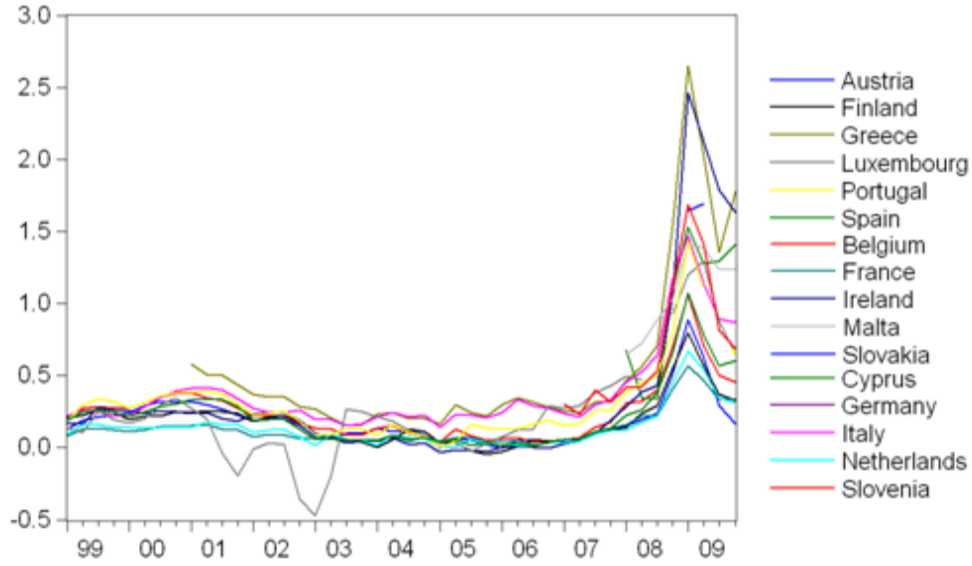
As was already mentioned, researchers generally agree that spreads are mainly influenced by the default risk, exchange rate risk, and liquidity premiums, and factors such as transaction costs or different sensitivities to common shocks. Transaction costs are assumed to be similar in the EMU and the exchange rate risk is supposed not to be relevant after accession to the euro. Therefore, different fiscal indicators are used as proxies for the default risk and other variables are used as proxies for liquidity premiums and different sensitivities to shocks. The regression model is the following:

The dependent variable, Spread, is the difference between a country's long-term government bond yield and the German long-term government bond yield, both expressed in percentage points.

All the indicators of fiscal performance refer to the general government. The key fiscal indicators that are used in the estimation are the following: budget balance (or net lending) as share of GDP relative to Germany (NetLending), expressed in percentage points, that is expected to have a negative effect on the dependent variable; gross public debt as share of

GDP relative to Germany (GrossDebt) that is expressed in percentage points and is expected to have a positive effect on the dependent variable; and the share of interest payable on governmental revenues (Int/Rev) that is expressed as a percentage and is also expected to have a positive effect on the dependent variable.

Figure 2: Long-term government bond yield spreads of EMU countries in 1999 - 2009 (in %)



Source: IMF, International Financial Statistics.

To take into account the external position of the given countries, the current account as share of GDP (*CA*), expressed as a percentage, is included in the estimation.

Based on Bernoth et al. (2006) the share of a government's debt on the sum of debts of all EMU countries expressed as a percentage (*DebtShare*) is used as a proxy for liquidity of a government's debt.[10] To proxy for international risk aversion two variables are employed: the short-run interest rates in the EMU – 3-month EURIBOR (*SR_IntRate*) and the spread between the US bank prime loan rate and the US 10-year government bond yield (*US_spread*), as defined by the IMF.[11] Changes in GDP are controlled for by the inclusion of the variable *GDPgrowth*, expressed as a percentage.

[10] Some authors use data on bid-ask spreads to proxy for the liquidity risk.

[11] It was not possible to follow previous research by using the US corporate bond yields instead of the bank prime loan rate because such data was not available.

Several time dummy variables are used. *Crisis* has the value of 0 until the third quarter of 2008 and 1 from the fall of the Lehman Brothers on, i.e. from the fourth quarter of 2008 until the end of 2009, which is also the end of the dataset. In order to distinguish the period of the crisis from the preceding period of turmoil when there were already some signs of the upcoming crisis, the variable *turmoil* which has the value of 1 from the fourth quarter of 2007 to the third quarter of 2008 and 0 otherwise is used. To make sure that it is correct to differentiate between the period of turmoil and the crisis period, regressions are also run that include the variable *turmcris* that does not take the difference into account, having the value of 1 from the fourth quarter of 2007 on and 0 otherwise.

The estimations include the squared terms of *NetLending* and *GrossDebt* and various interactions of the explanatory variables.[12]

Statistical properties of the key variables are investigated. *Spread, NetLending,* and *GrossDebt* are tested for stationarity. These time series are examined using the Fisher-ADF panel unit root test. While for *NetLending* and *GrossDebt* the null hypothesis of unit root is rejected, in the case of *Spread* this null hypothesis cannot be rejected. The results are shown in the Appendix, Table 3. Looking back at Figure 2 where we can see a clear rise in the spreads, this is not surprising. However, such a result of the test may be mainly due to the possible presence of a structural break in the data connected with the latest crisis. Furthermore, economically this time series has to be stationary as the spreads, in the end, have to return to sustainable levels. Therefore, an OLS model is estimated, checking whether the inclusion of the country-specific fixed effects is appropriate.

2.2 The governments' reaction

To investigate the issue of the governments' reaction to the financial markets, annual data from 1999 to 2009 for 16 EMU countries are used. Quarterly data cannot be used because the dependent variable is only available on an annual basis.

Data on government bond yield spreads are taken from the IMF (International Financial Statistics) and all other variables are taken from the AMECO database of the European Commission. Based on Balassone et al. (2004), a regression showing how governments adjust their fiscal policies in reaction to rising spreads is run. However, this paper also tries to capture the effect of the latest crisis on the governments' behaviour.

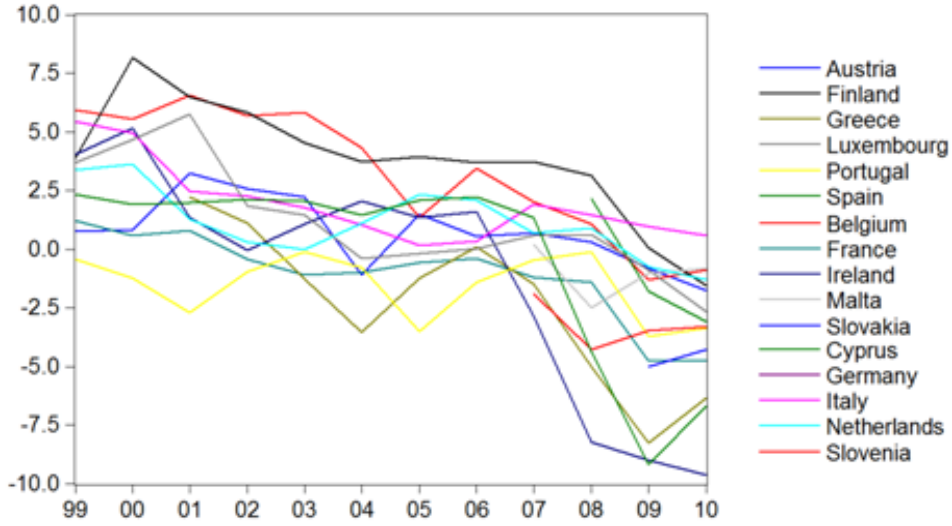
The regression model is thus the following:

$$StrPrBal_{i,t} = \alpha + \beta StrPrBal_{i,t-1} + \gamma Spread_{i,t-1} + \delta(other.factors)_{i,t-1} + \theta crisis_{i,t} + \varepsilon_{i,t}$$

[12] E.g. the interaction of crisis (or turmoil) and different fiscal or liquidity indicators; the interaction of country dummies and different fiscal or liquidity indicators; the interaction of crisis and country dummies and different fiscal or liquidity indicators; the interaction of proxies for international risk aversion and different fiscal indicators.

The dependent variable which should capture the fiscal behaviour of governments is *StrPrBal* (the structural primary balance, defined by Eurostat as net lending excluding interest, cyclically adjusted based on trend GDP, expressed as share of GDP, as a percentage). Cyclically adjusted figures are used because these reflect governments' fiscal behaviour better than non-adjusted figures. The development of this variable in the period under investigation is shown in Figure 3.

Figure 3: Structural primary balance of EMU countries in 1999 – 2010 (in % of GDP)



Source: IMF, International financial statistics.

The key explanatory variable is *Spread*, i.e. the difference between a country's long-term government bond yield and the German long-term government bond yield which is expressed in percentage points and shows how the markets value the given country's government bonds. As *Spread* increases, the government is expected to start reducing its borrowing to make the markets better price its bonds and thus lower its costs of borrowing.

Another variable used is the gross public debt as share of GDP (*GrossDebt*) that is expressed as a percentage and is expected to have a positive effect on the dependent variable (a higher stock of debt is assumed to induce the government to start pursuing more responsible fiscal policies). As another factor likely to have an impact on a country's structural primary balance, the lagged value of the dependent variable is taken into account because the speed at which governments can increase revenues or decrease expenses is rather limited and thus the structural primary balance usually does not change very quickly.

Several time dummy variables are used that theoretically should be the same as in the previous estimation where quarterly data were used. However, as this time annual data are used, these variables have to be simplified: *turmoil* thus has the value of 0.33 in 2007, 0.75 in 2008 and 0 otherwise; *crisis* has the value of 0.25 in 2008 and 1 in 2009 and 0 otherwise; and *turmcris* has the value of 0.33 in 2007 and 1 from 2008 on and 0 otherwise. Various interactions of the explanatory variables are included in the estimation.

Dummy variable *EDP*, having the value of 1 for each year during which a country is in the Excessive Deficit Procedure, is included in the estimation to capture the political pressure of the EU on countries having an excessive deficit to rectify the situation (when placed in the procedure, countries are obliged to reduce their structural deficit by at least 0.5 percent of GDP every year).

Again, statistical properties of the key variables are examined. *StrPrBal*, *Spread* and *GrossDebt* are tested for stationarity. These time series are examined using the Fisher-ADF panel unit root test. While for *StrPrBal* the null hypothesis of unit root is rejected, in the case of *Spread* and *GrossDebt* the null hypothesis cannot be rejected. The results are shown in the Appendix, in Table 4. However, as the time series are very short, we have to bear in mind that we cannot draw strong conclusions from the tests, also taking into account that the end of the sample is strongly influenced by the crisis. In addition to this, economically both these variables have to be stationary.

Given that the lagged value of the dependent variable is used as one of the explanatory variables, which could give rise to autocorrelation, the Arellano-Bond estimator (a dynamic panel data estimation technique, taking a partial adjustment based approach) is applied.[13] This is also consistent with the approach of Balassone et al. (2004).

3 Estimation results

3.1 The markets' reaction

Table 1 presents the estimation results. In all models the coefficients have the expected signs.

Note: 1) ***, **, * indicate 1%, 5% and 10% level of significance, respectively
2) standard errors are HAC robust

Model 1 includes only *NetLending* and *GrossDebt*. The effect of both these variables on *Spread* is relatively high, the coefficients being -0.03 and 0.01, respectively. However, the coefficient on *NetLending* diminishes three times when the *turmoil* and *crisis* dummies are included as well, which can be seen in Model 2.[14] By doing this it is possible to estimate how the spreads were affected by the recent crisis. When other variables are added, mainly interactions of different variables with the *crisis* dummy, the coefficient on *NetLending* becomes insignificant. This suggests that in non-crisis times the markets do not price the government bonds based on the states' budget deficits.

GrossDebt has a positive effect on *Spread*: when a country's gross debt increases by 1 percentage point relative to Germany, the spread of this government's bond yields relative to

[13] For more details on this method see Arellano & Bond (1991).
[14] The inclusion of these two dummy variables proved to be better than the inclusion of only one of them or the inclusion of *turmcris*.

Germany increases by 0.01 percentage point. According to the estimations, the turmoil period had a significant effect on the spreads of government bond yields relative to Germany: in this period, spreads increased by 0.17 – 0.22 percentage points, depending on the model. Nevertheless, the effect of the crisis was even stronger: it caused an increase in spreads by at least 0.7 percentage points.

Table 1: Estimation results 1

Dependent variable: *Spread*	Model 1	Model 2	Model 3	Model 4	Model 5
Const	0.3626 ***	0.2291 ***	0.2129 ***	0.1102 **	0.1761 ***
NetLending	-0.0285 *	-0.0090 ***	-0.0013	-0.0005	-0.0001
GrossDebt	0.0109 *	0.0137 ***	0.0124 ***	0.0115 ***	0.0132 ***
Turmoil		0.2015 ***	0.2168 ***	0.1651 ***	0.2185 ***
Crisis		0.7779 *	0.7016 *	0.7404 *	0.7403 *
Crisis*NetLending			-0.0349 ***	-0.0361 ***	-0.0358 ***
Crisis*GDPgrowth			-0.0185 *	-0.0181 **	-0.0180 *
SR_IntRate				0.0310 *	
US_Spread					0.0222 **
Adjusted R2	0.4246	0.7946	0.8382	0.8431	0.8434
Akaike criterion	207.09	-264.91	-372.61	-385.78	-386.66
DW statistic	0.6876	0.8611	0.9702	1.0556	1.0123
Test statistic for common intercept	6.9252 ***	20.4972 ***	22.9358 ***	22.6118 ***	24.5266 ***
Test statistic for normality of residuals	229.55 ***	286.37 ***	456.84 ***	497.32 ***	455.47 ***
Number of observations	460	460	460	460	460

During the crisis, the importance of the height of the budget deficit increased significantly: an increase in NetLending (i.e. a decrease in the budget deficit) by 1 percentage point relative to Germany resulted in a 0.03 percentage point decrease in Spread. Another factor has also become important during the crisis: GDPgrowth. In the time of crisis, the markets valued better bonds of countries with higher GDP growth (with a 1 percentage point increase in GDPgrowth, Spread decreased by nearly 0.02 percentage points).

Based on previous research papers, a proxy for international risk aversion is also included. In Model 4 the short-term interest rate (SR_IntRate) is used and in Model 5 US_Spread is employed. Mostly the inclusion of these variables does not change the coefficients of the other explanatory variables much, the fit of the models improving only slightly. The biggest change in coefficients or their significance appears in the case of turmoil in Model 4 and crisis in both models. It thus seems that the inclusion of proxies for international risk aversion is relevant.

Many variables that were expected to be important are not significant in the estimations. These are the current account, *CA*, the share of interest payable on the revenues, *Int/Rev*, and the proxy for the liquidity of a debt, *DebtShare*. When interactions of different fiscal indicators with proxies for international risk aversion were included, these terms did not turn out to be significant.

For all models neither pooled OLS, nor a random-effects model would be more adequate than the fixed-effects model: the test statistic for common intercept is highly significant in all cases (see Table 1) and according to the Hausman test GLS estimators would not be consistent.

Comparing the results with the previous research, it can be noted that our coefficients are mostly lower. Taking e.g. Schuknecht et al. (2010), we can see that our coefficients both on *NetLending* and *GrossDebt* are significantly lower and the same holds for the interaction of these variables with the *crisis* dummy. This is especially attributed to the fact that our models have included the *turmoil* and *crisis* dummy variables also separately in the regression, not only in interaction with other variables. It thus seems that due to this, the reaction of the markets to fiscal developments is estimated to be significantly lower than in the above mentioned paper both before and during the crisis, which would weaken the conclusions of its authors.

As we can see in Table 1, in none of the models do the residuals have a normal distribution. Figure 6 in the Appendix shows that their main problem is probably too high kurtosis for having a normal distribution.

The estimation suggests that financial markets do change the pricing of a government's bonds when its fiscal stance deteriorates, although not very strongly in non-crisis times. While before the start of the crisis government bond spreads basically responded to the level of gross public debt only (the budget deficits affected the spreads only very slightly or not at all – see Models 3, 4 and 5), when the crisis began the importance of the budget deficits increased significantly.

3.2 The governments' reaction

Table 2 presents the estimation results. Model 1 only takes into account the past value of the dependent variable and past values of *Spread* and *GrossDebt*. In Model 2, *crisis* dummy variable is added as it is reasonable to expect that the crisis had an impact on the ability of governments to run balanced budgets. In Model 3 the past value of *Spread* is substituted by the interaction of *crisis* and the past value of *Spread* to find whether the dependent variable is

better explained in this way. In Model 4 all of the above mentioned variables are included. Finally, Model 5 enriches Model 2 by including the *EDP* dummy variable to show whether states being in the Excessive Deficit Procedure have a better fiscal behaviour than others.

Table 2: Estimation results 2

dependent variable: StrPrBal	Model 1		Model 2		Model 3		Model 4		Model 5	
Const	-0.550	***	-0.542	**	-0.453	*	-0.562	**	-0.573	**
StrPrBal(-1)	0.512	***	0.450	***	0.500	***	0.441	***	0.248	*
Spread(-1)	0.522	*	1.273	***			0.567		0.788	**
GrossDebt(-1)	0.002		0.001		0.003		0.003		-0.001	
crisis			-0.813	***	-0.931	**	-1.132	***	-1.232	***
crisis*Spread(-1)					1.572	***	1.309			
EDP									1.002	***
SSR	369.08		345.12		359.75		341.50		277.10	
Test for AR(1) errors	-1.97	**	-1.86	*	-2.14	**	-2.01	**	-1.07	
Test for AR(2) errors	-0.81		-0.80		-0.67		-0.69		-0.72	
Sargan over-identification test	49.83		49.04		46.69		51.50	*	47.23	
Wald (joint) test	48.51	***	93.63	***	100.34	***	98.19	***	69.70	***
Test for normality of residuals	2.59		3.04		2.61		2.21		3.86	
Number of observations	112		112		112		112		112	

Note: ***, **, * indicate 1%, 5% and 10% level of significance, respectively

Of the five models, Models 2 and 5 seem to be the most appropriate, having the best statistical properties: at the 5 percent level of significance it is not over-identified and the errors are not AR(2). However, *GrossDebt* is not significant in any of the models.

We can see that *StrPrBal* is strongly influenced by its past value. Furthermore, in Model 1 we can see that with a 1 percentage point increase in *Spread*, *StrPrBal* increases by 0.5 percentage points in the following period, but only at the 10 percent level of significance. This would suggest that the structural primary balance is strongly influenced by its own height in the previous period but that it is independent of the financial markets' signals.

In all the other models, where also the effect of the crisis is taken into account, variable *crisis* has a significant negative effect on the dependent variable. This event caused a decrease in the structural primary balance relative to GDP by 0.8 – 1.2 percentage points, depending on the model. Model 2 suggests that governments react to the bond yield spreads even at the 1 percent level of significance: with a 1 percentage point increase in *Spread*, *StrPrBal* increases by 1.3 percentage points relative to GDP in the following period.

The interaction of *crisis* and *Spread* instead of *Spread* only is included in Model 3. The effect of this term is greater than the effect of only *Spread* itself: during the crisis a 1 percentage point increase in *Spread* made the governments improve the structural primary budget balance by 1.6 percentage points relative to GDP in the following period. When in Model 4 both *Spread* and *crisis*Spread* were included in the estimation, they both turned out to be insignificant while the coefficient of *crisis* decreased to less than -1.

Nevertheless, when the hypothesis that the coefficient on *Spread* was the same before and during the crisis is tested, i.e. that coeff(Spread_1)=1.572 and coeff(crisis*Spread_1)=1.273, in neither of the two cases is it possible to reject the null hypothesis that the reaction of governments to increasing costs of borrowing did not change after the start of the crisis. The result of this test is reported in the Appendix, Table A3.

In Model 5 the coefficient on the past value of the dependent variable decreases nearly by one half, but the coefficient on *crisis* increases and the coefficient on *Spread* decreases compared to Model 2. The coefficient on *EDP* is equal to 1 and is significant at the 1 percent level. This suggests that states put in the Excessive Deficit Procedure have lower structural deficits, *ceteris paribus*. The variable *GrossDebt* remains insignificant but has a negative sign.

Comparing the estimation results with Balassone et al. (2004) for the period 1999 – 2003 in their paper, the following should be noted: in Model 1, which is the closest to theirs, the estimate of the effect of the past value of the dependent variable is slightly higher in this paper (0.51 compared to 0.45) and the effect of *Spread* is slightly lower (0.52 compared to 0.67). Unlike Balassone et al. (2004) the effect of *GrossDebt* is not significant.

However, when the effect of the crisis is taken into account, the impact of the past value of the dependent variable is very similar to theirs (also 0.45) in Model 2 and much lower (0.25) in Model 5. The effect of *Spread* is similar to theirs in Model 5 (the coefficient is 0.79 compared to 0.67) but is much higher in Model 2 (1.27).

As the estimation only covers the period after the EMU was put in place, it is difficult to distinguish whether the governments improved the structural primary balance in response to the financial markets' signals or whether they did so because according to the SGP their deficits must not exceed 3 percent of GDP.

In this respect, conclusions must partly be based on the results of Balassone et al. (2004) who investigated several time periods and obtained different results for each: in the period 1992 – 1998 (which can be considered a time of a run up to EMU), the reaction of the structural primary balance to the spreads was significantly lower than in the period 1999 – 2003 when the SGP was already in place (0.16 compared to 0.67). This difference was even more significant for the period 1981 – 1991 (the coefficient on the spread was only 0.05) when EU countries were not bound by any supra-national fiscal rule and the introduction of such a rule was not even in planning stages. Partly it is possible to base the conclusion on Model 5 showing that governments do run smaller deficits when being in the Excessive Deficit Procedure.

The estimation results presented in this paper suggest that governments do react to increasing costs of borrowing (or spreads). However, given that spreads were mostly quite low after the introduction of the EMU (in terms of tenths of percentage points, or tens of basis points, before the start of the crisis as we could see in Figure 2), an increase of 0.5 percentage points is already very big – such a thing happened e.g. to Greece between 2007 and 2008 (during this time its budget deficit increased from below 4 percent to 7.8 percent of GDP, i.e. it nearly doubled) or to Italy between 2008 and 2009 (during this time its budget deficit increased from below 2.7 percent to 5.2 percent of GDP) – and this would only trigger, according to Models 2 and 5, a 0.5 - 0.8 percentage point improvement in the structural primary balance in the following period. Given that such big increase in spreads only happened when budget deficits increased greatly, such governments' reaction may simply not be sufficient to maintain fiscal discipline.

Therefore it seems that even if the SGP very likely contributed to more responsible fiscal behaviour of governments, it was not powerful enough and did not keep Eurozone countries from having excessive deficits. This can be documented by the fact that most countries whose spreads increased significantly in 2008 often corrected their deficits only slightly in 2009 and continued breaching the Pact, which means that the effect of being placed in the Excessive Deficit Procedure is not strong enough.

Conclusion

The aim of this paper is to answer the question of whether financial markets have a sufficiently disciplinary effect on the governments' fiscal behaviour under a monetary union and whether this makes fiscal rules redundant. To do this, two issues are investigated: the reaction of the markets to changing fiscal stances of governments and the reaction of governments to a change in the markets' pricing of their bonds. The institutional setup and market conditions in the EMU are also briefly discussed.

The results suggest that in non-crisis times the markets react to fiscal indicators only very weakly, mainly to the level of gross public debt. However, during the latest financial and economic crisis, their reaction, especially to budget deficits, increased. In addition to this, the crisis brought an overall increase in the level of spreads and a bigger sensitivity of markets to GDP growth of a given country. If 2010 data were included to the estimation, these effects would probably become even stronger.

Concerning the governments' reaction to the change in financial markets' pricing of their bonds, the results suggest that the governments do react to increasing spreads of their bond yields relative to Germany by improving their structural primary budget balance. Yet, the reaction is not strong enough. It seems that this reaction was not affected significantly by the latest crisis. Based on previous research we can assume that before the introduction of the EMU it was even weaker. This is supported by the finding that states placed in the Excessive Deficit Procedure have a higher budget balance than other countries, *ceteris paribus*.

The possible substitutability of the SGP by financial markets is hampered by several issues: first, in non-crisis times the reaction of financial markets to the fiscal stance of a government is rather weak. Second, the governments do not react very strongly to increasing spreads by limiting their budget deficits, not even in times of crisis. Although the Excessive Deficit Procedure has some positive impact on the behaviour of governments, this effect is rather limited.

In addition to this, there are several obstacles to the effectiveness of this setting. First, official data on government finance are released with a significant delay. Second, although bail-outs are prohibited by the Treaty, the reaction both of the financial markets and of the governments is very likely biased because of the behaviour of the EMU towards its members that have got in financial troubles: the sum of loans granted to countries such as Greece, Portugal and Ireland by the Eurozone and the IMF has reached more than 200 billion euro. Third, governments have a privileged access to the markets, as we have witnessed recently.

Although the SGP has not been powerful enough to keep the states fiscally disciplined even before the crisis, given all the points mentioned above, the conclusion of this paper is that the Stability and Growth Pact cannot be effectively substituted by the financial markets. The EMU thus needs to have fiscal rules, probably even stronger than the newly revised SGP-rules that would be able to prevent crises effectively.

References

Alesina, A.; De Broeck, M.; Prati, A. & Tabellini, G. (1992). 'Default Risk on Government Debt in OECD Countries', Economic Policy, vol. 7, no. 15, pp. 428 – 463.

Alexopoulou, I.; Bunda, I. & Ferrando, A. (2009). 'Determinants of Government Bond Spreads in New EU Countries', ECB working paper no. 1093.

Ardagna, S.; Caselli, F. & Lane, T. (2004). 'Fiscal Discipline and the Cost of Public Debt Service - Some Estimates for OECD Countries', ECB working paper no. 411.

Ardy, B.; Begg, I.; Hodson, D.; Maher, I. & Mayes, D. G. (2006). 'Adjusting to EMU', Palgrave Macmillan, New York.

Arellano, M. & Bond, S. (1991). 'Some tests of specification for panel data', The Review of Economic Studies, vol. 58, no. 2, pp. 277-297.

Balassone, F.; Franco, D. & Giordano, R. (2004). 'Market-induced fiscal discipline: Is there a fall-back solution for rule failure?', Banca d'Italia - conference research paper, pp. 389-426.

Beetsma, R.; Debrun, X. & Klaassen, F. (2001). 'Is fiscal policy coordination in EMU desirable?', Swedish Economic Policy Review, vol. 8, no. 1, pp. 57-98.

Bernoth, K.; Schuknecht, L & von Hagen, J. (2004). 'Sovereign Risk Premia in the European Bond Market', CEPR Discussion Papers, no. 4465, July.

Bernoth, K.; von Hagen, J. & Schuknecht, L. (2006). 'Sovereign Risk Premiums in the European Government Bond Market', Discussion Papers 151, SFB/TR 15 Governance and the Efficiency of Economic Systems, Free University of Berlin, Humboldt University of Berlin, University of Bonn, University of Mannheim, University of Munich.

Bishop, G.; Damrau, D. & Miller, M. (1989). '1992 and Beyond: Market Discipline Can Work in the EC Monetary Union', Salomon Brothers, London.

Blanco, R. (2001). 'The Euro-Area Government Securities Markets. Recent Developments and Implications for Market Functioning', Paper prepared for the BIS Autumn Central Bank Economist's Meeting, October 2001, Banco de Espaňa.

Blundell-Wignall, A. & P. Slovik (2010). 'The EU Stress Test and Sovereign Debt Exposures', OECD Working Papers on Finance, Insurance and Private Pensions, no. 4, OECD Financial Affairs Division.

Breuss, F. (2007). 'The Stability and Growth Pact: Experiences and Future Aspects', Springer-Verlag, Wien-New York.

Buiter, W. H. (2006). 'The 'Sense and Nonsense of Maastricht' Revisited: What Have We Learnt about Stabilization in EMU?', Journal of Common Market Studies vol. 44, no. 4, pp. 687-710.

Catenaro, M. & Morris, R. (2008). 'Fiscal policy and implementation in EMU', in Farina, F. & Tamborini, R., ed. Macroeconomic Policy in the European Monetary Union. Routledge, New York. pp. 19-44.

Codogno, L.; Favero, C. & Missale, A. (2003). 'Yield Spreads on EMU Government Bonds', Economic Policy, CEPR, CES, MSH vol. 18, no. 37, pp. 503-532.

Eijffinger, S. C. W. & de Haan, J. (2000). 'European monetary and fiscal policy', Oxford University Press.

European Commission (2010). Memo/10/506 (20 October 2010) – An EU framework for Crisis Management in the Financial Sector – Frequently Asked Questions. http://europa.eu/press_room/index_en.htm

Feldstein, M. (2005). 'The euro and the stability pact', NBER working paper no. 11249.

Fitoussi, J.-P. & Saraceno, F. (2007). 'Fiscal discipline as a social norm: The European stability pact', Documents de Travail de l'OFCE 2007-22, Observatoire Francais des Conjonctures Economiques (OFCE).

Gale, W. G. & Orszag, P. R. (2002). 'The Economic Effects of Long-Term Fiscal Discipline', Urban-Brookings Tax Policy Center Discussion Paper.

Haugh, D.; Ollivaud, P. & Turner, D. (2009). 'What Drives Sovereign Risk Premiums? - an Analysis of Recent Evidence from the Euro Area', OECD Economics Department working paper no. 718.

Hedbavny, P.; Schneider, O. & Zápal, J. (2004). 'Does the Enlarged European Union Need a Better Fiscal Pact? ', UK FSV – IES working paper no. 55.

Kohler, W. (2007). 'On the Theoretical Underpinning of the Stability and Growth Pact' in Breuss, F. (2007). 'The Stability and Growth Pact: Experiences and Future Aspects', Springer-Verlag, Wien-New York, pp. 99-143.

Kopits, G. (2001). 'Fiscal rules: Useful policy framework or unnecessary ornament?', IFM working paper no. 01/145.

Lane, T. (1993). 'Market Discipline', IMF, Staff Papers, no. 40, March, pp. 53-88.

Laubach, T. (2003). 'New Evidence on the Interest Rate Effects of Budget Deficits and Debt', Federal Reserve Board Finance and Economics Discussion Series, vol. 12.

Lemmen, J. J. & Goodhart, C. A. (1999). 'Credit Risks and European Government Bond Markets: A Panel Data Econometric Analysis', Eastern Economic Journal vol. 25, no. 1, pp. 77-107.

Lindbeck, A. & Niepelt, D. (2006). 'The Stability Pact - Rationales, problems, alternatives', KYKLOS vol.59, no. 4, pp. 579-600.

Manganelli, S. & Wolswijk, G. (2009). 'What Drives Spreads in the Euro Area Government Bond Market?', Economic Policy, CEPR, CES, MSH vol. 24, pp. 191-240.

Paesani, P.; Strauch, R. & Kremer, M. (2006). 'Public Debt and Long-term Interest Rates - The Case of Germany, Italy and the USA', ECB working paper no. 656.

Schneider, O. & Hedbavny, P. (2003). 'Fiscal Policy: Too Political', UK FSV – IES working paper no. 37.

Schuknecht, L.; von Hagen, J. & Wolswijk, G. (2008). 'Government Risk Premiums in the Bond Market - EMU and Canada', ECB working paper no. 879.

Schuknecht, L.; von Hagen, J. & Wolswijk, G. (2010). 'Government Bond Risk Premiums in the EU Revisited - The Impact of the Financial Crisis', ECB working paper no. 1152.

Stark, J. (2001). 'Genesis of a Pact' in Brunila, A.; Buti, M. & Franco, D., ed. The Stability and Growth Pact. Palgrave, New York, pp. 77-105.

Tavares, J. & Valkanov, R. (2001). 'The Neglected Effect of Fiscal Policy on Stock and Bond Returns', FEUNL Working Paper Series, no. 413, Universidade Nova de Lisboa.

'Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community', Official Journal C 306 of 17 December 2007.

'Treaty on European Union', Official Journal C 191, 29 July 1992.

Woods, R. (2008). 'Notes on the reformed SGP: creating and implementing effective macroeconomic frameworks' in Talani, L. S. & Casey, B., ed. Between growth and stability - The demise and reform of the European Union's Stability and Growth Pact. Edward Elgar Publishing Limited, Massachusetts, pp. 129-169.

Wyplosz, C. (2006). 'European Monetary Union - The dark sides of a major success', Economic Policy, vol.21, no 46, pp. 207-261.

Appendix

Figure 4: Government bond yields of EMU countries from 1999 to 2009 (in %)

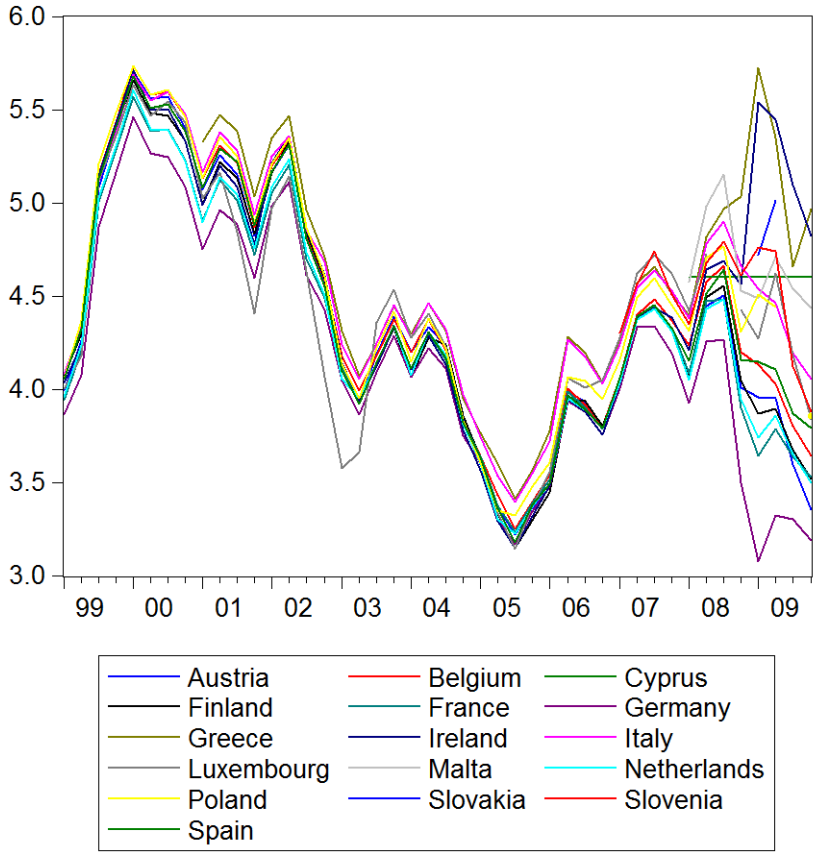


Figure 5: Government bond yield spreads of EMU countries from 1999 to 2009 (in %)

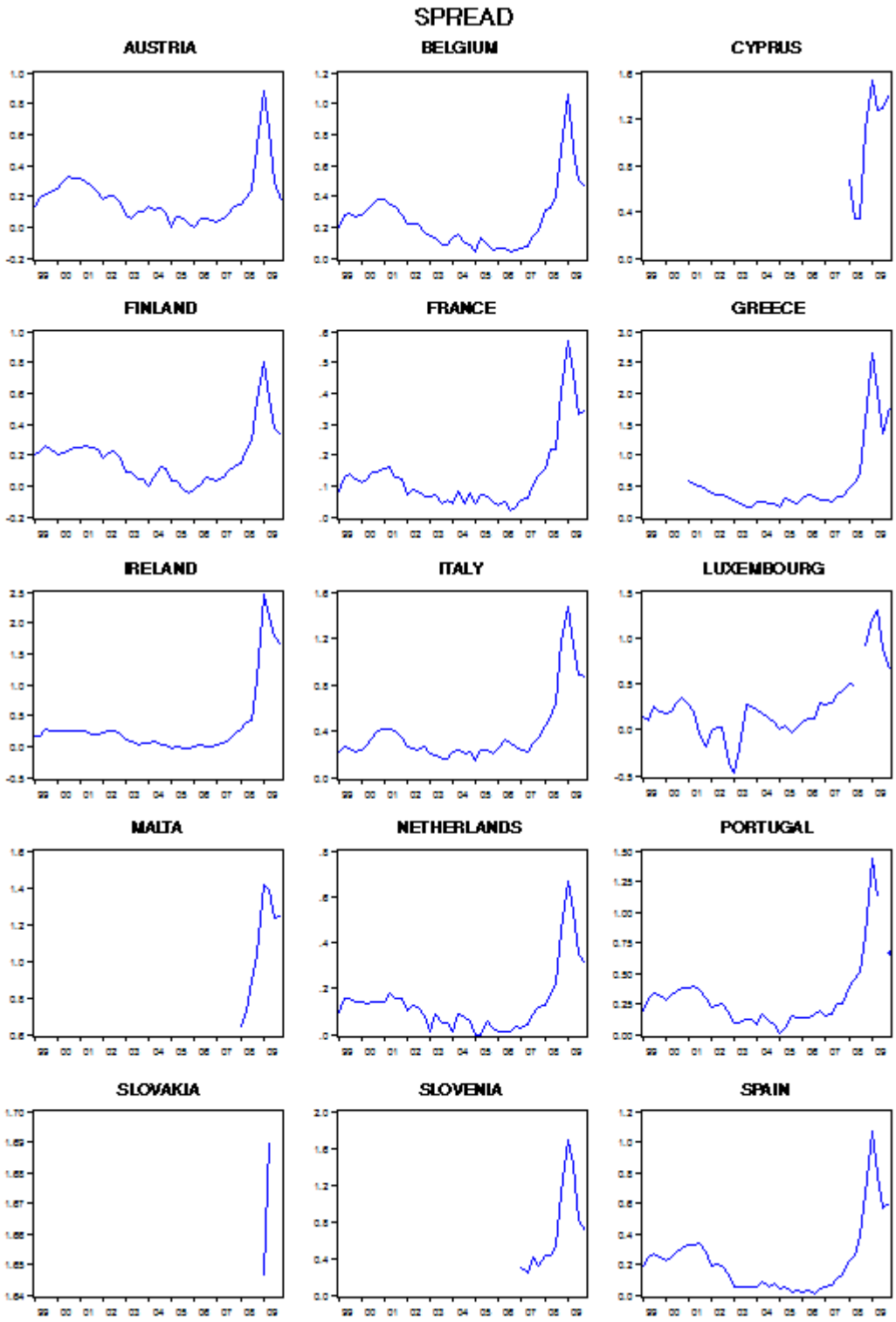
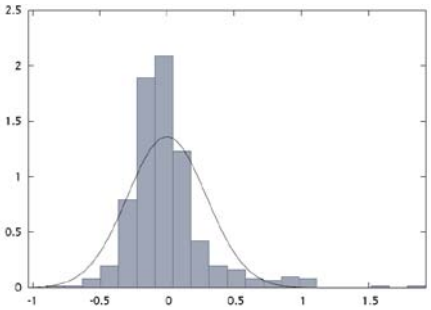
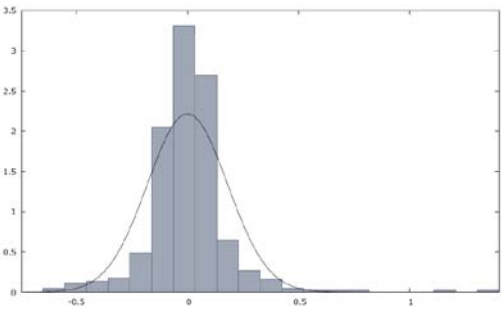


Figure 6: Test for normality of residuals

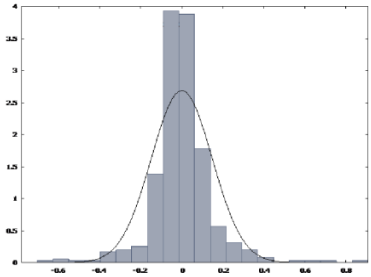
Figure A3 – Test for normality of residuals

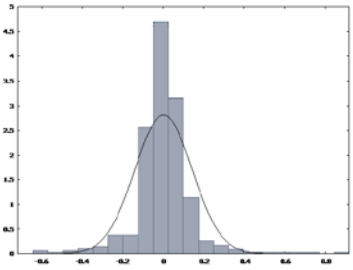
Model 1 Model 2





Model 3 Model 4 Model 5





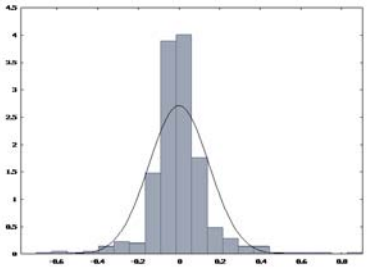


Table 3: Panel integration test

Integration test			
	NetLending	GrossDebt	Spread
ADF – Fisher chi-square	46.6**	52.3***	32.5

Notes: 1) ***, **, * indicate 1%, 5% and 10% level of significance, respectively.
2) For all tests the number of lags was chosen automatically using the Hannan-Quinn information criterion and individual intercepts were included in the test equation.
3) All models assume individual unit root processes.

Table 4: Panel integration test

Integration test			
	StrPrBal	Spread	GrossDebt
ADF – Fisher chi-square	40.8**	20.2	18.3

Notes: 1) ***, **, * indicate 1%, 5% and 10% level of significance, respectively.
2) For the test the number of lags was chosen automatically using the Hannan-Quinn information criterion and individual intercepts were included in the test equation.
3) All models assume individual unit root processes.

Table 5: Hypothesis testing

Null hypothesis	Test statistic	P-value
coeff[spread_1] = 1.572	0.171	0.896
coeff[crisis*spread_1] = 1.273	0.282	0.595

Abbreviations

2SLS – Two-Stage Least Squares

AR(1), AR(2) – Autoregression of order 1 and 2, respectively

DM – Deutsche Mark

ECB – European Central Bank

EMU – European Economic and Monetary Union

EU – European Union

EUR – euro

FE – Fixed Effects

GDP – Gross Domestic Product

GLS – Generalized Least Squares

IMF – International Monetary Fund

OECD – Organization for Economic Co-operation and Development

OLS – Ordinary Least Squares

SGP – Stability and Growth Pact

TEU – Treaty on European Union

TFEU – Treaty on the Functioning of the European Union

US, USA – United States of America

USD – US Dollar

VAR – Vector Autoregression