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Slovenia: Government's bond yield spread evolution, drivers and policy implications
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Abstract: One of the most adverse developments in the year 2011 has been the substantial increase in the Slovenia's 10-year government bond yield spread against that of Germany. Looking at daily data the paper identifies three factors explaining the development of the spread: i) a common risk factor shared by countries considered as peers of Slovenia in terms of historical debt pricing and credit risk; ii) spillovers from the unfolding sovereign debt crisis in the euro area and policy response to it resulting in spreading contagion and; iii) country specific considerations taken into account in the downgrades of Slovenia's sovereign rating, singling out change in credit risk, at the time of when systemic risk in euro area intensify and market liquidity dried.

Key words: government's bond spread, common risk factor, spillovers, country's specific sovereign risk, liquidity risk

CONTENTS

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LIST OF ABBREVIATIONS

CAC	collective action clauses
CDS	credit default swap
ECB	European Central Bank
EFSF	European Financial Stabilisation Mechanism
ESM	European Stability Mechanism
KFW	Kreditanstalt für Wiederaufbau
MF	Ministry of Finance
S&P	Standard&Poors
SMP	Securities Markets Program
OIS	overnight indexed swap

Summary

The government's bond yield is a key economic variable because it is used as a reference for private sector wholesale borrowing costs. In the case of the Slovenia's bank-based financial system this is even more important. In an environment of systemic risk intensification and contagion, one that followed the outburst of the Greek crisis, the importance of the government's bond yield spread evolution becomes critical. What has driven the Slovenia's government bond spread evolution in the aftermath of the Greek crisis? Besides macroeconomic fundamentals, which determine long-term evolution of spreads, this paper suggests that sovereign risk premiums tend to commove in euro area and that a common factor ("risk attitude") has a significant role in explaining its short-term behavior. In particular, there are three main factors: i) the dynamics of a common factor pertaining risk perception of euro area countries considered as Slovenia's peers from the point of view of historical bond pricing; ii) spillovers from the unfolding sovereign debt crisis in the euro area and policy response to it resulting in spreading and contagion to Italy and; iii) country specific considerations that were taken into account by credit rating agencies in justifying the downgrades of Republic of Slovenia's credit rating, and thus worsening the perception of its creditworthiness, at the time when systemic risk at euro area level intensified and political crisis in Italy reached its height. The analysis did not prove conclusive on the statistical significance of a single country specific variable or event in affecting the spread with the exception of credit rating downgrade which in turn sumarizes the credit rating agency's perception and weight of various country specific factors leading it to the reasesment of sovereign creditworthines. It suggests that increase in spreads, related to worsened macroeconomic conditions in Slovenia, was triggered by the developments in euro area.

Given the importance of the common factor in explaining short-term spread developments, Slovenia should foster policies at euro area level aiming at reducing common risk perception and stabilize the euro area government bond market. In view of worsening liquidity conditions and increasing overall refinancing risk in euro area policy should pursue the issuance of collective Eurobonds and advancement towards a fiscal union. Country-specific policies should be geared towards mitigating the impact of spillovers and contagion. This implies pursuing policies that avoid further worsening of country specific risk perception as reflected in further downgrades of sovereign credit rating. Among the key policies are the enhancement of the of Slovenia's owned banks' balance sheet, minimizing the effect of the required fiscal consolidation on economic activity taking into account the deleveraging of corporate sector, and re-building credibility by setting realistic and credible fiscal targets and delivering on them. Due to the worsening of overall liquidity conditions and in absence of progress at euro area to improve overall market conditions in the short-term efforts should be place on frontloading the fiscal adjustment while minimizing its impact on economic activity.

Povzetek

Donos državnih obveznic je ključni makroekonomski indikator, saj se uporablja kot referenca za strošek grosističnega zadolževanja zasebnega sektorja. V primeru slovenskega finančnega sistema, ki temelji na bančnem sistemu, je še toliko bolj pomemben. V okolju rasti in prenašanja sistemskega tveganja, ki je posledica izbruha grške krize, je pomen gibanja razmikov državnih obveznic postal še bolj kritičen. Kaj je vplivalo na gibanje donosov slovenskih državnih obveznic po grški krizi? Poleg tega, da na dolgoročni razvoj razmikov vplivajo makroekonomski temelji, ta analiza ugotavlja, da se premije državnega tveganja v evrskem območju gibajo soodvisno in da je lahko njihovo kratkoročno obnašanje obrazloži predvsem skupni faktor (»risk attitude«). Pomembni so predvsem trije dejavniki: i) gibanja skupnega faktorja, ki zajema percepcijo tveganja držav evrskega območja, ki so primerljive s Slovenijo (peer countries) z vidika zgodovinskega oblikovanja cene; ii) prenosi tveganj, kot posledica razkrivanja državne dolžniške krize v evrskem območju in odziv politik s posledico prenosa okužbe na Italijo; iii) specifični razlogi, s katerimi so bonitetne agencije utemeljevale znižanje ocene kreditnega tveganja Slovenije, ki je poslabšalo percepcijo njene kreditne sposobnosti v času, ko se je sistemsko tveganje evrskega območja okrepilo in je politična kriza v Italiji dosegla vrh. Analiza ni dala dokončnega odgovora glede statističnega pomena ene same (za državo specifične) spremenljivke ali dogodka za gibanje razmika, z izjemo znižanja bonitetne ocene, ki pa povzema percepcijo bonitetne agencije in večino različnih specifičnih faktorjev, ki vodijo k ponovni oceni kreditne sposobnosti države. Analiza ugotavlja, da je povečanje razmikov, ki so povezani z makroekonomskimi pogoji v Sloveniji, posledica gibanj v evrskem območju.

Zaradi pomembnosti skupnega faktorja pri pojasnjevanju kratkoročnih gibanj razmikov, bi Slovenija morala krepiti tiste politike na evropski ravni, katerih cilj je zniževanje skupne percepcije tveganja in stabilizacija trga državnih obveznic v evrskem območju. Z ozirom na poslabševanje likvidnostnih razmer in povečevanje celotnega tveganja refinanciranja v evrskem območju, bi politike morale zasledovati cilj izdaje skupnih Evroobveznic in napredek k fiskalni uniji. Politike posameznih držav bi morale biti usmerjene k zniževanju učinkov nadaljnjih prenosov in okužb krize. To napotuje na sprejemanje politik, ki pripomorejo k izogibanju nadaljnjega poslabšanja percepcije specifičnega državnega tveganja, ki se odraža v nadaljnjih poslabšanih ocene državnega kreditnega tveganja. Med ključnimi politikami so kapitalska krepitev slovenskih bank, minimiziranje učinka fiskalne konsolidacije na gospodarsko aktivnost upoštevaje razdolževanje gospodarskih družb in ponovna vzpostavitev kredibilnosti z določanjem realističnih in kredibilnih fiskalnih ciljev in doseganjem le teh. Zaradi poslabšanja celotnih likvidnostnih razmer in v odsotnosti napredka pri izboljšanju tržnih pogojev v evrskem območju, bi kratkoročni napori morali biti usmerjeni v hitrejše doseganje fiskalnih prilagoditev od zastavljenih, ob hkratnem minimiziranju učinkov na gospodarsko aktivnost.

1 INTRODUCTION

One of the most adverse economic developments in 2011 was the increase in the Slovenia's government 10-year bond yield spread vis-à-vis that of Germany. In November 2011 the Slovenia's sovereign yield spread increased sharply and exceeded the level of some of most recently affected countries by the sovereign debt crisis (i.e. Spain and Italy). Since then it has remained slightly above the spread levels of those countries[1]. An increase in the government's bond yield, particularly if is permanent, has adverse implications for the whole economy as it constitutes the benchmark for private sector borrowing (Corsetti.et al (2012)). This is particularly the case in the Slovenian economy as investment financing depends heavily on bank's credit which borrowing conditions are benchmarked against those of the Sovereign (Caprirolo 2011).

The adverse development in the government yield spread can be attributed to various reasons. In general government yield spread and its dynamics should reflect perception on sovereign creditworthiness based on economic fundamentals and liquidity considerations. However, in the case of euro area countries the membership of monetary union adds an additional important dimension explaining government's bond yield dynamics in both good as well in bad times. This has been particularly the case in the aftermath of the Greek crisis, in which systemic risk intensified (i.e. risk aversion) and contagion has been playing an important role in explaining individual countries' government bond yields spread dynamics. A clear evidence of this is the observed attitude and preference of investors for German government bonds (flight to security) and the announced simultaneous rating actions on euro area members' sovereign ratings by Standard&Poors (S&P) on December 2011 (rating review) and posterior downgrade of 9 countries on January 2012 and Moodys' simultaneous downgrade of 9 euro area countries on February 2012. This collective revision of euro area members' sovereign credit ratings based on assessment of conditions of euro area fundamentals has also resulted in the revision of the Slovenia's credit rating outlook to negative in both cases. Country specific considerations also play an important role as they affect perception of creditworthiness and because countries' debts are traded with different degree of liquidity. Among the important country specific considerations influencing assessment of sovereign creditworthiness and the spread evolution in the case of Slovenia are: the post crisis weak economic recovery due to relative high leverage of non-financial enterprise sector; worsening of domestic banks' balance sheets; widening of fiscal deficits and rapid government debt accumulation and; weak policy implementation concerning bank capitalization, fiscal consolidation and structural reforms. The assessment of these various factors and with different emphasis by three major credit rating agencies resulted in downgrades of the Slovenia's Sovereign rating in the last four months of 2011.

The aim of this paper is of contributing to disentangle the weight of different factors driving the observed dynamic in the Slovenia's government bond spread in the last two years. This issue is important as it can contribute to identify and assess policy actions and options and determine the extent to which they can mitigate further worsening in the government debt yield dynamics and its negative effect on the overall economy. Addressing the risks of further deterioration of government's debt yield can in turn reduce the risk of the country falling into a bad equilibrium in which the spread between government debt yield and GDP growth would lead to unsustainable debt dynamics.

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[1] March 2012 is the cut of date of this paper.

Growing empirical literature on government's spread developments in the euro area points out to the existence of an international risk factor as the main driver of sovereign governments' spreads. Research has also pointed out to market mispricing of risks irrespective of the development in the countries' economic fundamentals. Yet, most of recent research does not included development on the Slovenian government yield spread with the exception of Jesenko et al. (2011) which focuses on the relation between pricing of Slovenia's government bonds and fundamentals concluding that developments in government yield, particularly in last quarter of 2011, do not correspond to deterioration of Slovenia's fiscal and macroeconomic fundamentals. This paper emphasizes the role of international risk factor in underpinning the Slovenia's government spread dynamics and thus the importance of taking into account systemic risk environment when making policy choices and of mitigating risks. This is the case for example at the time when deciding on: the pace and policy mix of fiscal consolidation; the timing and strategy for bank capitalization; priorities for structural reforms taking into account their implications on fiscal consolidation and; the policy stance to be pursued in the euro area policymaking gatherings respect to common action to mitigate systemic risk. The paper also pins down significant changes in the spread and the interaction between country-specific and euro area developments.

In this paper, a common factor that can be interpreted as time-varying risk attitude of international investors towards the credit risk of a group of euro area countries including Slovenia and which affects their governments' yield spread evolution is identified and estimated. In particular, Slovenia's government bond yield has historically moved close to those of euro area countries considered as peers in terms of credit rating (i.e. Italy, Portugal, Spain, Greece, Belgium) but, in the pre-Greek crisis period due to liquidity considerations (relative small size of government debt) it was slightly higher. Thus, while pricing of government debt bonds is made against German Bund the range of pricing of Slovenia's bonds and its dynamics has been close to those of euro area countries considered as peers. In the aftermath of the Greek debt crisis the governments' bond yield movements of Greece and Portugal have detached from those of Italy, Belgium, Spain and Slovenia. Taking into account the common risk factor the paper identifies main changes in the Slovenia's government's yield spread due to spillovers and country-specific considerations.

The quantitative approach involves identifying a time-varying risk factor shared by the sovereign bond's spreads of euro area sovereigns including that of Slovenia. Since the existence of a common risk factor "risk appetite" is not directly observable the Kalaman filter approach is used to determine its existence. Then a dynamic factor analysis is performed to assess the relation between the common factor and Slovenia's government debt spread. In particular, a vector error correction model is specified between the common factor and Slovenia's government spread. Finally, the contribution of country specific policies and events including rating actions that would have contributed to change in risk perception affecting the spread and its evolution is assessed.

The paper is organized as follows: section two reviews recent explanations concerning spread developments in euro area and Slovenia; section three describes main trends in the evolution of the Slovenia's government 10-year bond spread in the past two years pointing out to main events and policies that have affected its evolution; section four describes the data; section five presents the results of the empirical analysis; section six discuses policy implications and; section seven presents conclusions.

2 REVIEW OF LITERATURE

A common finding in the empirical literature concerning governments' bond yield spreads in the euro area is that they commove over time and that their dynamics are underpinned by a single time varying common factor associated with international risk appetite proxied by the difference between US corporate bonds over Treasury bonds (e.g. Favero, et al. (2010) and Gerlach, et al. (2010). More recently De Santis (2012) using the same models found out that the coefficients of the aggregate international risk factor cannot help to interpret sharp developments in euro area sovereign spreads and suggests instead using a regional aggregate risk factor measured by the spread between Kreditanstalt für Wiederaufbau (KFW) bonds and Bund. Sgherri et al. (2009) argues that changes in investor's risk appetite are not directly observable and thus estimated a common factor by assuming that risk premiums on yields are determined jointly in the market and thus the common factor is filtered out from the spreads. While estimated common factors are used together with other variables to explain country specific sovereign spread developments (Favero, et al. (2010) and Gerlach, et al. (2010) and De Santis (2012)), Sguerri, et al. (2009) also identified elements underlying the dynamics of the common factor. The implication of the existence of a common factor explaining spread developments is that actions aiming at addressing systemic risk can mitigate the impact on country specific spread developments. This is particularly the case in view that credit rating agencies in their rating analysis have lumped together euro area member countries.

Since the common risk factor tends to be the dominant force driving spreads, another related issue that has been addressed by the literature is whether observed spreads are reflecting underlying fundamental variables. According to De Grauwe, et al, (2012) this has not been the case. Particularly in the euro area's peripheral countries arguing that the surge of their spreads during 2010-2011 was disconnected from underlying increases in debt-to-GDP ratios and resulted from negative market sentiment developments. De Santis (2011) has a similar assessment regarding the government spreads of euro area countries considered as having solid fundamentals (Austria, Finland and Netherlands) and on peripheral countries where their spreads have been affected by credit rating information and spillovers effects from sovereign downgrades of Greece, Ireland and Portugal. Aizenman et al, (2011) also found that euro area spreads' fluctuations are difficult to reconcile with the fiscal stance in 2010 and argued that their driving force are future fundamentals. In the case of Slovenia, Jesenko et al, (2011) indicate that the developments in the Slovenia's bond spread also do not reflect worsening of fundamentals, particularly in November 2011. They point out to Slovenia's better fundamentals than those of euro area average. The worsening of the yields according to the authors is due to so-called soft factors such as lack of credible fiscal consolidation strategy, weak policy implementation and communication strategy. According, to the authors addressing these pitfalls could result in fast bringing back the spread to level close to that of euro average.

This paper relates to the literature in the sense that identifies a common risk factor underpinning the dynamics of Slovenia's peer group countries from the point of view of pricing government bonds. The paper also underlies the importance of spillovers in explaining spread developments and identifies the timing where they intensify. The paper suggests that perception of deterioration of fundamentals (default risk) played an important role in the spread evolution as captured by the impact of the sovereign credit downgrades at the time where systemic risk in euro area intensified and liquidity dried. In contrast with some findings in the literature the CDS spread development seem to commoved with that of the government's bond spread rather than anticipate credit risk downgrades and thus not affect directly risk perception and yield.

3 SPREAD DYNAMICS

In November 11th, 2011 the Slovenia's 10-year government bond spread against the benchmark (Bund) reached its highest level so-far (598 bps). It was higher than those of Italy and Spain, which also became affected by the spreading of the Greek debt crisis. The issue to disentangle is the underlying factors leading to such a development.

Looking at the Slovenia's government bond yield spread development over the past three years indicates that with the unfolding of the international financial crisis it widened in the fourth quarter of 2008 to a level of 190 bps and remained there until spring 2009 (Figure 1). Then with improved international conditions the spread decreased and averaged 70 bps until spring 2010. Since then, the evolution has been underpinned by the effect of spreading of the Greek debt crisis and the euro area policy response to it. In particular two events stand out: the outbreak of the Greek crisis in spring 2010 and the contagion to Italy in July 2011.

On May 2011 the effect of Greek crisis, resulting from the new Greek government revealing information of higher past deficits and debt figures than previously reported, become visible. In the aftermath of this crisis and until the end of June 2011, the Slovenia's government yield spread widened and fluctuated between 100 bps and 150 bps (Figure 1). Within this period (May 2010–June 2011) the spread tightened and averaged close to 100 bps (from January until the first half of April 2011). From April onwards an increasing trend on the spread emerged which stepped up in July 2011 (i.e. contagion of Italy). In the months of August to October 2011 the speed of the trend increase slowed down and the spread averaged 300 bps. In November, again a sharp and substantial increase in the spread took place and since then the spread remained around 500bps until the end of January 2012. More recently, on the back of ECB intervention in the interbank market, the spread has decreased.

The evolution of the government bond spread can be seen in light of the default and liquidity risks. Yet, separating these concepts is rather difficult since they are positively correlated (Ericsson et al 2006). Since these variables are not observable directly they are usually proxied with different variables. The credit default swap (CDS) spread or credit ratings are used as a proxy for credit quality and trading-based liquidity measures like bid-ask spreads or market depth for liquidity risk.

The evolution of CDS spread should reflect underlying country-specific default risk considerations and past values of changes in CDS spread are considered to be significant determinants of the change in credit rating which in turn affect spread's evolution. In particular, the CDS market seems to anticipate the information contained in ratings downgrades (Afonso et al. 2011) and as such it is considered to reflect market perception of worsening in fundamentals. Figure 2 shows the evolution of the Slovenia's 10-year government bond CDS spread. It indicates that there were three main changes in the CDS's spread trend evolution: i) a level shift in the average spread in May 2010; ii) a change in the slope in the last week of May 2011 and; iii) a sharp increase in the spread in November 2011. All these changes are also reflected in the evolution of the government bond yield spread (Figure 3). Notice, however that in the case of Slovenia the CDS spread evolution seems to commove with the bond yield spread rather than anticipate changes in ratings (as this happened in September to October 2011) and thus on yields.

The evolution of CDS spread should reflect underlying country-specific default risk considerations. However, changes in the level and slope of CDS and government's yield spreads were also coincidental or strongly influenced by spillovers from the unfolding sovereign debt crisis and policy response to it at euro area level (Figure 4). This also points out to the idea of a single time-varying common factor underlying

the pricing of Slovenia's sovereign risk. In particular, towards the end of April 2010 spreads increased across sectors and rating classes in the euro area triggering flight-to-safety behavior by investors on a large scale amid concerns regarding the implementation of the financial support package for Greece. The events on these days were comparable to the 2009 crisis in particular as regards the suddenness of the change in sentiment and the abruptness of the flight to safety by financial investors (ECB 2010). On May 2010 tension eased when EU finance ministers agreed on a European Financial Stabilisation Mechanism (May 9th). However, the impact of the market tension on CDS (Figure 4) and government debt yield spreads become permanent as their levels increased (Figure 5). Notice also in Figure 6 that the yield of German government debt started to decline since May 2011 indicating higher risk aversion which influenced all euro area spreads.

The second change in the trend of CDS spread (i.e. increase in slope) took place on May 2011, at that time when concerns of market participants' regarding a possible restructuring of the Greek debt intensified (Figures 2 and 4). The spreads of Portuguese and Irish sovereign bond yields widened further and intensification of safe-haven flows were observed from May to July 2011. Fears of the crisis spreading to other euro area countries beyond Greece, Ireland and Portugal weighted on government yields[2]. On 23/24 June the European Council endorsed the concept of private sector involvement in the case of Greek's debt crisis resolution including voluntary private sector debt reduction and its rolling over[3]. On July 21st the European Stability Mechanism (ESM), a successor to the EFSF, was established with additional resources, yet considered insufficient by the market and EU Commission[4]. These measures temporarily reduced the government yields of euro area members but not resulted in reversing their increasing trends. In August 2011 the ECB conducted operations including Italian and Spanish government debt through the Securities Markets Program (SMP) indicating that the crisis further spread to Italy and Spain. In November the crisis hit hard Italian bond spreads. A series of Italian government sovereign credit downgrades pushed the Italian government spreads to historic height reaching its peak on November 9th, 2011 (5.75 %) and leading to Berlusconi resignation (November 12th, 2011). The Slovenia's government bond yield and CDS spreads also reached in November 11th their highest levels so far (Figure 2).

In the pre-crisis period, when the possibility of default of and euro area member was not conceived as a likely event, liquidity considerations (volume and trade) had an important bearing on the government bond spread. In particular, liquidity considerations outweighed credit risk as proxied by sovereigns' credit ratings. For example, notwithstanding that Slovenia had a better credit rating than those of Italy (since 2007), Greece and Portugal, its sovereign bond spread was higher than of those countries. In the case of Italy this is particularly the case, since Italy is the fourth largest sovereign issuer in Europe and before the crisis its bid-ask spread was even tighter than that of Germany.

The spreading of the Greek debt crisis has also affected liquidity conditions in the government bond market. This is reflected in the bid-ask spread as well as in the traded volume. Slovenia's 10-year bond bid-ask spread after increasing temporarily on May 2010 it remained below 50 bps until April 2011 (Figure 7). Also in the case the bid-ask spread an increasing trend emerged since April 2011 which was matched

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[2] The European Council President Van Rompuy called an emergency meeting of top officials on July 11th, dealing with the euro area debt crisis, reflecting concern that the crisis could spread to Italy, the region's third largest economy.

[3] According to Orphaniades (2012) private sector involvement provided a clear message to potential euro area creditors in terms that sovereign debt should not longer be considered a safe asset with the implicit promise to be paid in full.

[4] In a letter sent by Commissioner Barroso to EU heads of state (FT 2011) two weeks after the decision was taken on July 21 regarding the €440bn bailout fund stated that it was not having the intended effects.

by a successive falls in trading volume in the months of April and June. The widening trend in the spread reached its peak in the month of November (280 bps). As in the case of CDS spread the bid-ask spread moved in tandem with those of peer euro area countries. The bid-ask spreads of Italy, Spain and Slovenia simultaneously and significantly increased in the months of July and November 2011 (Figure 7). Italy and Spain also registered significant drops in the level of traded volume in the month of July 2011 but in relative terms there were not as large as that experienced by Slovenia in April and June, which can be explain by their relative large size of debt and investor bases. Notice in particular that Italy maintained the smallest bid-ask spread throughout the whole period of analysis notwithstanding its lower credit rating than Spain and Slovenia (Figure 7). This fact points out to markets' participants given preeminence to liquidity risk rather than sovereign risk.

Figure 1: Slovenia's 10-year government bond yield spread against benchmark (bps)
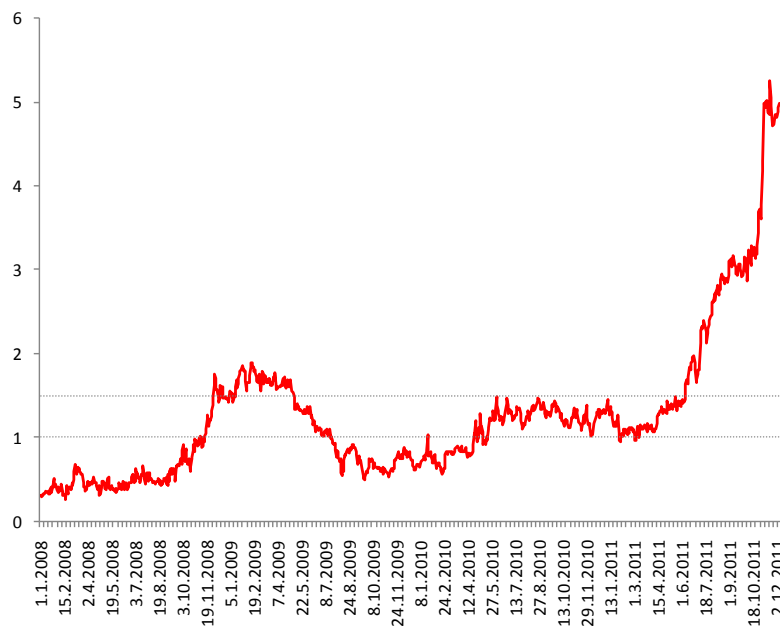
Source: Bloomberg (own calculation)

Figure 2: Slovenia's credit default swap (CDS) spread, 10-year government bond (bps)
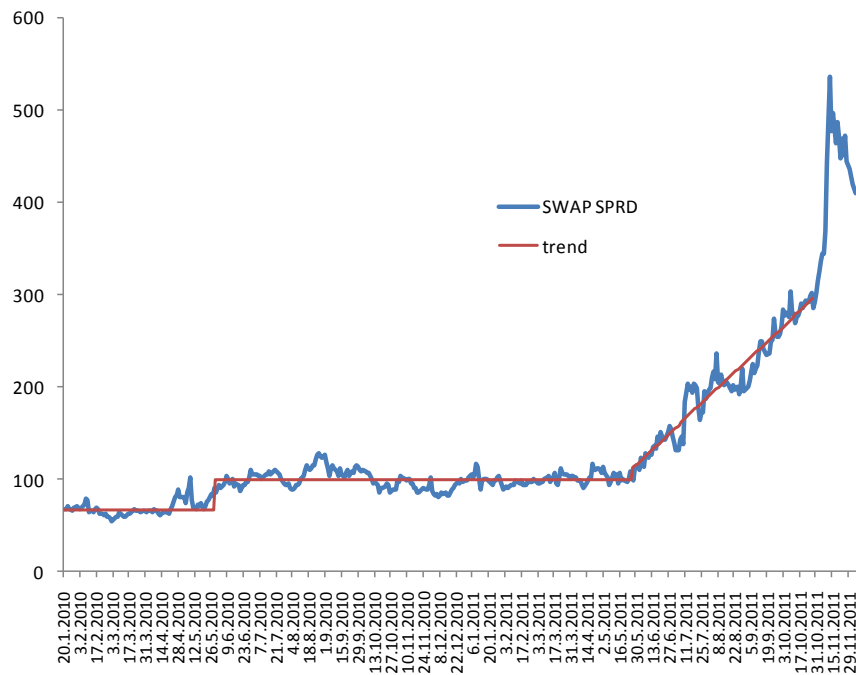
Source: Bloomberg (own calculation)

Figure 3: Government bond yield spread and CDS spread, bps
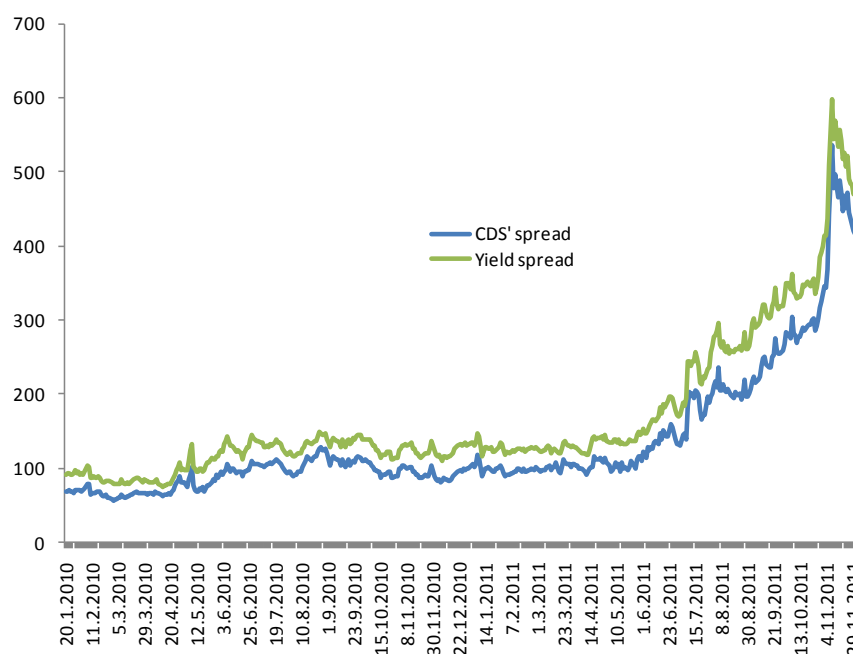
Source: Bloomberg (own calculation)

Figure 4: 10-year government bond CDS's spreads, bps
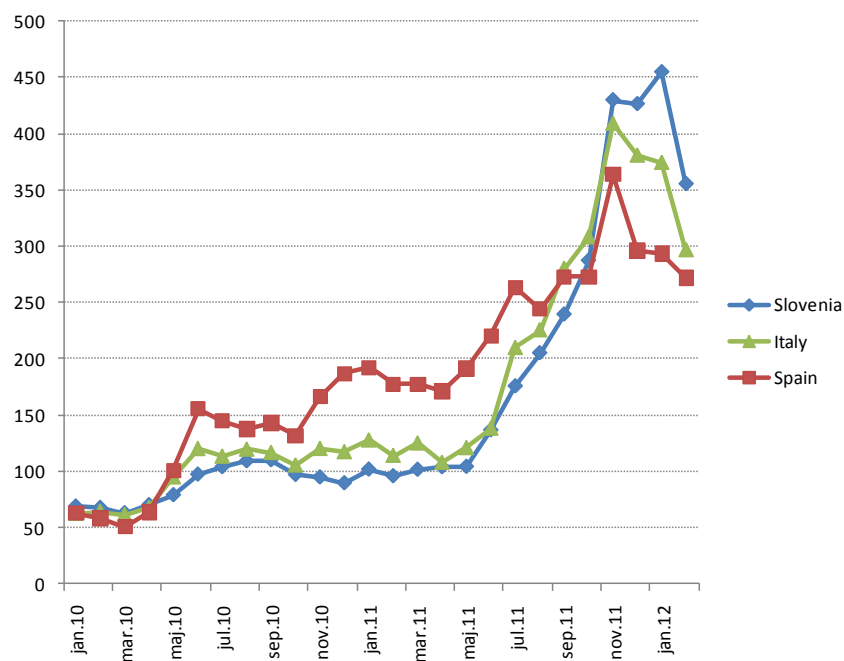
Source: Bloomberg (own calculation)

Figure 5: 10-year government bond yield spreads, bps

Source: Bloomberg (own calculation)

Figure 6: 10-year government bond yield (bps)

Source: Bloomberg

Figure 7: Bid-ask spreads, bps

Source: MF–MTS (own calculation)

Figure 8: **Daily-end of quarter spread correlation coefficient with Slovenia's spread, %**
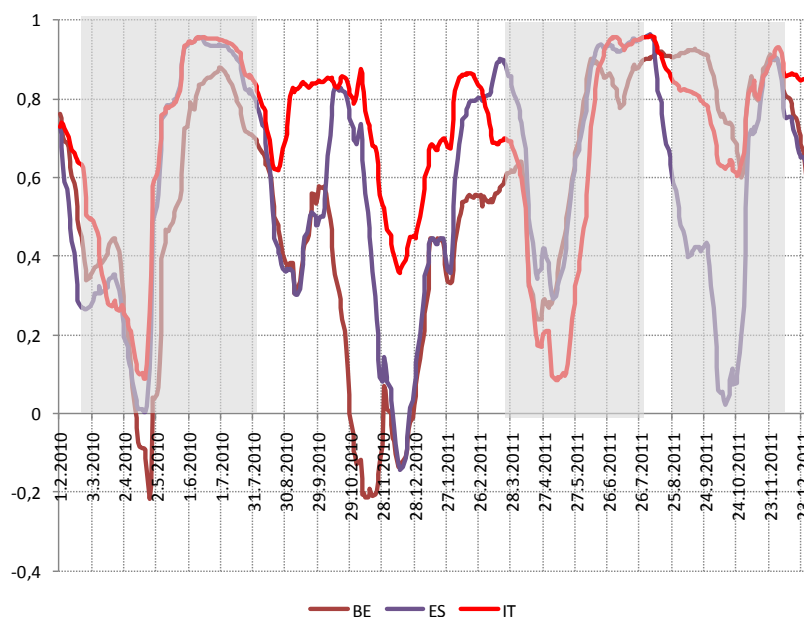
Source: Bloomberg (own calculation)

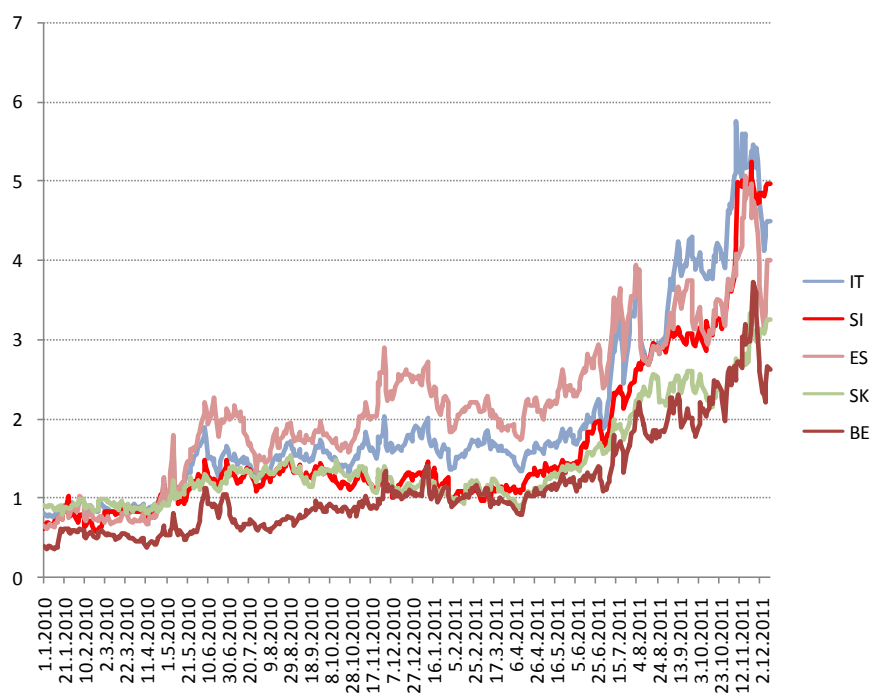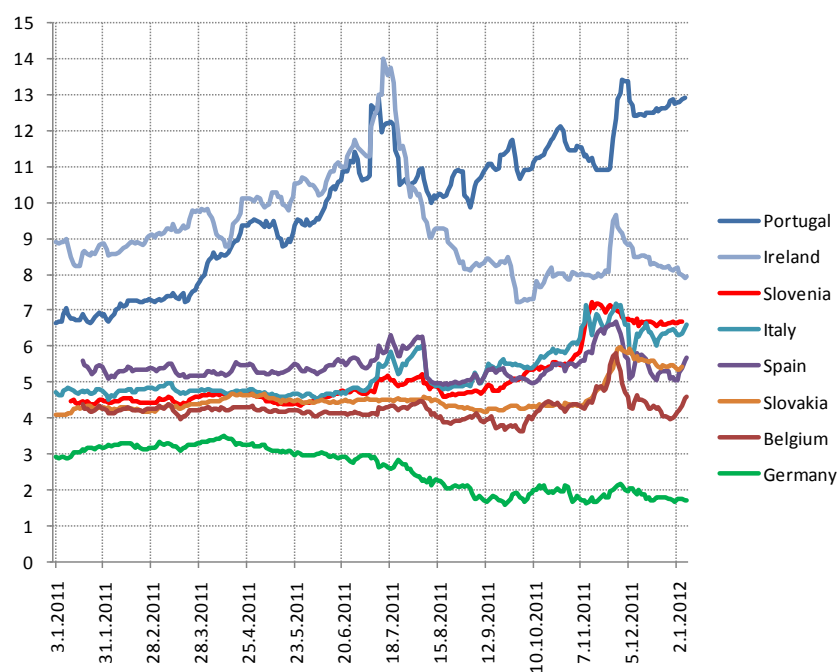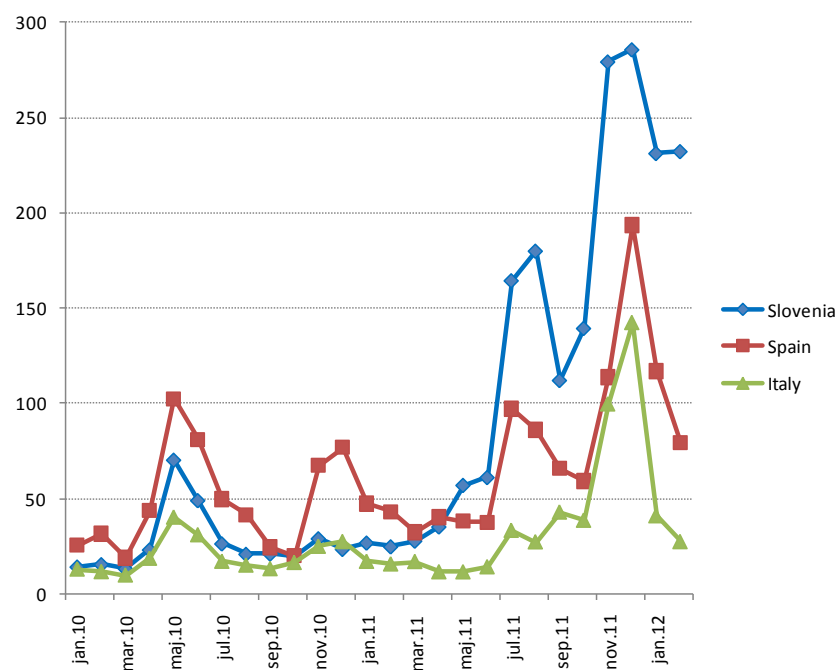Looking at the Slovenia's government yield spread in light of those of euro area peer countries (Figures 5 and 8) indicate that it strongly co-moved with those of other euro area countries. The various governments' bond spreads exhibit similar dynamics and changes at the same time that those identified for Slovenia's government bond spread (Figure 5). Furthermore, Figure 8 indicates that the daily end of quarter correlation coefficients between Slovenia's government's bond yield spread with those of some euro area countries (i.e. Belgium, Spain and Italy) increased simultaneously above 80 percent in the periods identified as those of severe market stress due to the unfolding crisis (March–July 2010, March–July 2011 and August–December 2011). The observed behavior is consistent with the notion that a single time-varying common factor associated with shifts in international risk appetite drives the euro area government bond spreads and that there is growing differentiation among the bonds of sub-group of countries as if they would belong to different class of assets.

In addition to the presence of a common factor affecting the Slovenia's government bond spread and those of other euro area countries considered as Slovenia's peers, there are also country-specific considerations that influence its dynamics (i.e. default and liquidity risks). Yet, it seems to be difficult to identify the role of country-specific variables such as fiscal or other in the determination of spread given the dominant force of the common factor (Borgy et al. 2011). This is particularly the case with respect of the CDS spread (default risk) which exhibit similar dynamics as those of peer countries. To this regard Jesenko et al. (2011) indicate that the developments in the Slovenia's bond spread in November 2011 are not associated with deterioration of basic macroeconomic and fiscal factors. Similar observation for euro area countries was made by De Grauwe et al. (2012). In fact some Slovenian macroeconomic fundamentals do not compare unfavorably to those of euro area average. Nevertheless, they have deteriorated importantly in the aftermath of the international financial crisis and particularly in light of worsening of funding conditions in euro area. In particular, the worsening of economic fundamentals and weak policy response and implementation resulted in the three major credit rating agencies downgrading the Slovenia's sovereign credit rating by one notch in the months of September and

October 2011 (Moody's September 23th; Fitch September 28th and; S&P October 20th) and of Moody's by one additional notch in December 22nd, 2011. These developments in turn are important with respect to yield developments as negative rating decisions single out worsening of credit risk for a particular country and consequently they can influence the dynamics of the government bond yield. One important consideration is that those rating actions took place at the time when systemic risk and contagion at the euro area level intensified (liquidity dried and bid-ask spreads widened) and reached a height in November 2011. In particular, the downgrades took place at the time where liquidity conditions in euro area markets worsened significantly (in the second semester of 2011 trading volume halved in the case of Italy and Spain and in the case of Slovenia was only 30 percent of the level traded in the first half of the year). Liquidity conditions as measured by trade and bid-ask spread (liquidity risk) deteriorated already in April 2011 for Slovenia and for larger countries (Italy and Spain) since July 2011 which is consistent with the relative lower size of government debt in the case of Slovenia and probably due to ECB intervention in the case of Italy and Spain.

Among the key rationale for Slovenia's sovereign rating downgrades with negative outlook exposed by Moody's and Fitch was the financial position of domestic banks and spillovers to government balance sheet and weak government policy implementation.[5] Moody's (2011) referred to vulnerabilities in the banking system asset quality, their capital adequacy and short-term external funding with potential spillovers to government balance sheet and, the effect of enterprise deleveraging in the negative outlook for banks. Fitch (2011) also indicated that the downgrade reflected deterioration in the financial position of the banking system and high degree of state ownership in the financial system and interconnectedness.[6] Signals about the negative outlook of the banking system were already provided by Moody's in December 2008 (Moody's 2008). Since then, negative rating actions on banks including the largest two state-owned banks, were taken by Moody's and Fitch. In the case of the S&P's (2011) downgrade the argument was the deterioration of fiscal position since the 2008 financial crisis and the lack of credible fiscal consolidation strategy.

Looking at relevant macroeconomic indicators, including some of forward looking nature from the view point of evolution of spreads in 2011 (e.g. forecasted government's deficit and debt, and GDP growth for the ongoing year) influencing developments in risk assessment and thus evolution of debts spreads for a sample of countries, indicates that Slovenia in general does not perform poorly (e.g. expected government debt and private debt (Figure 9) but have worsened in the aftermath of the international crisis. In addition, the size of Slovenia's government financing requirement for 2012 compares quite favorably to other EU countries (UMAR 2011). However, Slovenia's banking sector performance seems to be the exception (Figure 9) and to some extent the government's relatively poor track record in meeting fiscal targets (i.e. higher deficits and debt figures than originally planned for 2011 (Figure 10).

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[5] Among the arguments Fitch also refers to the failed attempt to further reform of the pension system.
[6] In December 2010 S&P revised the Slovenia's sovereign credit outlook to negative. The rationale on the negative outlook reflecting risk of government's missing medium-term budgetary targets and consequently a failure to stabilize the debt burden.

Figure 9: Selected indicators for a sample of countries
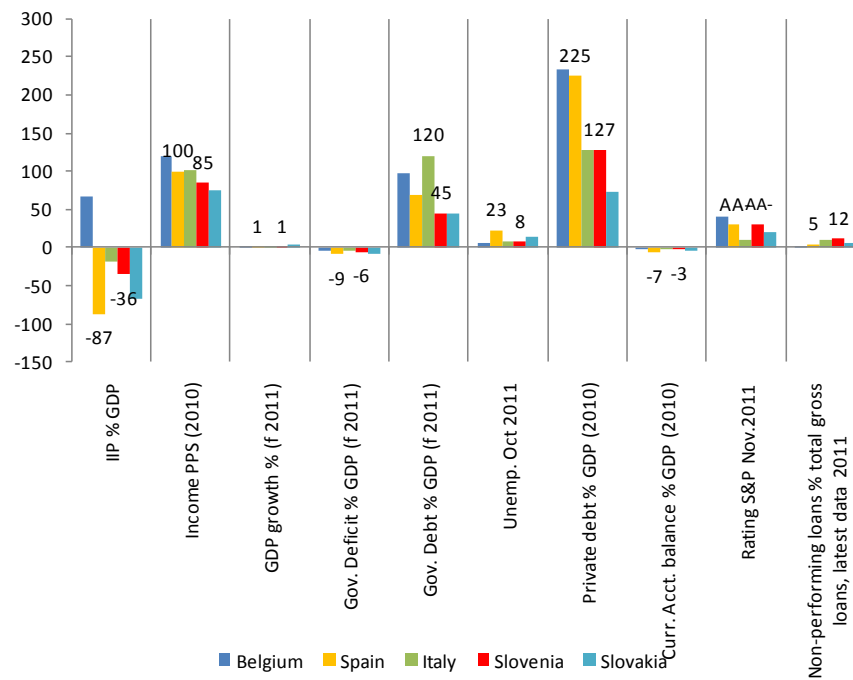
Source: Eurostat, S&P, IMF

Figure 10: Difference between debt and deficit figures for the year 2011 in the 2011 and 2010 updates of stability programs (% GDP)
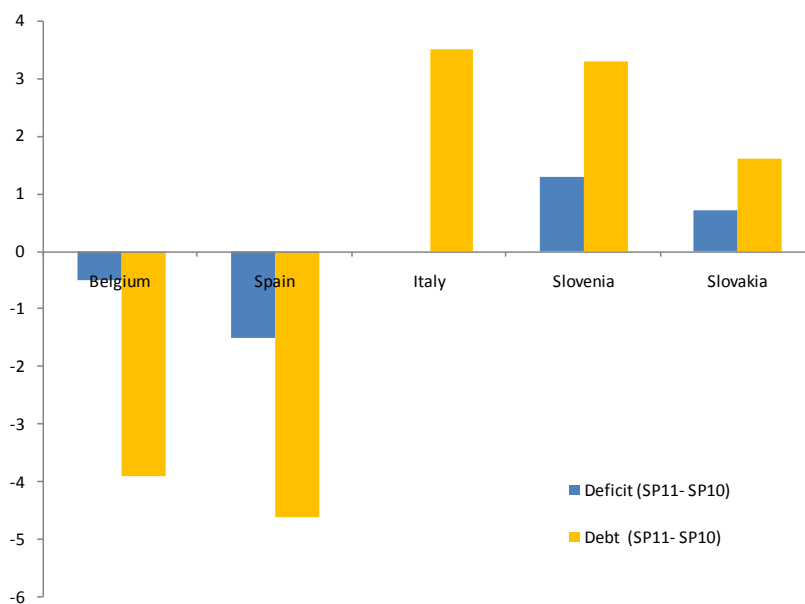
Source: Eurostat, S&P, IMF

In an environment of heightened systemic risk it seems that not only negative credit rating revision affect yield development but also positive credit rating revisions reflecting appropriate policies mitigate adverse systemic developments. This seems to have been the case of Slovakia where its sovereign rating outlook was revised to positive by S&P on August 24th, 2011. Such an event appears to have influenced the level of Slovakia's yield and spread development compared to that of Slovenia's since then (Figure 5). Development of credit ratings in a highly volatile environment with spillovers in which risk is fast re-priced (Figures 11 and 12) highlights the importance prioritizing policies aiming at enhancing confidence and preventing credit rating downgrades.

Figure 11: Government's deficit and 10-year yield spreads
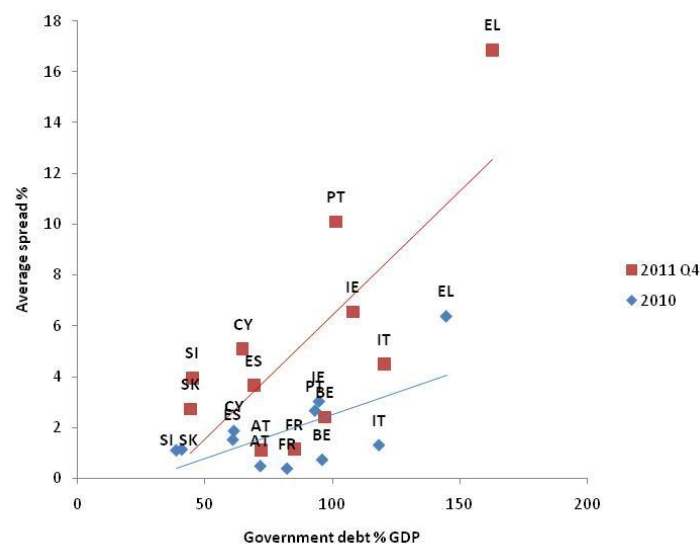
Source: Eurostat and Bloomberg

Figure 12: Government's debt and 10-year yield spreads
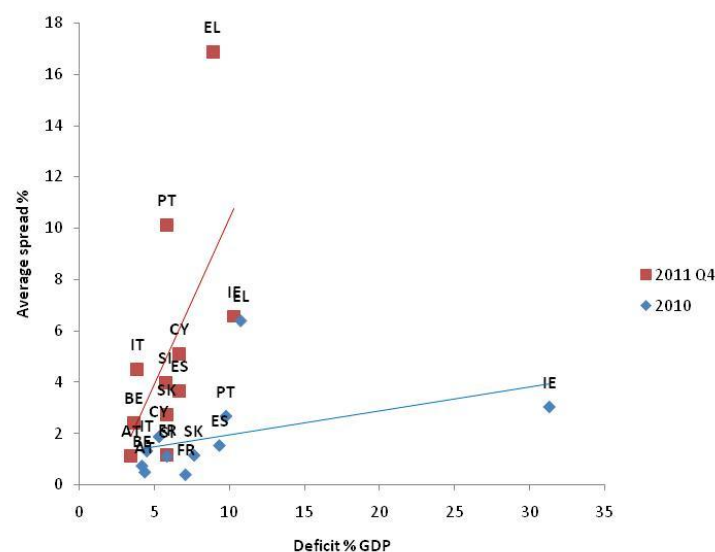
Source: Eurostat and Bloomberg

Euro area leaders, to address market developments and intensification of the crisis against the background of a threat of a collective downgrading of ratings of euro area members by Moodys, agreed on December 12th 2011on the following actions: i) tougher and more biting fiscal rules to be implemented at a national level; ii) additional resources for the ESM and; iii) re-affirmed their promise that Greece would remain a unique case concerning the approach to private sector involvement. For other euro area members private sector involvement was conceived to be limited to debt restructuring according to defined collective action clauses (CAC) applied to all debt issued from 2013. Nevertheless, these measures did not affect visibly the evolution of yield spreads. The observed stabilization of the yields towards the end of the year and beginning of 2012 seems to have responded primarily to ECB interventions in debt markets under the Securities Markets Programme and long-term (3 years) refinancing operations of banks.

4 DATA

The empirical literature analysis is based on government 10-year bond yield for Germany, Slovenia, Italy, Belgium, Spain and Slovakia provided by Bloomberg. The Period is from January 20th, 2010 to December 7th, 2011. The frequency is daily business.

Summary of data series on Slovenia's spread is presented in Table 1. The data indicates evidence of fat tails as the kurtosis exceeds 3, which is the normal value, and evidence of positive skewness, suggesting that the right tail is particularly extreme.

Table 1: Data on Slovenia's spread (January 20th, 2010–December 7th, 2011)

Mean	5.012104
Median	4.877465
Maximum	6.393994
Minimum	4.317968
Std. Dev.	0.472375
Skewness	1.063148
Kurtosis	3.400878
Jarque-Bera	95.19729
Probability	0.000000
Sum	2445.907
Sum Sq. Dev.	108.6681
Observations	488

Source: Bloomberg (own calculation)

5 MODELING GOVERNMENTS' BOND YIELD SPREAD DEVELOPMENTS

In this section a euro area sub-regional aggregate risk factor is identified. Using the Kalaman filter the existence of an unobservable common factor driving the spread dynamics of countries considered as peers of Slovenia is tested. In a second step a common factor based on sovereign' debt spreads of euro area countries considered as Slovenia's peers is determined and its influence in underpinning Slovenia's sovereign spread dynamics is modeled trough a vector error correction model. Taking into account the results of the vector error correction model the relevance of various country-specific considerations in driving the spread dynamics including the sharp increase in November 2011 is assessed. The purpose is to identify the timing of country specific shifts in risk perception that could suggest change in investors' attitude towards Slovenia's sovereign credit[7]. To this end also an attempt is made to disentangle the emergence of a positive margin between the government's spreads of Slovenia and Slovakia is carried out.

The dynamics of euro area sovereigns' bond spreads with respect to German Bund indicate that in the aftermath of the financial crisis in 2009 they narrowed below 100 basis points but started to diverge on the back of the Greek sovereign debt crisis (May 2010). Differentiation became more accentuated since July (2011) when at the EU summit it was decided to force losses on bond holders of government Greek debt. In the case of countries considered as having relative solid fundamentals (Austria, France, Finland and Germany) their yield spread fluctuated with declining trend in the aftermath of the Greek crisis but since July 2011 they have exhibited an increasing trend which was more pronounced in the case of Austria and France indicating further differentiation among euro area members. On the other group of countries, the so-called EU peripheral countries, governments' yields exhibited strong positive trend in the second half of 2011 and spreads widened considerably (Figure 5). While literature indicates that euro area government yield spreads are driven by common factor, it seems that with the worsening of the crisis there has been also a growing differentiation among sub-groups of euro area countries as if their government bonds of each sub-group would have similar risk premium and belonging to similar class of assets.

As shown in Figure 8 (debts spreads) and Table 2 (correlation coefficients) the Slovenia's government debt spread seems to co-move strongly with those of some euro area members. Before the crisis the spread moved tightly close to those of euro area countries considered as peers (i.e. Greece, Portugal, Spain and Italy) but its level was higher reflecting mainly liquidity considerations (Zadravec 2010). While the co-movement of spreads continued in the aftermath of the Greek debt crisis, there was a level shift in favor of Slovenia's spread (until November 2011) reflecting what would seemed investors assigning more value to default risk than liquidity risk. Such a broad behavior would conform with empirical literature that has studied government bond spread evolution in the euro area since the beginning of implementation of single monetary policy in 1999 indicating that spreads are mostly driven by a single time varying common factor associated with shifts in international risk attitude. Furthermore, principal component analysis regularly reveals that a single component accounts for more than 80 % in the total variation of yield spreads (Borgy et al, 2011). An implication of the existence of a common factor is that it makes difficult to identify the role of country-specific variables in the determination of spreads. Yet, in the aftermath of the crisis, the evidence shows that the degree of spread co-movement varies and that among some countries it has weakened (e.g. Austria and France or Slovenia and Austria (Table 2). This

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[7] According to Moody's (2012) the key drivers of the December 2011 downgrade were the increase of risks on sovereign bond markets and in the Slovenian banking system.

points out to the possibilities for identifying sub-regional risk factors that could underlie spread dynamics of a group of countries or that investors would attribute different risk level to sub-group of countries.

Table 2: Correlation coefficients between Slovenia's government spread with those of a sample of euro area countries

	AT	BE	ES	IE	IT	PT	SK
2008	0.94	0.94	0.92	0.97	0.96	0.92	0.93
2009	0.90	0.91	0.88	0.79	0.90	0.91	0.70
2010	0.31	0.70	0.84	0.66	0.91	0.85	0.89
2011	0.92	0.97	0.94	0.03	0.97	0.82	0.96
2010–2011	-0.46	0.95	0.86	0.53	0.97	0.84	0.95

Source: Bloomberg. Own calculation

In view that risk premium for government bonds seems to be jointly determined by a common factor ("risk appetite") which is not directly observed, as staring point the Kalaman filter was used to extract information regarding the unobserved variable (i.e. "risk appetite") for the group of euro area countries whose government's debt spread exhibited strong co-movement with that of Slovenia. Then, tests were performed to determine whether the underlying dynamics of the group of countries were explained by a common factor.

After carrying out a selection analysis it was found out that the dynamics of the 10-year governments' bond yield spread of Slovenia, Italy, Belgium, Spain moved together and assumed to be determined within a multivariate generalized autoregressive framework[8]. The corresponding econometric model was specified as follows:

$$s_{j,t} = \lambda_j \gamma_t + \upsilon_{j,t} \qquad \upsilon_{j,t} \sim iid\ N(0,\ \sigma_\upsilon^2),.\ j=1..4,$$

$$\gamma_t = \theta\gamma_{t-1} + \eta_t \qquad \eta_t \sim iid\ N(0,\ \sigma_\eta^2)$$

Where observed spreads ($s_{j,t}$) are believed to depend upon an unobserved variable (γ_t) expressing country specific risk attitude and macroeconomic risk. The factors driving sovereigns spread dynamics are assumed to fallow a random walk. The relative riskiness of each sovereign is captured by the country-specific λ_j. The model was estimated and results are presented in Table 3.

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[8] Before the Greek crisis Slovenia's government bonds although priced against Bund their level was slightly higher that the so-called group of peer countries including Belgium, Italy, Portugal, Spain and Greece. This was the case notwithstanding higher credit rating of Slovenia to some of them. With the crisis the yields of Portugal and Greece diverged significantly from those of the rest of the peer group.

Table 3: State space results (AR model)

Sspace: KALAMAN
Method: Maximum likelihood (Marquardt)
Specification
@state sv1 = c(2)* sv1(-1) + [var = exp(c(1))]   Slovenia
@state sv2 = c(4)* sv2(-1) + [var = exp(c(3))]   Italy
@state sv3 = c(6)* sv3(-1) + [var = exp(c(5))]   Belgium
@state sv4 = c(8)* sv4(-1) + [var = exp(c(7))]   Spain

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	0.684570	0.002172	315.1170	0.0000
C(2)	0.979598	0.000116	8451.232	0.0000
C(3)	0.327772	0.001208	271.4168	0.0000
C(4)	0.964849	6.31E-05	15280.96	0.0000
C(5)	0.818419	0.002842	287.9828	0.0000
C(6)	0.941303	0.000230	4090.551	0.0000
C(7)	3.455724	0.021467	160.9761	0.0000
C(8)	1.000012	0.000929	1076.812	0.0000

	Final State	Root MSE	z-Statistic	Prob.
SV1	376.3879	1.408161	267.2903	0.0000
SV2	436.3279	1.178080	370.3720	0.0000
SV3	254.8315	1.505627	169.2527	0.0000
SV4	382.7377	5.628607	67.99865	0.0000

Log likelihood	-47062.06	Akaike info criterion	203.7665
Parameters	8	Schwarz criterion	203.8381
Diffuse priors	4	Hannan-Quinn criter.	203.7947

Source: Own calculation

To elucidate the extent to which current developments in yield spread among the group of sample countries is due to a common unobservable factor a test on whether the loadings on the 4 factors of the sate variables are equal (in a statistical/ probabilistic sense) was carried out. Table 4 presents the results of the test and indicates that the hypothesis that loadings of the state variables are equal cannot be rejected. Thus, it can be said that the Slovenia's government bond debt spread is also driven by the same unobservable component factor underpinning the dynamics of the euro area countries considered as peers. A test on whether the common factor also pertains the second moments of the series was also carried out but results were inconclusive.

Table 4: Wald test

SSpace: KALAMAN

Test Statistic	Value	df	Probability
Chi-square	0.373634	3	0.9456

Null Hypothesis: C(2)=C(4),C(4)=C(6),C(6)=C(8)
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(2) - C(4)	0.000509	0.005725
C(4) - C(6)	2.55E-05	0.006558
C(6) - C(8)	0.002160	0.006230

Restrictions are linear in coefficients.

Source: Own calculation

The model was also re-specified under the assumption that the observed variables have separate idiosyncratic error terms. For this purpose series were assumed to have a separate MA (1) component. The resulting estimation improved the log likelihood estimator significantly (-6458.14) and based on the resulting likelihood ratio test and chi-squared statistic it is concluded that the model including separate idiosyncratic terms is superior.

Table 5: Wald test

SSpace: KALAMAN_ARMA

Test Statistic	Value	Df	Probability
Chi-square	0.464627	3	0.9266

Null Hypothesis: C(1)=C(2),C(2)=C(3), C(3)=C(4)
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1) - C(2)	-34.33464	53.84961
C(2) - C(3)	-326.2340	4929.994
C(3) - C(4)	326.2264	4929.972

Restrictions are linear in coefficients.

Source: Own calculation

The autoregressive moving average model was also used to test whether the hypothesis of a single common factor driving changes in the observed spreads was conducted. Based on the results shown in Table 5 the hypothesis was not rejected. A similar test on whether the common factor also pertains the second moments of the series was also carried out but results were inconclusive as above. In summary, the analysis suggests that the Slovenian government bond spread is driven by the same common factor influencing the spread developments of some other euro area countries.

Taking into account that the Slovenia's government bond spread dynamics seems to be underpinned by a common factor "risk appetite" affecting other spread of peer countries the next step is to determine the extent to which the common factor explains the Slovenia's government spread dynamics.

Principal component analysis performed on the government debt spreads of euro area countries (i.e. Italy, Belgium, Spain and Slovakia) exhibiting strong correlation with that of Slovenia and specified on logarithms indicates the existence of one single factor explaining about 95 % of the total communality of the total observed spreads' variances. Taking into account this information a single factor was estimated and results are presented in Table 6. The loadings on the factor are relatively large and similar (above 92 %) indicating high correlations between each variable and the factor. Notice that Italian's spread has the highest relevance in the factor model. Results also indicate that large proportion of each country spread's variances is common while the proportion that is unique is relatively small (exception Spain). In the case of Slovenia's government debt spread the variance attribute to common factor (i.e. shared with other spreads) is large 96 % while the proportion of individual (unique) component is low.

**Table 6: Result of principal component's analysis**

	Loadings F1	Communality	Uniqueness
LB	0.957899	0.917570	0.082430
LE	0.925575	0.856689	0.143311
LI	0.994936	0.989897	0.010103
LS	0.978212	0.956899	0.043101
LSK	0.941813	0.887012	0.112988

Factor	Variance	Cumulative	Difference	Proportion	Cumulative
F1	4.608066	4.608066	---	1.000000	1.000000
Total	4.608066	4.608066		1.000000	

	Model	Independence	Saturated
Discrepancy	1.271133	10.64470	0.000000
Chi-square statistic	537.6895	4502.707	---
Chi-square prob.	0.0000	0.0000	---
Bartlett chi-square	533.6642	4476.095	---
Bartlett probability	0.0000	0.0000	---
Parameters	10	5	15
Degrees-of-freedom	5	10	---

Source: Own calculation

The estimated dynamic common factor in sovereign bond spreads (F1) and sovereign bond spreads is shown in Figure 13 and also in Figure 14 together with the Euribor-OIS spread. The later spread is a key indicator reflecting the willingness of European banks to lend one to another. Figure 12 indicates that the degree of distress in euro area money markets (Euribor-OIS spread) has been in on a risk-averse trend since June 2011 which is similar to that followed by government spreads and captured by the dynamic common factor.

Figure 13: Sovereign yield spreads and estimated common factor
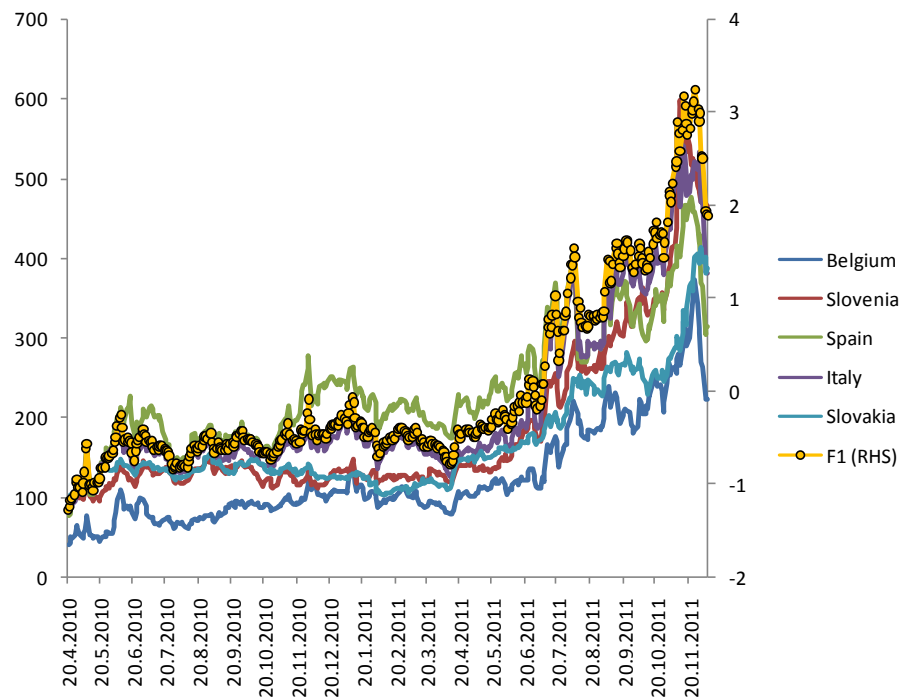
Source: Bloomberg, ECB (own calculation)

Figure 14: Euro-ois spread and common factor in sovereign bond spreads (logs)
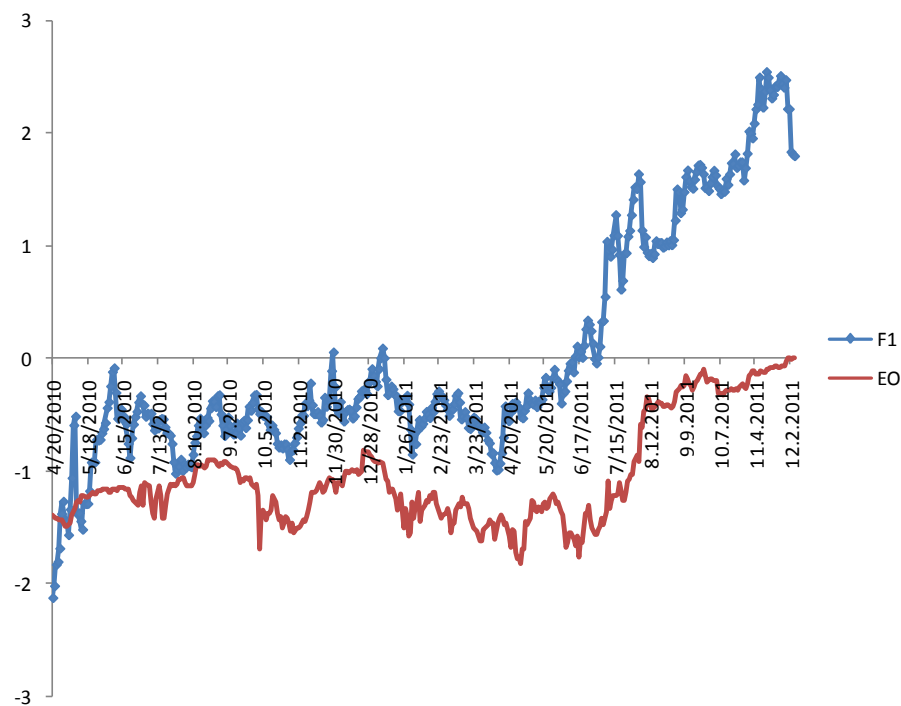
Source: Bloomberg, ECB (own calculation)

The next step consists of determining the relation that exists between the Slovenia's sovereign spread and the common factor. To this purposes the assessment of the presence of a long-term equilibrium relationship between the Slovenia's government yield spread and the common factor in which observations deviate from such equilibrium in a stationary process is pursued. The results of unit root and co-integration tests are presented in Table 7 and 8 respectively.

Given that the Slovenia's government debt spread and the factor's time series exhibit strong persistence, standard augmented Dickey-Fuller test with the inclusion of intercept and a trend were carried out. Table 7 shows the results of the test including intercept indicating the existence of unit roots in the levels of the variables but not in their first differences. This was also the case when using intercept and a trend.

Table 7: Augmented Dickey-Fuller test

	ADF test	
	Level	1st difference
Slovenia's government debt spread	0.30	-20.56**
Common factor	-1.24	-15.44**

** significant at 1% level

Source: Own calculation

The next step was to study the relationship between the two non-stationary variables (i.e. common factor and the Slovenia's government spread). To this purpose a Johansen co-integration test was performed. Results presented in Table 8 suggest the existence of one co-integrating relationship among the variables.

Table 8: Johansen co-integration test

Hypothesized No. of CE (s)	Trace statistic	Probability
None*	18.48	0.0172
At most 1	0.0046	0.9446

* denotes rejection of the hypothesis at the 0.05 level

Source: Own calculation

Taking into account the co-integrating relationship a vector error correction model was estimated underlying the long-term relationship between the Slovenia's government spread and the single factor. The specification include three impulse dummy variables all associated with events in which euro area government bond market become under heavy strain. The first dummy variable (du5110) corresponds to Monday 10th, 2010 when the ECB announced the Securities Market Program (SMP) aiming at purchasing euro area government bonds. The second dummy variable (du711) corresponds to July 11th, 2011, when Italian 10-year government bond yield hit their highest level over a decade (i.e. Contagion of Italy). It jumped by around 45 basis points to 5.6 % based on concerns that the euro area crisis was spreading to Italy and Spain. The third dummy variable (du1111) on November 11th, 2011 reflects the spillover of the Italian crisis on Slovenia's government yield. On November 9th the yield on 10-year Italy's government bond touched 7 % (the rate at which Greece, Ireland and Portugal were forced to seek bailouts from the EU). Two days later (November 11th) that yield fell sharply at the prospect of a new government being formed and, on November 12th, Berlusconi resigned. On November 11th the Slovenia's government bond yield overshot the level of Italy's.

Taking into account the existence of a co-integration relationship between the Slovenia's government spread and the common factor a vector error correction model was estimated. The long-run relation between the common factor and the spread was estimated as follows.

$LS = 5.097 + 0.475\ F1_{t-1}$

(0.01988)

$R^2 = 0.32$, $\sigma = 0.0338$.

The estimated vector error correction model suggests the existence of a long-run relation between the common factor and Slovenia's risk. In particular, a 1 p.p. increase in the common factor leads to about 0.5 p.p. increase in Slovenia's spread. The feedback or adjusted coefficient is negative implying that there is tendency to adjust to the long run equilibrium but the coefficient is relatively small suggesting slow adjustment. Impulse response functions suggest that shocks have lasting effects on the Slovenia's government spread as discussed below.

The properties of the model were evaluated. The test for autocorrelation portmanteau (Q test) indicates that autocorrelation for residuals is rejected at all plausible lags. Normality test (Jarque-Bera) of the residuals is rejected due to kurtosis test. However, based on Paruolo (1997), the Johansen results are not affected when the normality test is rejected for rejecting kurtosis rather than skewness (i.e. errors are symmetrically distributed). Homoscedasticity is rejected suggesting arch effects however according to Rahbek et al. (2002) the cointegration tests are quite robust against moderate ARCH effects.

The dummy variables all are significant and associated mainly with external spillovers (Table 9). The first dummy (du51010) corresponds to the strong pressure of sovereign yields due to the unfolding Greek debt crisis and the introduction of the ECB's SMP on May 10th 2010. The estimated impact of this dummy on the Slovenia's government yield spread is of an increase in the spread of 20 basis points (bps). The second dummy variable (du711) capturing the impact the spreading of the sovereign debt crisis to Italy (i.e. the Italian 10-year government bond yields hitting on July 7th 2011 their highest level over a decade) resulted in an increase in the Slovenia's sovereign yield spread of 59 bps. The third dummy variable (du1111) reflects the spillover of the Italian crisis on Slovenia's government yield. The effect of this event on Slovenia's yield spread was the largest and increased by 104 bps.

Table 9: Dummy variables

du51010	du711	du1111	du_mdy	du_SK
-0.278***	0.203***	0.196***	0.0571	-0.0462
(0.0340)	(0.0340)	(0.0345)	(0.0339)	(0.0281)

p<0.01***, p<0.1

Source: Own calculation

While its seems clear that spillovers from the unfolding sovereign debt crisis in euro area and policy responses affects the Slovenia's yield spread, it is also evident from observation that a growing differentiation between the government spreads of Slovenia and Slovakia vis-a-vis German Bund emerged which cannot be associated only to external spillovers but to country specific considerations which in turn magnify or mitigate the impact of spillovers. Figure 15 shows that while the government yield spreads of Italy, Slovenia and Slovakia move together a positive margin between the government's yield spreads of Slovenia and Slovakia (and between those of Italy and Slovakia) emerged in the last

quarter of 2011. Figures 16 shows that the Slovakia's government yield detached from those of Italy and Slovenia after Slovakia's credit rating outlook was revised to positive by S&P on 24th, August 2011. Towards the end of the year the Slovakia's yield moved closer to those of Italy and Slovenia, reflecting underlying common risk perception, but it remained lower. With the spreading of the crisis to Italy the Slovenia's yield moved closer to that of Italy. The negative difference between the Slovenia's and Italy's yield that was observed in most of 2011 narrowed and then it turn positive after November 1st, 2011 (Figure 17). The yield dynamics of the two sovereigns seem to have been also influenced by changes in credit rating assessment. Italy's downward rating revision in September 19th, 2011 widened the difference between the Italian yield against that of Slovenia, but downward revision of the Slovenia's rating in September 23rd and 28th narrowed it again (Figure 17).

To assess the impact of country specific developments to the Slovenia's yield the significance of impulse and step dummies associated with important events were tested in the cointegration equation estimated above as exogenous variables. In particular the impact of the following events was tested: i) the significance of the rejected referendum on the pension reform as it was argued that this event triggered the widening of Slovenia's spread; ii) the collapse of the government on September 20th and; iii) the effect of the downgrades of the Slovenia's sovereign rating by three rating agencies in the months of September and October.

The dummy variables on the pension reform and collapse of the government did not prove significant in explaining the developments of the Slovenia's spread. With respect to dummies associated with the three dates in which credit rating agencies downgraded the Slovenia's sovereign rating by one notch, the one pertaining to Moody's rating agency (i.e. first downgrade (du_mdy)) proved relative significant (Table 9). The downgrade by Moody's is estimated to have increased the Slovenia's sovereign spread by 21.4 bps.

Figure 15: 10-year sovereign yield spreads (bps)
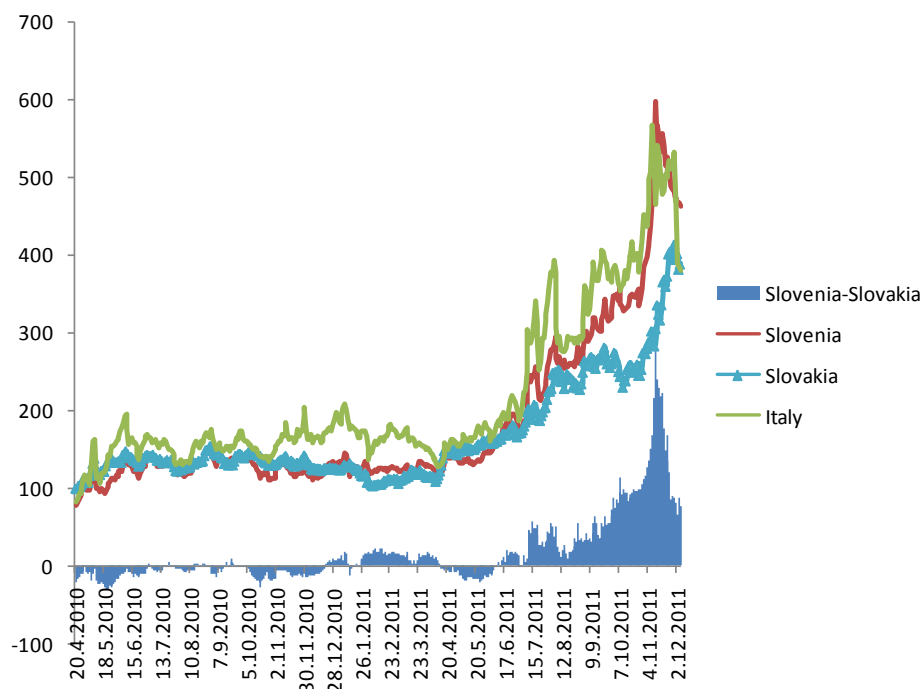
Source: Bloomberg. S&P, Moody's and Fitch (own calculation)

Figure 16: Sovereign yields (%), margin between sovereign yields spreads (SI and SK) and change in credit rating assessments
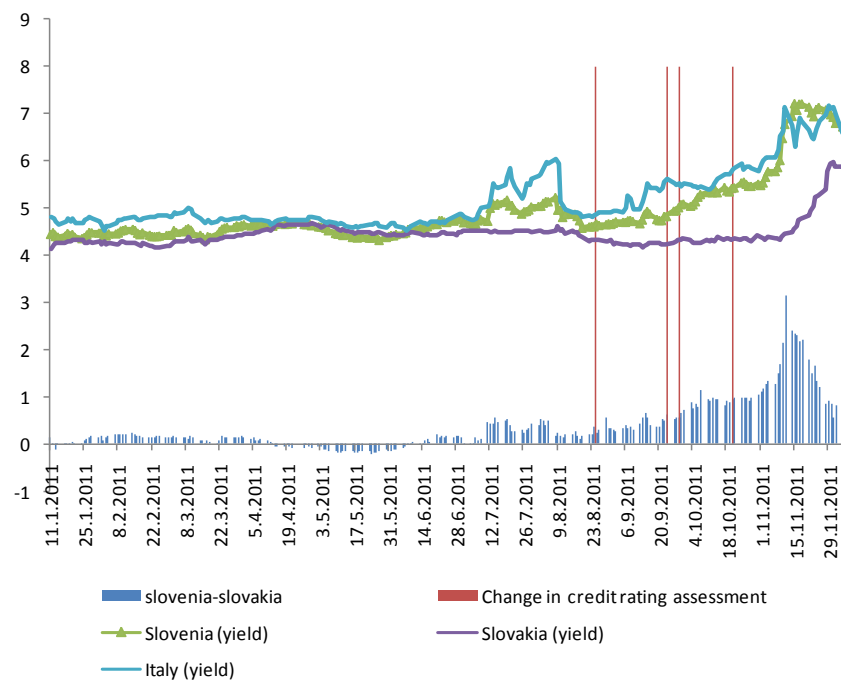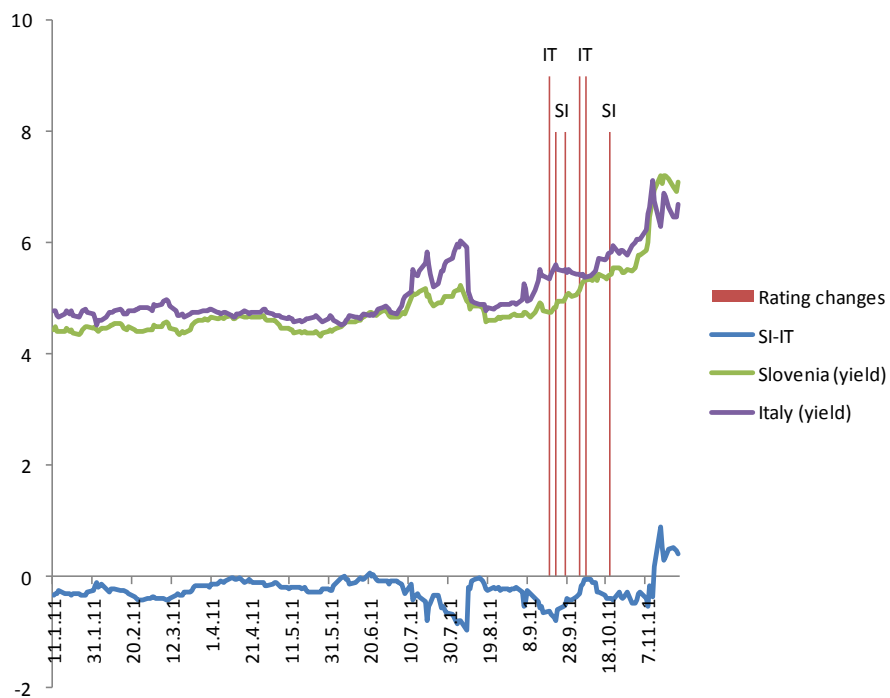

Source: Bloomberg. S&P, Moody's and Fitch (own calculation)

Figure 17: Sovereign yields (%), margin between sovereign yields spreads (IT and SI) and change in credit rating assessments


Source: Bloomberg. S&P, Moody's and Fitch (own calculation)

Taking into account the results obtained it can be said that while the dynamics and discrete changes in the Slovenia's spread have been driven by common risk factor and spillovers, the downgrading of Slovenia's sovereign rating has also contributed to the widening of the spread. The fact that the downgrades of Slovenia's rating took place at the time where the sovereign crisis spread to Italy and overall systemic risk intensified (liquidity dried in government bond market) resulted in worsening the investors' risk perception of Slovenia placing it at par with that of Italy (i.e. Slovenia's contagion). The fact that the Slovenia's spread has remained slightly above that of Italy since November 11th, 2011 might be explained on the grounds of credit and liquidity risks. The Slovenia's sovereign rating downgrades (September-October) singled out a change in Slovenia's default risk. The change in risk perception due to the downgrades was also reflected in the emergence of a positive difference between the Slovenia's CDS spread with respect to those of Italy and Spain in the last quarter of 2011 (Figure 18). With regard to liquidity consideration, it worsened as reflected in the decrease of bond traded volume in secondary market particularly in the second half of 2011 (Figure 19) and the emergency of positive difference in the bid-ask spreads between that of Slovenia and those of Italy and Spain respectively (Figure 20). Notice in particular that the risk perception of Slovenia (as measured by the CDS spread) was more favorable than that for Italy and Spain until the last quarter of 2011 despite the fact that liquidity conditions worsen more for Slovenia as reflected in the widening of bid-ask spread and lower traded volume. Nevertheless, the lower credit risk perception of Slovenia with respect to Italy and Spain seemed to have outweighed the liquidity risk as the Slovenia's government bond spread performed better than those of Italy and Spain until last quarter of 2011 when the credit downgrades took place (Figure 21). Notice however that while Slovenia maintained a higher rating than Italy throughout the whole period and during the Italian crisis in particular, the Slovenia's bond spread remained higher than that of Italy since November 2011 suggesting that favorable liquidity considerations (enhanced by the ECB in the case of Italy) prevailed over credit risk. In this regard it is important to highlight that Italy does not only have a large size of debt but also a relative large domestic investor base.

The other issue to disentangle is why the Slovenia's bond spread overshot that of Italy in November 2011. As determined in the econometric analysis this was due to the spillover of Italian crisis (Table 9), but the impact was particularly adverse because the downgrades of Slovenia credit rating took place at the time when liquidity in the bond market practically dried. This was not only the case of the government's bond market but also of the interbank market which triggered the sizable refinancing operations of ECB. The fact that Italy's government bond spread was below that of Slovenia in the aftermath of the Italian crisis suggest the perception that likely losses arising from trading were higher from those arising from risk perception as shown in the difference between bid-ask spread of Slovenia and Italy (Figure 20).

With regard to Slovakia's government bond yield spread evolution a similar vector error correction model between the common factor and the Slovakia's government bond yield spread was identified. The specification also exhibited similar results regarding the test on the assumptions of the model as in the case of the model specified for Slovenia's government bond spread. Based on the identified long-term relationship between the Slovakia's government bond spread and the common factor the significance of a dummy variable associated with the positive change in the credit rating outlook by S&P was assessed (August 24th, 2011). The results indicate that the dummy variable (du_SK) is relative significant (Table 9). Thus, there is some evidence indicating that the rating action contributed to lower the Slovakia's government bond spread by 10 bps and thus to a differentiation in its evolution from those of Italy's and Slovenia's.
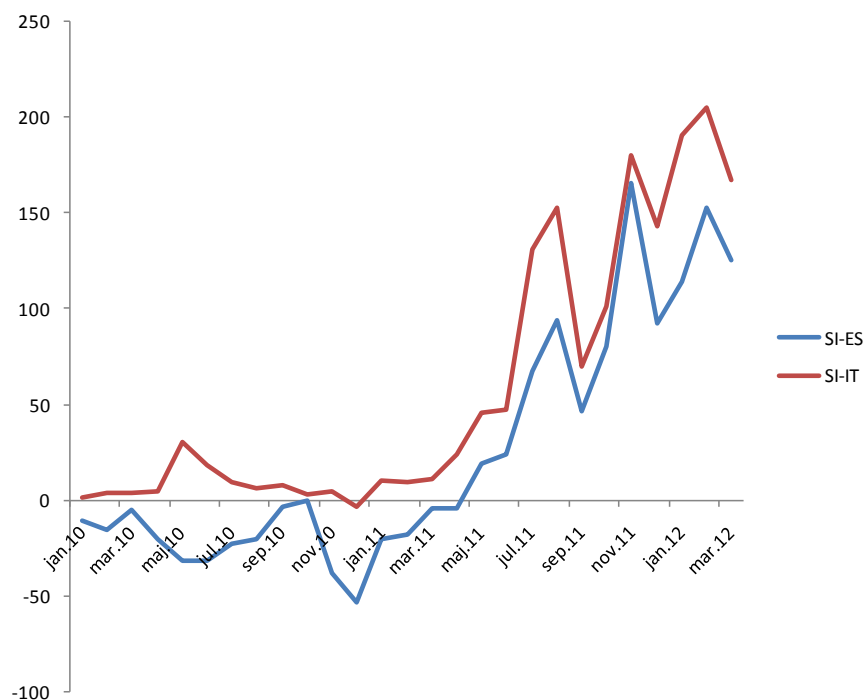
Figure 18: Difference between CDS spreads, bps
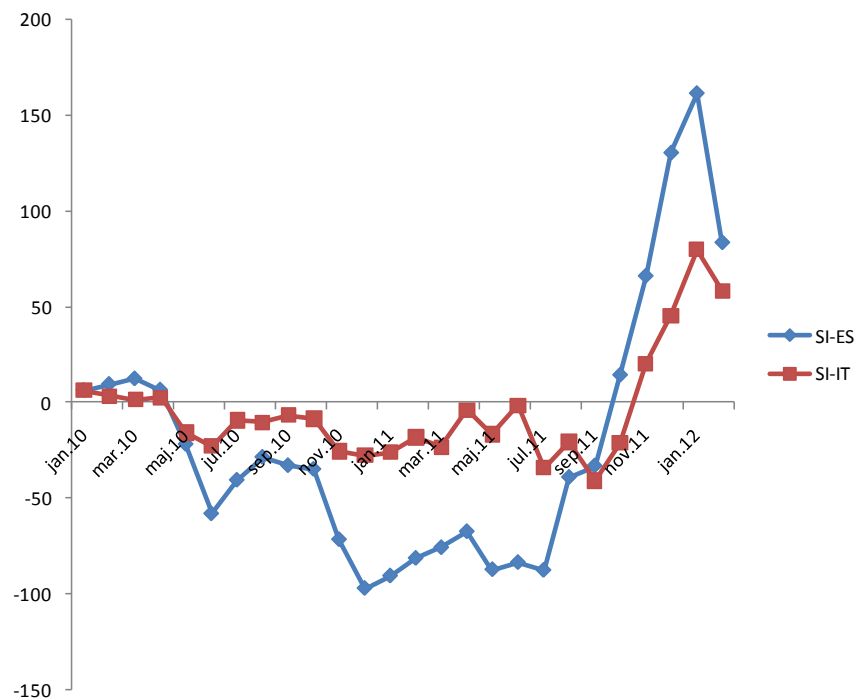
Source: MF–MTS (own calculation)

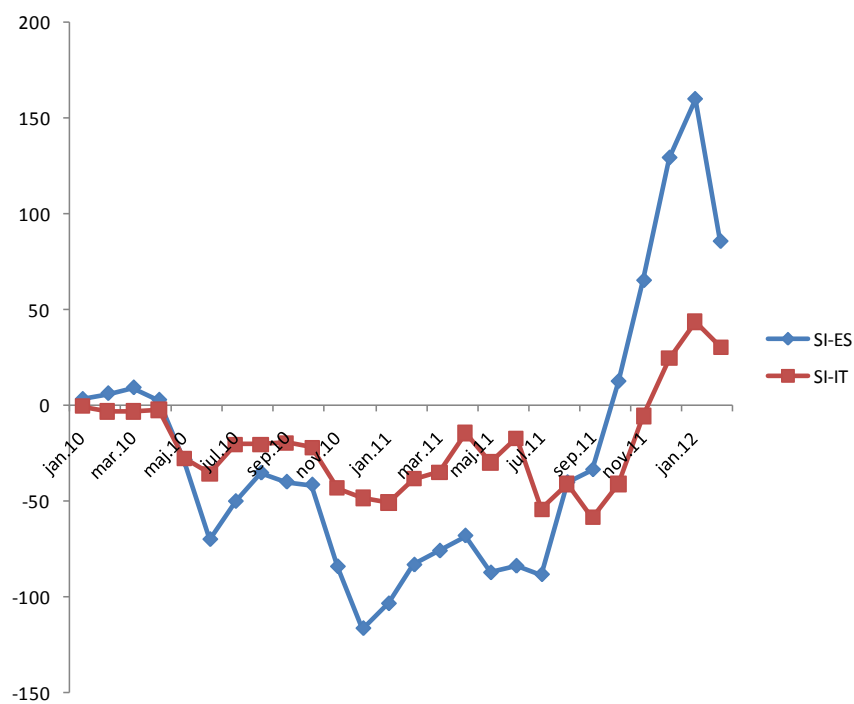**Figure 19: Traded volume (average 2011 = 100)**
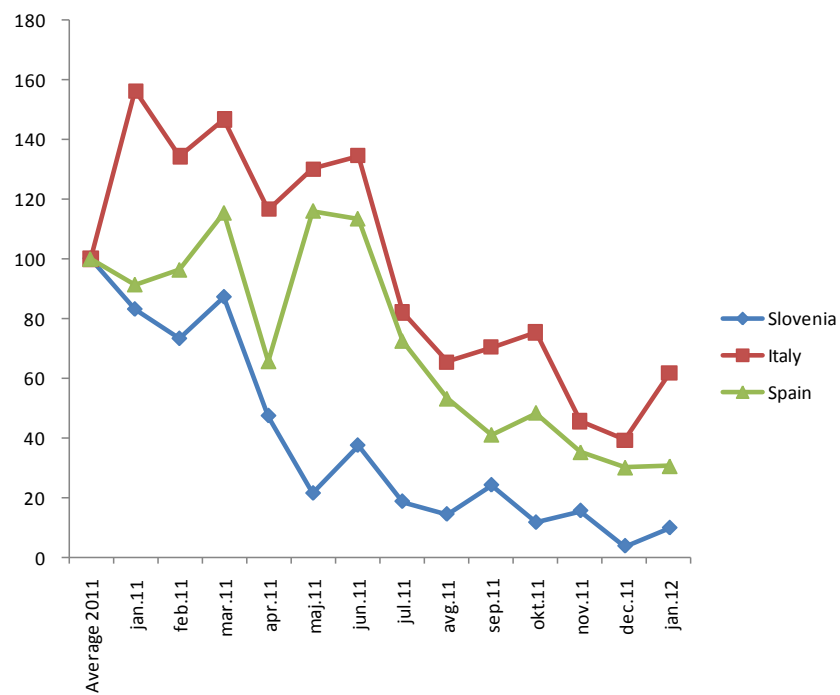
Source: MF–MTS (own calculation)

Figure 20: Difference in bid-ask spreads, bps

Source: MF–MTS (own calculation)

Figure 21: Difference between benchmark spreads, bps

Source: MF–MTS (own calculation)

The evidence of the impact of rating actions on Slovenia's and Slovakia's sovereign spreads against the scenario of the spreading of the effects of the debt crisis suggests that also country specific policies and developments influence the government's spread developments. The evidence also indicates that policy events such as the lost referendum on pension reform, the collapse of the government on September 20th and the decision on early elections in 2011 did not directly result in discrete changes in the spread but that the rating decisions were those that affected adversely the spread and resulted in re-pricing the Slovenia's sovereign risk.

Taking into account the identified long-term relationship between the common risk factor and the Slovenia's spread, attempt was made to include other variables that would have contributed to explain the spread dynamics. These include fiscal variables (i.e. deficit and debt and their expected changes), banking sector indicators (i.e. loan-to-deposit ratio, spread of Slovenia's loan-to-deposit ratio against that of euro area average, non performing loans of banking system) and GDP growth rate. Results were inconclusive as to the existence of co-integration relationships when adding additional variables to the common risk factor. This suggests that the common risk factor seems to be the dominant force explaining the evolution of the spread in the specified period of analysis and of the difficulty to identify the role of specific variables in the determination of the spread[9]. There was not made an attempt of estimating autoregressive process between the spread and various variables considered to avoid the risk of estimating spurious relationships[10]. The data analysis suggests that in order to identify the country specific factors that contributed to the adverse spread development in 2011 as reflected in the change in country's creditworthiness it is necessary to dig into the underlying rationale of credit rating agencies that lead them to change the rating of the Slovenia's sovereign in 2011 and that in turn triggered the increase in the spread and change the risk perception of Slovenia's credit. Table 10 summarizes the main rationale of credit rating agencies for the downgrades in the months of September to November 2011.

Table 10: Summary of key rationale of credit rating agencies in their respective downgrades of Slovenia's sovereign credit rating

	Moody's	Fitch	S&P
Banking sector	Financial position and spillovers to government balance sheet	Financial position and spillovers to government balance sheet	
Corporate sector	Impact of deleveraging on banks		
Fiscal stance			Deterioration of fiscal position and lack of credible fiscal consolidation strategy
Structural reform policy		Weak policy implementation (e.g. pension reform)	

Source: Own elaboration based on Moody's (2011), S&P (2011) and Fitch (2011).

[9] Notice that Jesenko et al, (2011) in their findings indicate the required yield to maturity on 10-year government bond in the period 2008-2011 continuously exceeded that of underpinned by fundamentals.

[10] A co-integration relationship and vector error correction model between the common factor and the OIS spread using Greek sovereign debt spread was identified but diagnostic checks on assumptions were inconclusive.

Beyond the arguments exposed by credit rating agencies in the downgrades which deal with vulnerabilities and policy responses, the key issue in the overall perception of Slovenia's risk seems to be the underestimation of the potential risks of a downgrade of the credit rating in an environment of systemic risk intensification in the euro area and of not having taken appropriate pre-emptive measures (i.e. Early capitalization of banks in 2009 and frontloading fiscal consolidation (e.g. Caprirolo 2010)).

Impulse response estimates (Figure 22) based on VEC model suggest that idiosyncratic shocks to Slovenian government spread (LS) are stronger than those arising from the common factor (LF11). Idiosyncratic shocks also tend to persist longer highlighting the importance of policies aiming at mitigating discrete changes in the spread which mainly fed through rating changes. The response of the common factor to shocks triggered by it tends to be temporal suggesting that policies affecting overall risk perception or the spreads can reduce the level of the common factor. This is observed in the relative success of recent ECB actions in reducing overall spread level in the euro area.

Figure 22: Impulse response
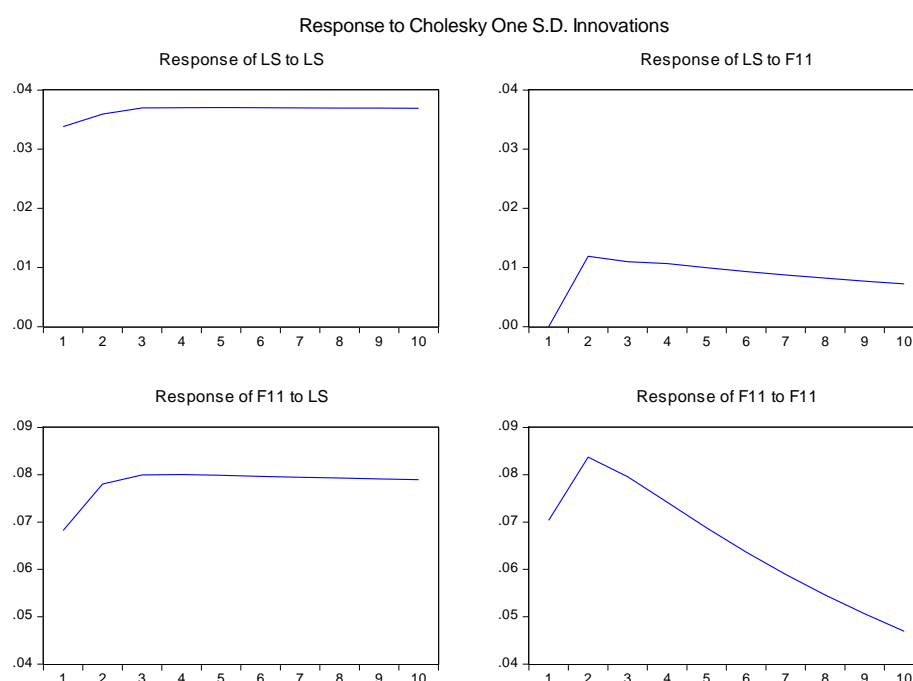
Source: Own calculation

Looking forward it seems that euro area government bond market has been severely affected by the spreading of the crisis as reflected in low trading volumes and market volatility towards the end of 2011 and by investor's retrenchment within national boundaries. Notwithstanding, the positive impact of ECB intervention on development of government spreads there is great uncertainty as to whether the observed developments in the second half of 2011 will have lasting effects on the stability of the investor base and underlying yields. The risk is that even if credit risk is addressed with country specific policies the liquidity issue could significantly affect market access and pricing. The implication of that is that sovereigns would have to rely primarily on domestic investor base in placing government debt. The shifting towards domestic investors, depending on relative size of domestic market and underlying domestic conditions could result on further increase in spreads and refinancing risk. This is an important consideration taking into account the relative small size of the Slovenia's domestic market and investor base at the times when the economy is undergoing a deleveraging process.

6 POLICY IMPLICATIONS

The Slovenia's government bond spread after the downgrade of the sovereign rating has increased above that of Italy. This happened notwithstanding Slovenia's relative higher rating than Italy which suggests that liquidity premium has important bearing in bond pricing at the time where the euro area's government bond market has become dysfunctional as investors retrench from the euro bond market in search of security or within national boundaries. In turn the government bond spread of the two and peer countries depends on a common risk perception as if the government bonds of these countries will correspond to a similar class of assets. This has been also observed in the aftermath of ECB's interventions that have reduced the spread level and improve liquidity of the group of countries including that of Slovenia's but with different degrees. Countries' borrowing conditions are interlinked to the extent that even countries that have not experienced major worsening of fundamentals have also been affected from contagion and spillovers (e.g. Slovakia, Austria) which on a volatile environment cannot decrease their relative borrowing costs but mitigate the effect of worsening of systemic risk. To this extent country specific circumstances and policies are important to avoid change in credit risk perception and the impact of spillovers. Therefore a policy agenda towards avoiding further worsening of the spread should be actively pursued at euro area and domestic levels.

The importance of the common risk perception in explaining the spread dynamics and worsening of liquidity conditions in the euro area's government bond market clearly suggests that policies at euro are level should improve market conditions on a permanent basis. In absence of solutions at that level, the risk of a liquidity freeze could push a solvent sovereign out of the market or into a default irrespective of its level of indebtedness. This risk is increasing. The ECB's interventions have contributed importantly to mitigate liquidity risk (improvement in trading volume and lower spreads) but also might have resulted in a further shifting investor base towards banks that reaped up the benefits of the difference between bond yields and the ECB policy rate. Nevertheless, re-establishing market conditions and confidence requires broader and permanent policies at euro area level. The alternatives for keeping market activity and mitigate increasing refinancing risk (i.e. illiquidity-induced default) for sovereigns in the so-called euro area periphery seem to be two: either further ECB's interventions including the indiscriminate purchase of euro area government bonds in the secondary market (extending the Securities Markets Program to all its members) or; decisive actions at euro area level that would crowd in investors to the euro area's government market and correct its dysfunction. Among the latter it is the proposal for euro area members issuing common Eurobonds and the ECB ensuring their liquid in all circumstances. This proposal is consistent with the steps taken at euro area level toward rebuilding confidence and fostering recovery but yet still insufficient as rely primarily on the commitment to fiscal discipline and partially address the most pressing issue of financing conditions. Other important building block in this regard is the development of an euro area growth agenda.

Under prevailing market conditions the key priority at euro area level is to address liquidity risk to mitigate refinancing and default risks. In this context the trading of Slovenia's government bonds compared to those of Italy's and Spain's has become more affected and reflected in bond's yield spreads. The respective countries' investor base and the relative size of the debt have an important bearing on this outcome but also ECB's selected intervention in some governments' papers. While ECB's bond purchases under SMS program can be considered as stigma, the further worsening of liquidity conditions might argue for the extension of the program to all euro area countries. An alternative approach to that could be the extension of the SMS program on a country-case basis. Such an approach in the case of Slovenia might have only temporary benefits at the expense of pushing investors' away permanently as the size of the Slovenia's government debt is relatively small, the domestic investor base not large and obtaining

support from ECB can have negative credit risk implications for the sovereign as perceived by credit rating agencies.

County specific factors and policies have also played important role in the Slovenia's government's bond spread developments (i.e. weak policy response to key challenges) to the extent that they were used to justify credit rating downgrades and thus single out to the market the worsening of creditworthiness. They played an important role not only because they resulted in the worsening of credit risk, but also because policy perception and action underestimated the consequences of credit rating revisions in an environment of systemic stress which placed the assessment of Slovenia's risk at par with that of countries affected more severely by the spillovers of the Greek crisis.

The policy implications of the observed developments of the government's spread of Slovenia and Slovakia suggest that country specific policy to the extent that lead to avoid sovereign's downgrades can mitigate the effect of adverse change in systemic risk perception. Going forward this implies the following policy agenda for Slovenia: a) enhancing the balance sheet of Slovenia's own banks to avoid spillovers to the government balance sheet; b) re-building credibility by setting realistic and credible fiscal targets and delivering on them; c) minimizing the effect of the required fiscal consolidation on economic activity taking into account the deleveraging of corporate sector. In turn this suggests a careful and consistent consolidation policy mix and sustained fiscal effort over the medium term. The policy mix being of outmost importance given that fiscal consolidation is likely to excerpt pressure on the spread between government's bond yield (predominantly determined by a common factor) and country specific GDP growth.

In absence of progress of policy at euro area level to address the risk of illiquidity and increasing refinancing risk in the short-term, the government should consider seriously the option of frontloading the adjustment by beefing out the consolidation strategy with government revenue measures. Such an approach by reducing the borrowing requirement also reduces the refinancing risk. This should be carefully assessed in light of market conditions and government obligations.

7 CONCLUSION

The empirical analysis suggests that the Slovenia's government debt yield spread co-moved with those of euro area countries considered as peers (i.e. Belgium, Italy, Spain and Slovakia) during the period of analysis. Three reasons explain the dynamics of the Slovenia's government yield spread. Besides macroeconomic fundamentals, a single time-varying common factor associated with the risk perception of a selected group of euro area countries (peer group) seems to be the significant force explaining the evolution of Slovenia's government debt spread. Another important determinant is spillovers related to the spreading of the Greek debt crisis and policy response to it. In particular specific policy events related to the Greek crisis and contagion to Italy spilled over to the Slovenia's spread affecting it adversely. The first of such events corresponds to the intensification of the debt crisis in May 2010. The second event in July 2011 which is associated to the European approach to solving the debt crisis (i.e. private sector involvement by forcing losses on holders of Greek debt) and contagion to Italy and; the third is on November 2011 related to the intensification of the contagion to Italy (resulting in the resignation of Berlusconi) and its spillover to Slovenia. The third important determinant is country-specific considerations that lead to a change in the sovereign credit risk perception (i.e. downgrades of the Slovenia's sovereign rating) at the time where euro area's systemic risk intensified.

Notwithstanding that the important role of the single factor makes difficult to identify the role of country specific variables in the determination of the spread such as fiscal or banking sector variables (i.e. lack of co-integration relationship), the interplay of some events and considerations explain their contribution to the extent that they were used by credit rating agencies to justify the change in credit rating of Slovenia's sovereign and singled out the worsening of its credit risk. Before the Slovenia's sovereign credit rating downgrades there was no single country–specific event that caused (i.e. statistical sense) change in the bond spread including the collapse of the Slovenia's government, which was not for example the case of the resignation of the Italian government (i.e. the dynamics of the spread was explained by the common factor). The interplay between the worsening of liquidity conditions in euro area bond market, the timing of the Slovenia's sovereign downgrades, close to the Italian government crisis, resulted in spreading the contagion to Slovenia and magnifying the effect of the Slovenia's sovereign downgrade (sharp increase in the spread in November 2011). Contagion placed the Slovenia's government bond spread slightly above that of Italy despite of Slovenia's having higher sovereign credit rating which highlights higher liquidity premium in the case of Slovenia. While it is possible to dig into the rationale for the Slovenia's downgrades in the credit rating agencies' assessments, a more fundamental reason seems to be the underestimation of the consequences of credit rating revisions in an environment of systemic stress and the absence of policy to prevent them.

The econometric analysis indicates a relative significant impact of changes in common risk perception affecting the spread of the peer group of countries including that of Slovenia. These changes have been particularly frequent in the second half of 2011. While changes in the common factor to its own shocks tend to correct relatively fast, in the case of country-specific shocks to the spread (i.e. credit rating downgrade) the adjustment seems to be slow. This highlights the importance of policies towards mitigating the event of sovereign credit downgrades. The dominance of the single factor in spread dynamics also suggests that country-specific policies cannot but mitigate the adverse impact of changes of common risk perception. Therefore, it is critical to pursue and agree on long-term policies at euro area level to reestablish confidence and the functioning of the euro area government bond market.

REFERENCES

1. Afonso, A., Furceri, D. and P. Gomes, 2011. "Sovereign credit ratings and financial markets linkages: application to European data". ECB Working Paper Series, n. 1347.

2. Aizenman, J., Hutchison, M. M., and Y. Jinjarak, 2011. "What is the risk of european sovereign debt defaults? fiscal space, cds spreads and market pricing of risk." NBER Working Papers Series, n. 17407.

3. Borgy, V., Laubach, T., Mésonnier, J. S. and J.P. Renne, 2011. "Fiscal sustainability, default risk and euro area sovereign bond spreads." Banque de France Working Paper Series, n. 350.

4. Caprirolo, C., 2010. "Slovenia: Alternative Fiscal Consolidation Policy." Zveza ekonomistov Slovenije, 12 izobaževalni seminar o javnih financah in državnemu revidiranju, zbornik referatov.

5. Caprirolo, C., 2011. "Slovenija: Prispevek fiskalne politike h gospodarskem okrevanju." Fiskalni svet. Conference proceedings "Fiskalna politika v luči okrevanja slovenskega gospodarsta". Forthcoming.

6. Corsetti, G., Kuester, K., Meier, A., and Müller, G, 2012. "Sovereign risk, fiscal policy and macroeconomic stability", IMF Working paper 12/33.

7. De Grauwe, P., and Yumei, Ji, 2012. "Mispricing of sovereign risk and multiple equilibria in eurozone." CEPS Working Document, No. 361.

8. De Santis, R., 2012. "The euro area sovereign debt crisis: Safe haven, credit rating agencies and the spread of the fever from Greece, Ireland and Portugal." ECB Working Paper Series, n. 1419.

9. ECB., 2010 Monthly Bulletin. June.

10. Ericsson, J., and O. Renault (2006): "Liquidity and Credit Risk," Journal of Finance, 61, 2219–2250.

11. Favero, C.A., Pagano, M. and E.L. von Thadden, 2010. "How does liquidity affect government bond yields?." Journal of Financial and Quantitative Analysis, 45: 107-134.

12. Financial Times., 2011. " Was Barroso's letter bold leadership or bad timing? " August 4th, 2011.

13. Fitch, 2011. "Fitch Downgrades Slovenia to 'AA-'; Outlook Negative", Fitch Ratings 29 September 2011

14. Gerlach, S., Schulz, A. and G.B. Wolf, 2010. "Banking and sovereign risk in the euro area." CEPR Discussion Paper, n. 7833.

15. Jesenko, M., Roter, M., and Žakelj, L., 2011. "Ali so zahtevane donosnosti na slovenske obveznice previsoke?." Banka Slovenije, Prikazi in analize 6/2011.

16. Moody's Investor Service., 2011. "Rating Action: Moody's downgrades Slovenia's bond ratings to Aa3, on review for further downgrade" Global Credit Research - 23 Sep 2011.

17. Oprphaniades, A., 2012. "Time to jettison the plans to hit Greek creditors." Financial Times, January 6th, 2012.

18. Paruolo, P., 1997. "Asymptotic Inference on the Moving Average Impact Matrix in Co-integrated I(1) VAR System," Econometric Theory, Vol. 13, pp 79–118.

19. Rahbek, A., Hansen E., and Dennis J. G., 2002. "ARCH Innovations and their Impact on Cointegration Rank Testing, Department of Theoretical Statistics", Centre for Analytical Finance, University of Copenhagen, Working Paper no.22.

20. Standard&Poors, 2011, "Research update: Republic of Slovenia Long- And Short-Term Ratings Lowered To 'AA-/A-1+' On Weakened Fiscal Position; Outlook Stable." Global credit portal. Ratings direct, October 19th.

21. Sgherri, S., and Zoli, E., 2009. "Euro area sovereign risk during the crisis." IMF working paper WP/09/222.

22. UMAR, 2011. Economic Mirror, November.

23. Zadravec, S., "Značilnosti trga državnih obveznic v EMU." Zveza ekonomistov Slovenije, 12 izobaževalni seminar o javnih financah in državnemu revidiranju, zbornik referatov.