Special Conference Paper

International banking and sovereign risk calculus: the experience of the Greek banks in SEE

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Editorial

On 19-21 November 2009, the Bank of Greece co-organised with the Bank of Albania the 3rd Annual South Eastern European Economic Research Workshop held at its premises in Athens. The 1st and 2nd workshops were organised by the Bank of Albania and took place in Tirana in 2007 and 2008, respectively. The main objectives of these workshops are to further economic research in South Eastern Europe (SEE) and extend knowledge of the country-specific features of the economies in the region. Moreover, the workshops enhance regional cooperation through the sharing of scientific knowledge and the provision of opportunities for cooperative research.

The 2009 workshop placed a special emphasis on three important topics for central banking in transition and small open SEE economies: financial and economic stability; banking and finance; internal and external vulnerabilities. Researchers from central banks participated, presenting and discussing their work.

The 4th Annual SEE Economic Research Workshop was organised by the Bank of Albania and took place on 18-19 November 2010 in Tirana. An emphasis was placed upon the lessons drawn from the global crisis and its effects on the SEE macroeconomic and financial sectors; adjustment of internal and external imbalances; and the new anchors for economic policy.

The papers presented, with their discussions, at the 2009 SEE Workshop are being made available to a wider audience through the Special Conference Paper Series of the Bank of Greece.

Here we present the paper by Panayiotis Kapopoulos (Emporiki Bank) and Sophia Lazaretou (Bank of Greece) with its discussion by Panagiotis Chronis (Bank of Greece).

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Altin Tanku (Bank of Albania)
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(on behalf of the organisers)

INTERNATIONAL BANKING AND SOVEREIGN RISK CALCULUS: THE EXPERIENCE OF THE GREEK BANKS IN SEE

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ABSTRACT

Between 1996 and 2003 emerging market economies all over the world experienced major financial crises with both high frequency and severity. Since then and till the recent bout of financial turbulence initiated by the sub prime crisis in the US, the drop off in the frequency of such crises has been notably marked. However, the absence of a crisis episode does not in any case mean that there are not some potential risks looking forward. In this paper we use the theoretical framework of international banking and the sovereign risk calculus in an effort to study the experience of the Greek banks in SEE over the last decade. A trivial way to do that is viewing it as the product of two factors. The first factor refers to the 'value at risk', namely the banks' 'exposure', and the second to the probability of a 'sovereign risk event'. We focus on both factors. First, we find that lending concentration is high. Second, by using the well known capital asset pricing model (CAPM) and implementing a two step identification process, we detect a diversification effect of this concentration risk. Third, we study the country specific features that may determine a high probability of a 'sovereign risk event'. We place an emphasis on the countries' fiscal structure in a comparative perspective. We find that although all countries in the sample have made efforts towards a successful fiscal consolidation – largely supported by strong growth and low real interest rates – the empirical evidence, however, is suggestive of a weak link between public debt sustainability and the short-run conduct of fiscal policy.

Key words: emerging SEE economies, banking exposure, sovereign risk, public debt dynamics
JEL classification: H3, G1, G2

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1. Introduction

Between 1996 and 2003 emerging market economies all over the world experienced major financial crises with both high frequency and severity. Since then and till the recent bout of financial turbulence initiated by the sub prime crisis in the US, the drop off in the frequency of such crises has been notably marked. However, the absence of a crisis episode does not in any case mean that there are not some potential risks looking forward. Indeed, some pressure has been associated with very large private capital inflows and a weaker than expected growth performance in the developed world.

During recent years, SE European economies experienced favourable prospects for future growth: large net capital inflows[1], high growth rates, success in containing inflation, steadily increasing foreign exchange reserves, closer institutional links with the EU and a very high foreign ownership in their banking systems.[2] Still, however, there are some worries going forward that will activate potential vulnerabilities, especially at a time when the growth rate in advanced Europe is falling (see Bank of Greece 2009, Gardó and Martin 2010). These worries are: high current account deficits weakening the country's external financing requirement; the strong economic downturn puts additional pressure on general government balances; a resurfacing of inflation pressures[3]; high unemployment rates; a large external gross borrowing requirement; high private credit growth; whereas a healthy, competitive and a dynamic private sector has not been fully established yet.[4]

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[1] During the recent years net private inflows to central and southeast Europe rose to 186.1 billion $ in 2007 and 118.2 billions in 2008, from a low of 5.6 billions in 2001. Importantly, the increase in foreign private portfolio investment was significant: from 0.2 billion $ in 2001 to 17.0 billions in 2004 and 18.3 billions in 2005. However, in 2006 it was reduced to 0.6 billions while in 2007 and 2008 was further reduced to -3.6 billions and -10.0 billions, respectively. See, IMF *World Economic Outlook*, April 2010.

[2] According to the EBRD data, in 1995 only 21 banks were foreign owned (8.6% of the total banks). In 2007, the number of foreign banks increased rapidly to 139 (67% of the total) and they possessed 80% of the total assets. For an analysis of the presence of foreign banks in SEE, see Kapopoulos and Lazaretou (2007).

[3] Although the outlook of inflation remains weak in most SEE countries, there are concerns about inflation in Turkey where strong economy means that the economy is now operating at close to potential and in Romania where currency further weakens (*Capital Economics*, Emerging Europe Central Bank Watch, July 2010).

[4] The fall in external demand and the cut off in capital inflows caused a reduction in exports and investment. At the same time, domestic private consumption also fell as the result of the sharp rise in the world prices of foodstuffs and raw materials in 2008. The fall in the output growth rate was the ultimate result. Between the years 2004-06 the mean annual rate of output growth in the countries of central and

While most of the 1990s had been characterized by an expansion in private infrastructure investment and in aggregate demand and supply, emerging Europe had experienced many episodes of economic and political crises. Past financial crises were driven by factors such as poorly developed financial systems, excessively volatile macroeconomic policies, a weak domestic banking sector, dependence on external money flows and uncertain growth prospects. The underlying triggers of these crises were likely to operate simultaneously in the foreign exchange market, the market for bank assets and for sovereign debt paper.[5,6] These crises involved real losses, increased investors' perception of market risk and their awareness of the need for adequate country risk management.

In this paper we use the theoretical framework of international banking and the sovereign risk calculus in an effort to study the experience of the Greek banks in SEE over the last decade. In particular, we try to assess any potential pressure and study its key determinants. A trivial way is viewing it as the product of two factors. The first factor refers to the 'value at risk', namely the banks' exposure, and the second refers to the probability of a 'sovereign risk event'. We focus on both factors. Since a 'sovereign' or a 'country risk event' is in large part independent of the credit standing of the individual loan to the borrowers, a lending decision to a party residing in a foreign country should be a two-step decision (see Saunders and Cornett 2003). First, the lender assesses the underlying 'credit risk quality' of the borrower, as it would do for a normal domestic

southeast Europe was 6.6%. In 2007, it was reduced to 5.5% and in 2008 it was further curtailed to 3.0%. In 2009, all countries in the region suffered by depression (-3.6%), while for 2010 it is projected that the growth rate will turn to a positive sign (3.2%). See, IMF *World Economic Outlook Update,* 7 July 2010.

[5] This is because there are certain repercussion effects of a particular crisis episode. According to the 'balance sheet approach' to financial crises (see *inter alia* Claessens *et al*. 2008, Goldstein 2007, Bordo 2006, 2008, Borio 2004, Beim and Calomiris 2001, Allen *at al*. 2002), a financial crisis can be considered as a chain and can emerge from weaknesses in banks' balance sheets, from vulnerabilities in corporate and household balance sheets and from problems in the government's balance sheet. In particular, a financial crisis occurs when a shock exposes the vulnerability of one sector or more in the economy and thus the demand for financial assets sharply declines. For example, investors and creditors can loose confidence in the government's ability to service its debt obligations. The resulting capital outflow leads to increasing balance sheet problems. As foreign investors pull out of the country, the exchange rate comes under pressure. Interest rates increase due to a higher risk premium or due to the efforts of the monetary authorities to slow capital outflow. The sharp fall in the exchange rate and the rise in the interest rates mean that the banks, the households and the corporations face increasing lending costs and their debt obligations in local currency increase notably.

[6] It is worthy to note that although all past crises events were in their majority an emerger's story, the 2008-09 recent financial and economic turbulence was an advance country story that hit emerging economies.

loan. And second, the lender assesses the 'sovereign' or 'country risk quality' of the country in which the borrower resides. Broadly speaking, country risk is the risk of the business loss due to country specific factors related to political, financial and economic instability which impact on the value of the country's bonds and equities (Harvey 1995, 2004). Here, we focus mainly on 'macro' economic threats, such as economic crises that are important to all investors and lenders and not on 'micro' threats such as discriminatory taxation or regulation.

Country risk includes 'sovereign risk', i.e. the risk that a government would fail to honour its sovereign obligations, due to either unwillingness or inability to pay[7]; 'transfer risk', i.e. the risk of restrictions on the international transfer of funds; and 'collective debtor risk', i.e. the threat country wide events will cause simultaneously default by a large number of private debtors. Hence, county risk is high when currency mismatch[8] is high; the real exchange rate is overvalued; and large portfolio capital inflows paired with a weak banking system make it less likely that credit expansion will go towards the most efficient borrowers (Goldstein 2007). Analytically, when financial liabilities are mostly denominated in domestic currency while assets are mainly denominated in foreign currency, then depreciation of the local currency will result in balance sheet problems that cause economic growth to decline. This is because if a sharp deterioration in the borrowers' prospects is expected, portfolio inflows quickly may reverse, the overvalued local currency plunges and asset losses may rise. Ultimately, bank failures happen and bankruptcies multiply, aggregate demand declines and growth falls. Conceptually, we can nominate three basic types of country risk facing foreign banks that operate in SEE. First, as the local economic conditions deteriorate households and firms might face increasing

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[7] Political risk is associated with unwillingness to pay while financial and economic risks are associated with inability to pay. For a thorough analysis of country and political risks with practical insights to global finance, see Wilkin (2004). In general, a sovereign country's negative decision on its debt obligations may take two forms: repudiation and rescheduling. Repudiation is an outright cancellation of all current and future debt obligations by a borrower. While rescheduling is that sovereign risk event when the borrower country first declares a moratorium or delay on its payments and then seeks to renegotiate the credit terms, i.e. maturity and the interest rate. For a theoretical analysis on country risk, see Saunders and Cornett (2003, ch. 6).

[8] It is a currency mismatch when an entity's net worth and net income are not well hedged against a change in the domestic currency rate. Currency mismatch was a common feature in all emerging market economic crises in the 1990s. This was the case of Mexico in 1994-98, of the Asian crises in 1997-98, of Russia in 1998, of Brazil in 1998-99 and again in 2001-02, of Turkey in 2001-02 and of Argentina in 2001-02.

difficulties in meeting their obligations, leading to a rise in non-performing loans.[9] Second, as the gap between assets denominated in foreign currency and liabilities denominated in domestic currency becomes larger, the exchange rate risk increases. And third, in the view of a bank deposit withdrawal foreign banks might face liquidity problems.[10]

We first present the key characteristics of the geography of the Greek banking system exposure in SEE. We find that lending concentration in this particular European periphery is high. Second, given the high degree of lending concentration we aim at detecting a diversification effect of this concentration risk. In a portfolio framework for country risk analysis, the risk of holding a well-diversified portfolio of loans may be smaller than that of having a portfolio heavily concentrated in a few countries. Our identification analysis has two steps. The first step is to pick a set of macroeconomic variables that may be important in explaining rescheduling probabilities and may directly or indirectly affect a 'sovereign risk event'. The second step is to divide total risk into a non diversifiable systematic risk element and to an unsystematic or country risk element. To this end, we consider the well-known capital asset pricing model (CAPM). Based on a panel data for 8 countries in the region and for 10 risk indicators over the period 1995-2008, empirical results support the view that, for the most SEE countries in the sample, the unsystematic risk is much more important.

Third, we study the country specific features that determine a sovereign risk element. We place an emphasis on the countries' fiscal structure in a comparative perspective, since public debt has often had more immediate consequences for economic performance and debt crisis is a recurring phenomenon of the histories of many of these countries. Moreover and more importantly, a high probability of a 'sovereign risk event'

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[9] According to *Capital Economics* (January 2010), the non-performing loans for all foreign banks functioned in SEE increased rapidly over the last year. In Bulgaria and Romania, they amounted to 16.5% and 12.3% of the total loans, respectively. This rise might cause a possible erosion of the banks' capital base and therefore bank portfolios might come under increasing pressure.

[10] However, a high degree of overall banking stability is supported by the continued sound capitalisation levels and the commitment (see 'the Vienna initiative') of the parent banks to keep the capitalisation of their subsidiaries at sound levels (see Gardó and Martin 2010, EBRD 2009). With regard to the Greek banking presence, stress tests that were conducted in collaboration with the IMF confirmed that the Greek banking system had enough buffers to withstand even a very big rise in non-performing loans under a worst-case scenario (see Bank of Greece *Financial Stability Report*, June 2009).

implies deterioration in the government balance sheet that will eventually adversely affect the health of the balance sheet of both households and firms and ultimately the health of the balance sheet of the banks. And this happens because an increase in the debt ratio today implies that taxes will go up tomorrow impairing firms' profitability and reducing their ability to repay their debts to the banks. Although all countries in the sample have made efforts towards a successful fiscal consolidation – largely supported by strong growth rates and low real interest rates over the last few years - the empirical evidence, however, is suggestive of a weak link between public debt sustainability and the short-run conduct of fiscal policy.
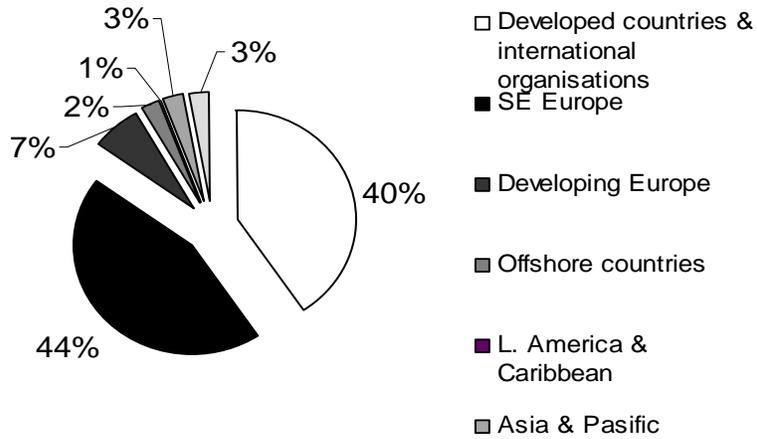
2. The geography of the presence of the Greek banks: key characteristics

One of the main features of the Greek banking system is its rapidly increasing exposure to the emerging market economies of SEE, dating from the mid 1990s. This development has been driven by several factors. First, after the liberalization of the Greek banking system in the mid 1990s, many new products appeared in the domestic money market making the access of households and firms to credit much easier and cheaper. At the same time, banking competition was enhanced resulting in an improvement in the services provided both with respect to quality and price. Further, banking intermediation measured as the ratio of private lending to output grew quickly.[11] Second, given the number of the Greek banks relative to the size of the domestic money market, the possibility to exploit further economies of scale and scope was deemed to be extremely limited. Therefore, many Greek banks first proceeded to consolidation *via* mergers and acquisitions, strongly supported by the privatization policies of the governments and, second, extended their presence in the Balkan Peninsula where private bank lending was still at very low levels.[12]

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[11] The ratio of private bank loans to GDP increased rapidly after 2000. While in the 1990s it was only 36.6% on average, in the first half of the 2000s it increased to 54.4%. Thereafter, it increased even more rapidly, approximating 84% in 2008 and 81% in 2009.
[12] Between 2006 and 2008 bank credit to the private sector (firms and households) as per cent to GDP was more than 3 times lower than the respective rate in the euro area.

Figure 1
The geography of the Greek banking system presence
(% in total foreign claims)
June 2009

Legend:
- ☐ Developed countries & international organisations
- ■ SE Europe
- ■ Developing Europe
- ■ Offshore countries
- ■ L. America & Caribbean
- ■ Asia & Pasific

Pie values: 40%, 44%, 7%, 2%, 1%, 3%, 3%

(% in total assets)

December 2008

Legend:
- ☐ Emerging Europe
- ■ euro area
- ☐ UK
- ■ other countries

Pie values: 42,7; 37,8; 17,4; 2,1

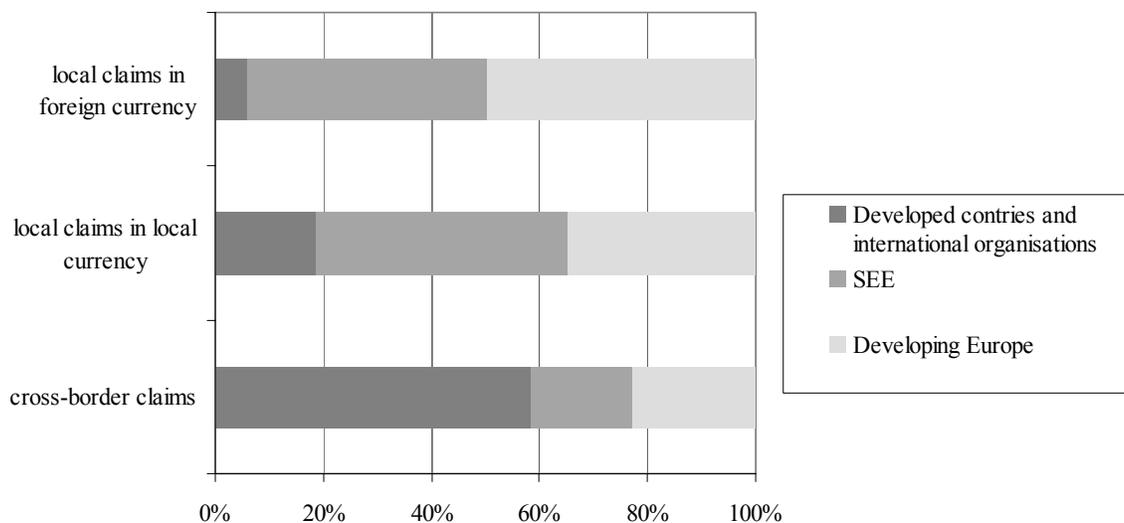*Notes:* consolidated data on group level, unweighted country sum. Turkey is included in SEE. Developing Europe does not include SEE countries. Malta, Slovenia, Slovakia and Cyprus are included in the developed countries.

Sources: own calculations based on data provided by the Bank of Greece (*Financial Stability Report*, June 2009), the BIS and the banks' balance sheets.

Figure 2
Type of foreign claim, 2009

Figure 1 plots the evolution over time of the exposure of the Greek banks to various geographical peripheries. Exposure is measured by total foreign claims, i.e. cross border claims, local claims in foreign currency and local claims in local money. Between 2004[13] and 2009, lending exposure to SEE countries increased by a factor of 3. From 17% of the total foreign claims at the end of 2004, it rose to 57% in 2007, 49% in 2008 and 44% at the end of June 2009. In terms of total assets, the presence of the Greek banks in emerging Europe has increased to 43% at the end of 2008.

In 2004, the annual rate of lending growth was 30%; in 2007 it reached a peak of 66%, while at the end of June 2009 it was negative (-4.4%) (see Table 1). Lending exposure was 20.8% of GDP in June 2009. Further, as seen in Figure 2, more than 80% of the total foreign claims to SEE concern local claims denominated either in local or in foreign currency (mainly euros and Swiss francs). It should be noted that the percentage of claims denominated in foreign currency reflects the exposure of the Greek banks to

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[13] Data do not exist prior to 2004. Thus, 2004 is used as a reference year.

credit risk since, in the light of the potential for devaluation of the domestic currency, the cost of loan servicing rapidly increases.

Figure 3
Lending exposure to SEE
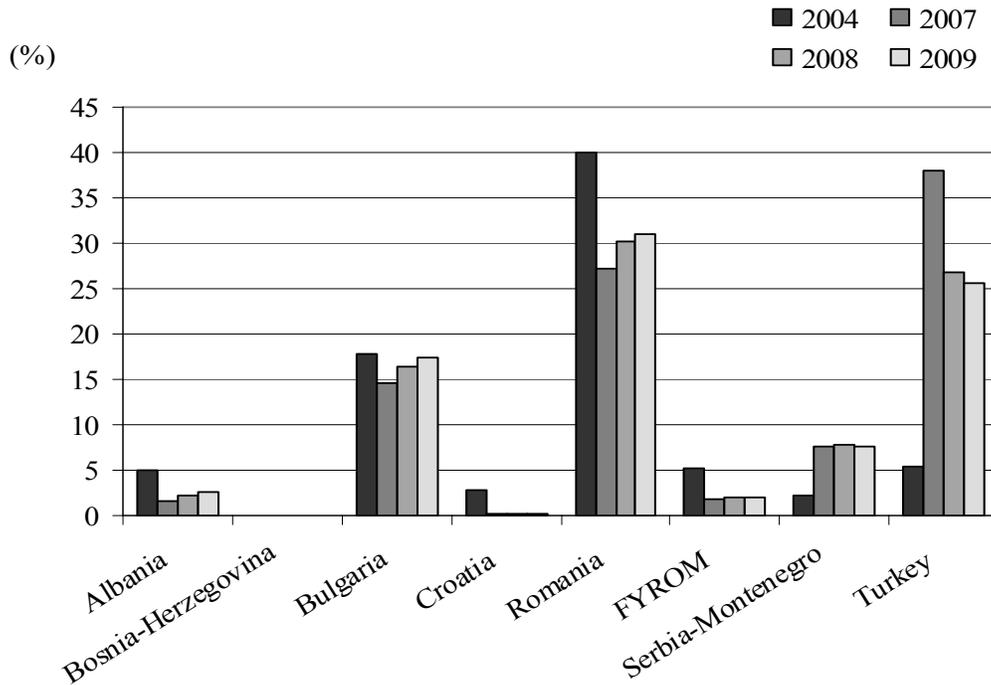
Notes: total foreign claims, consolidated data on group level. (%) in New Europe; Turkey is included in SEE.

Sources: own calculations based on data provided by the BIS and the banks' balance sheets.

A simple inspection of the data (see Table 1) reveals first, that claims are almost equally distributed between claims in foreign and local monies: 2008 (41.9% *versus* 41.7%), 2009 (35.8% *versus* 38.7%). Second, the coverage ratio, i.e. the rate of domestic liabilities (deposits) to domestic claims, both denominated in local currency, was more than 60% in 2009. Third, the penetration ratio was high as depicted by a rapid credit expansion. Indeed, as seen in Table 1, local claims denominated in local currency were, in 2008 and 2009, 2 and 1.5 times, respectively, as high as local bank deposits, also

denominated in local currency.[14] Fourth, the ratio of foreign claims to prudential own funds was 8 times as high in 2008 as in 2004. Finally, the ratio of foreign claims to total assets was 6 times as high in June 2009 as in 2004.

Table 1
Total foreign claims to SEE

	2004	*2007*	*2008[1]*	*2009[2]*
Annual average growth (%) [3]	29.9	66.0	3.8	-4.4
Local deposits in local currency/local claims in local currency (%)	-	51.8 (163.3)	65.1 (143.5)	69.1 (112.7)
Local claims in local currency/local deposits in local currency (%)	-	193.1 (61.2)	153.6 (69.7)	144.7 (88.7)
Ratio of total foreign claims to prudential own funds (%)	26.1 (71.2)	193.5 (87.8)	207.9 (139.5)	166.7 (141.0)
Ratio of total foreign claims to total assets (%)	2.2 (6.0)	14.2 (6.3)	12.9 (8.1)	11.3 (9.4)

Notes: [1] end of September 2008; [2] end of June 2009; [3] total foreign claims, i.e. cross-border claims, local claims in local currency and local claims in foreign currency; consolidated data on group level. The respective rate to developed Europe appears in the parentheses.

Sources: own calculations based on data provided by the BIS and the banks' balance sheets.

Lending is not uniformly distributed in all SEE countries. The main bulk is located in Bulgaria, Romania and recently in Turkey (Figure 3). Furthermore, as seen in Figure 4, more than 2/3 of total claims account for lending to the private sector (firms and households).

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[14] A more concrete picture would be detected if we could also assess the ratio of local claims in foreign currency over local deposits in foreign currency. However, data for these variables do not exist.

Figure 4
Lending exposure by counterpart, 2009
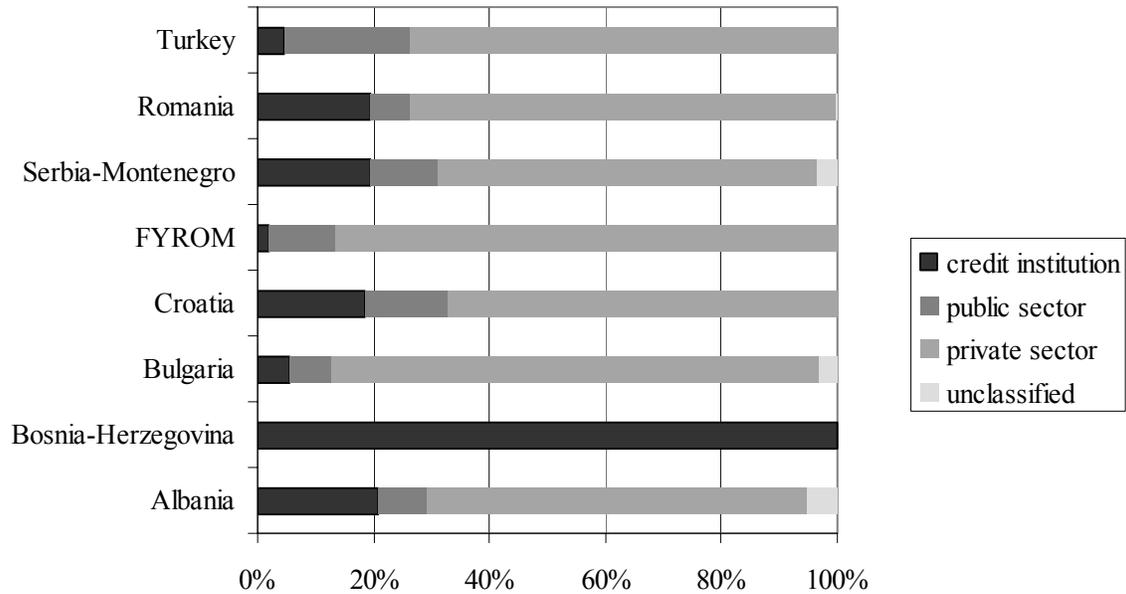
Notes: (%) in country's total, end of June, consolidated data on group level. The loans to the public sector refer to government bonds and Treasury Bills; to loans to insurance institutions of the public sector; and to loans to municipalities and public enterprises. The loans to credit institutions refer to bank bonds and positions on the interbank market. Private credit includes loans to households and firms. All items that the Greek commercial banks have not classified in one of the above mentioned categories are labelled as unclassified.

Sources: own calculations based on data provided by the BIS and the banks' balance sheets.

Table 2 presents the n-country concentration ratio, namely the top-10 and top-5 market ratios. We note that between 2004 and 2009 the degree of lending concentration of the Greek banks considerably increased and important changes occurred regarding its geographical distribution. In particular, while in 2004 only one SEE country, namely Romania, shows a high market share, in 2009 three SEE countries alone (Romania, Bulgaria and Turkey) record the highest lending market shares.[15]

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[15] The Herfindall index which is the sum of the squared market shares of all banks in the market indicates whether and how much a market is concentrated. However, we are interested in seeing in which countries the Greek banks are mostly concentrated. Therefore, the use of the n-country concentration ratio which is the sum of the n-largest market shares is more preferable.

Table 2
Lending concentration risk
(per cent in total foreign claims)

Countries	2009*	2008**	2004
Cyprus	7.024	6.621	9.152
France	3.547	3.417	4.031
The Netherlands		2.630	
Germany (ECB)	4.084		4.328
UK	9.593	9.190	19.671
USA		3.694	6.216
Italy			4.080
Luxemburg	3.635		3.143
Liberia			5.140
Bulgaria	8.987	9.347	4.229
Romania	15.969	17.191	9.451
Serbia-Montenegro	3.898	4.441	
Turkey	13.154	15.275	
Poland	4.416	4.934	
CR-10	**0.743**	**0.763**	**0.698**
CR-5	**0.547**	**0.576**	**0.487**

Notes: (*) end of June 2009; (**) end of September 2008. The concentration index (CR) is defined as the sum of the largest 10 or 5 market shares (top-10 or top-5). It is considered as a measure of lending concentration in a certain sub set of the countries in the sample.

3. Assessing country risk: portfolio aspects

Having so far found a high degree of lending concentration of the Greek banks in SEE, we next aim to detect a risk diversification effect. In a portfolio framework for country risk analysis, the risk of holding a well-diversified portfolio of loans may be smaller than that of having a portfolio heavily concentrated in a few countries. In particular, the lender may distinguish between those key risk indicator variables having a 'systematic' effect on the probability of repayment across a large number of countries to which the lender makes loans, and those variables having an 'unsystematic' effect by impacting a few countries (see Goodman 1986, Palmer and Saunders 1996, Saunders and Cornett 2003).

Therefore, the lender should be really concerned with the systematic variables since they cannot be diversified away in a multi-country loan portfolio. In comparison, unsystematic or country specific risk elements can be diversified away. In other words, the systematic risk element measures the extent to which that country's risk indicator moves in line with the risk indicator of all other countries to which the lender has made loans. Whereas, the unsystematic risk element measures the impact for each country independently and, therefore, that part of risk can be diversified away. The greater the size of the unsystematic risk element relative to the systematic one, the less important this risk indicator variable is to the lender since he can diversify it away by holding a broad array of loans.

The first step in this identification process is to pick a set of macroeconomic variables that may be important in explaining rescheduling probabilities. These variables may be considered as leading country risk indicators and usually refer to external debt variables, public debt variables, income, liquidity variables, monetary variables and other macroeconomic variables that could give useful insights on the probability of entering into a debt crisis and may directly or indirectly affect a 'sovereign risk event'. In other words, these key variables measure the weight of the country's indebtedness, the flow of financial resources that are destined for debt repayments, the revenue-generating capacity of a country, and the volatility of domestic economic policies or the changes in international financial conditions.

It has been shown that the levels of some important macroeconomic variables might determine the occurrence of a financial crisis (see Detragiache and Spilimbergo 2001). The theoretical and empirical literature highlights the role played by international illiquidity in determining a crisis. From a theoretical point of view, the relationship between liquidity variables and financial crises has been modelled through self-fulfilling creditors run (Chang and Velasco 1998, 2000, Radalet and Sachs 1998). In particular, when the amount of a country's debt is small, the 'bad' equilibrium disappears and there is not a sovereign risk event; the reverse is also true. Thus, measures of liquidity could be correlated with financial crises.

For the purposes of our analysis, we examine a series of indicators belonging to a wide category of macro variables such as fiscal variables, income, monetary variables, external financing and the balance of payments. However, due to serious data constraints we eventually chose the following set of variables (see Table 3): fiscal balance to GDP ratio, public debt to GDP ratio, real GDP growth rate, investment to GDP ratio, trade openness and current account to GDP ratio. Some of these variables such as debt variables and external financing are considered measures of liquidity and could be correlated with financial crises, meaning that the less liquid a country the more likely a debt crisis. Others such as money growth, inflation or real output growth may be considered as indicators or sources of macroeconomic volatility in the country. Their variations are deemed to have an adverse effect on both debt-servicing capacity and sovereign risk through their impact on fiscal revenues and the real exchange rate.[16]

The second step in our identification process is to divide total risk into a non diversifiable systematic risk element and to an unsystematic or country risk element. To this end, we consider the well-known capital asset pricing model (CAPM)[17], i.e.

$$X_{it} = constant + b_{it} (\underline{X_t}) + e_{it} \tag{1}$$

where X_{it} is a key risk variable for country i, $(\underline{X_t})$ is the weighted average index of this risk variable across all countries to which the lender makes loans. The weights are each country's share to total lending exposure and e_{it} is the residual term containing all the other factors impacting X_{it}.

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[16] One potential pitfall in using these macro variables as leading country risk indicators is that they reflect a historical picture whereas decisions on investment and lending require a more forward looking approach.

[17] See Palmer and Saunders (1996) and Goodman (1986). The CAPM is a market or a single index model that states that the return on asset i (R_{it}) over period t depends on the return on the market portfolio (RM_t) and the market sensitivity index (b_i), i.e. $R_{it} = constant + b_i\ RM_t + e_{it},$ where e_{it} is a disturbance term that includes all other factors that will affect the return on asset i and which are unrelated to the market. In variance terms we get $Var(R_i) = b_i^2 Var(R_M) + Var(e_i)$. Namely, the total risk associated with the return on asset i is decomposed into a systematic part, the market-related risk, and to an unsystematic or company specific risk.

Table 3
Selected key country risk indicators

Group of macro variables	Comments
1. Fiscal variables Fiscal balance to GDP ratio Public debt to GDP ratio	Liquidity measures: the less liquid a country the more likely a debt crisis.
2.Income Real GDP growth rate Investment to GDP ratio	A high rate of GDP growth drives government revenues higher and thus helps to guarantee a country's ability to service its liabilities. The investment ratio measures the degree to which a country is allocating resources to real investment rather than to consumption. The higher the ratio, the more productive the economy should be in the future and the lower the probability of debt rescheduling.
3. Monetary variables Money growth CPI inflation	The faster the money supply growth, the higher the inflation rate and the weaker that country's currency becomes in domestic and international markets.
4.External financing Foreign reserves growth Imports to reserves ratio	The higher the ratio of imports to foreign exchange reserves the higher the probability not to service external debt liabilities.
5. Balance of payments Current account to GDP ratio Trade openness (exports to GDP ratio)	Measures of external illiquidity.

Expressing equation (1) in variance terms we get

$$Var(X_i) = b_i^2 \, Var(\underline{X}) + Var(e_i) \qquad\qquad (2)$$

where $Var(X_i)$ is the total risk, $b_i^2 \, Var(\underline{X})$ is the systematic risk and $Var(e_i)$ is the unsystematic or country specific risk element.

We estimate by least squares equations (1) and (2) using quarterly data over the period 1995-2007 for 8 SEE countries and for 10 risk indicators. The results are presented in Table 4. For estimating the above equations, we need first to construct the weighted average index ($\underline{X_t}$). The weights are the country's share to the total foreign claims (cross border claims and local claims both in domestic and foreign currency) at the last available observation (end of June 2009). For the calculation of the weights we include only those

countries (19) to which the lending exposure of the Greek banks is equal or larger than 0.5% of the total foreign claims.[18]

Looking carefully at Table 4 some interesting conclusions emerge. First, important differences are detected among countries for the same risk indicator and between risk indicators for the same country. In particular, concerning the fiscal variables and when fiscal balance is used as a risk indicator, we find that Albania has the highest, relatively to the other countries in our sample, systematic risk element while Croatia has the lowest. However, when public debt is considered as a risk indicator, the picture differs notably. Turkey appears to have the highest systematic risk while Albania exhibits the lowest. In practice, this means that, for the Greek banks, lending of one more euros in Albania may offer more possibilities of risk diversification than investing the same amount of money in Turkey.

Second, regarding income, we find that almost all countries show low systematic risk implying that the high concentration risk can be successfully diversified away. Third, money supply, inflation and external financing seem to be generally characterized by very low systematic risk elements. This is not surprising since the control over the money supply and the use of the country's foreign exchange reserves are relatively discretionary variables for developing and emerging market economies. Import ratios also appear to have low systematic risk elements. This might be explained by the fact that the countries in question may have different demand for imports according first to their different consuming attitudes and, second, to the different degree of their dependence upon vital imports such as energy and capital goods. Finally, as far as regards the balance of payments and when exports are used as a risk indicator, we find that, for all countries, the systematic risk is relatively low.

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[18] The countries are: Cyprus, France, Germany, Italy, Luxemburg, the Netherlands, Portugal, Switzerland, the UK, the US, Albania, Bulgaria, FYROM, Poland, Romania, Russia, Serbia, Turkey and Ukraine.

Table 4
Systematic and unsystematic risk elements 10 key country risk indicators, 8 countries
(per cent in total variance, 1995Q1-2007Q4)

| | 1. Fiscal Variables | | | |
| | Fiscal balance to GDP ratio, % (*) | | Public debt to GDP ratio, % (**) | |
Countries	SR	USR	SR	USR
Albania	65.07	34.95	5.42	94.58
Bosnia-Herzegovina	-	-	-	-
Bulgaria	44.90	55.10	27.07	72.93
Croatia	1.43	98.57	19.00	81.00
FYROM	-	-	-	-
Romania	32.90	67.09	-	-
Serbia***	33.75	66.25	-	-
Turkey	-	-	72.05	27.95

Notes: SR= systematic risk element, USR= unsystematic risk element, (*) general government budget balance. The sample period is 2004Q1-2007Q4 for Albania; 2002Q1-2007Q4 for Romania; 2001Q1-2007Q4 for Serbia; 2000Q1-2007Q4 for Croatia and Bulgaria.
(**) general government total public debt. The sample period is 2004Q1-2007Q4 for Albania, 2000Q1-2007Q4 for Bulgaria, Croatia and Turkey. (***) Montenegro is not included. The data for Croatia refer to budgetary central government and for Turkey to the non financial public sector.

| | 2. Income | | | |
| | Real GDP growth rate, % (*) | | Investment ratio, % (**) | |
Countries	SR	USR	SR	USR
Albania	33.37	66.63	41.17	58.83
Bosnia-Herzegovina	-	-	-	-
Bulgaria	26.71	73.31	45.07	54.93
Croatia	9.57	90.43	18.29	81.71
FYROM	-	-	-	-
Romania	31.24	68.77	70.99	29.01
Serbia***	22.97	77.03	-	-
Turkey	48.88	51.12	0.62	99.38

Notes: (*) The sample period is 2004Q1-2007Q4 for Albania; 2002Q1-2007Q4 for Bulgaria, Serbia and Turkey; 2001Q1-2007Q4 for Romania.
(**) Gross fixed capital formation to GDP ratio. The sample period is 2004Q1-2007Q4 for Albania, 1997Q1-2007Q4 for Romania and Croatia. (***) Montenegro is not included.

| | 3. Monetary Variables | | | |
| | Money growth, % (*) | | CPI inflation, % (*) | |
Countries	SR	USR	SR	USR
Albania	51.76	48.22	60.97	39.00
Bosnia-Herzegovina	0.26	99.74	-	-
Bulgaria	86.01	13.99	93.68	6.32
Croatia	32.6	67.40	7.71	92.29
FYROM	9.18	90.82	0.11	99.89
Romania	84.20	15.80	82.34	17.66
Serbia**	25.21	74.79	1.11	98.89
Turkey	51.44	48.56	31.08	68.92

Notes: Broad money. (*) The sample period is 2001Q1-2007Q4 for Serbia and 1997Q1-2007Q4 for Bosnia-Herzegovina. (**) Montenegro is not included.

| | 4. External Financing | | | |
| | Foreign exchange reserves growth, % (*) | | Imports/foreign exchange reserves, % (*) | |
Countries	SR	USR	SR	USR
Albania	53.76	46.24	7.06	92.94
Bosnia-Herzegovina	1.04	98.96	-	-
Bulgaria	98.24	1.76	9.31	90.69
Croatia	9.10	90.90	18.33	81.67
FYROM	1.49	98.51	34.54	65.45
Romania	81.74	18.26	2.30	97.70
Serbia**	44.90	55.09	64.38	35.62
Turkey	15.29	84.71	5.09	94.91

Notes: Foreign exchange reserves minus gold, imports of goods and services. (*) The sample period is 1997Q1-2007Q4 for Croatia and Romania and 2003Q1-2007Q4 for Serbia. (**) Montenegro is not included.

| | 5. Balance of Payments | | | |
| | Current account to GDP ratio, %(*) | | Exports to GDP ratio, % (*) | |
Countries	SR	USR	SR	USR
Albania	53.19	46.81	5.65	94.35
Bosnia-Herzegovina	-	-	-	-
Bulgaria	86.41	13.59	38.47	61.53
Croatia	30.66	69.34	12.24	87.76
FYROM	-	-	-	-
Romania	60.41	39.59	46.77	53.23
Serbia**	61.62	38.38	13.95	86.05
Turkey	54.70	45.30	13.02	86.98

Notes: exports of goods and services. (*) The sample period is 1997Q1-2007Q4 for Croatia and Romania; 2001Q1-2007Q4 for Serbia and 2004Q1-2007Q4 for Albania. (**) Montenegro is not included.

A dash implies that monthly or quarterly data do not exist for the respective variable; therefore, the country is excluded from our sample.

Sources: IMF (IFS data base, November 2009), national central banks, national statistical services, the countries' ministry of finance and ECB (SDW).

In general, we conclude that, for the most countries in the sample, the unsystematic part of the risk facing the Greek banks that operate in SEE is much more important than the systematic one. However, some exceptions are present. For some countries, such as Bulgaria, Romania and Turkey the value of the systematic part of a specific (and not for all) risk factors is found to be higher. For instance, even though Turkey exhibits a higher part of systematic risk with respect to fiscal variables, the unsystematic part for the rest of the risk indicators is considerably lower. The same is true for Romania and Bulgaria when risk is proxied by foreign exchange reserve growth. Nevertheless, the larger part of the unsystematic risk for the majority of the countries and variables implies first that the high risk of lending concentration in SEE is considerably reduced so that, in the face of a country specific (and not global)shock, a mechanism for balancing the adverse effects on total lending portfolio comes into operation.[19] And, second, SEE countries seem to be a group of quite dissimilar economies having different structural features.

4. The probability of a 'sovereign risk event': public debt dynamics

We turn next to study those country specific features that determine a high probability of a 'sovereign risk event'. We place an emphasis upon the countries' fiscal structures in a comparative perspective.[20] Following a period of decline in the current

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[19] Defining $a_p = \sum_{i=1}^{N} w_i a_i$ as the portfolio alpha and $b_p = \sum_{i=1}^{N} w_i b_i$ as the portfolio beta, we can directly represent portfolio return as a portfolio alpha plus beta times expected market return, as shown

$$E(\mathrm{X}_p) = \alpha_p + b_p \cdot E(\underline{X}) \qquad (3)$$

Because of the assumption that securities are related only through a common market effect, the risk of a portfolio is also simply a weighted average of the market-related risks of individual securities plus a weighted average of the specific risks of individual securities in the portfolio:

$$Var(\mathrm{X}_p) = b_p^2 \cdot Var(\underline{X}) + \sum_{i=1}^{N} w_i^2 \cdot Var(e_i) \qquad (4)$$

As seen, the diversifiable risk component w_i^2 will become smaller as securities are added to the portfolio. This is because, according to the single index model, these risks are uncorrelated. See, Fabozzi (1999, ch. 5) and Farell (1997, ch.3).

[20] Few studies have empirically examined public debt sustainability or large public debt reductions in emerging market economies. For an examination of the episodes of large external debt reductions in these countries, see Reinhart, Rogoff and Savastano (2003). More recently, Reinhart and Rogoff (2009, 2010) analyse the cycles underlying serial debt and banking crises across a large sample of both emerging and mature economies and over a long time span. For an assessment of debt sustainability in emerging market economies, see IMF (2003, ch. II and III) as well as Sheikh and Heijmans (2004).

decade, recent developments in the view of the current global financial crisis brought again to the scene the issue of public debt in SEE emerging market economies. Public debt had sharply increased since the mid-1990s in many transition economies with costly debt defaults (Russia, Ukraine) and severe fiscal difficulties (Turkey) in the very early years of the 2000s. However, this is not to say that there have not been success stories. For example, Bulgaria has succeeded to reduce significantly its excessively high public debt ratio, from close to 160 per cent of GDP in the early 1990s to less than 20 per cent in 2007. Another success story is Serbia; its high public debt has been reduced from around 240 per cent of GDP in 2000 to close to 30% in 2007.[21]

The political economy aspects of public debt have received increased attention over the last years. In this literature, debt is seen in a strategic context where the government can use it to finance higher spending or tax cuts to boost its re-election prospects or to try to constrain the actions of successor regimes (see Rogoff 1990, Persson and Svensson 1989). Why might a government choose to borrow and accumulate debt? First, debt may be used to fund spending that contributes to broader economic and social objectives such as physical infrastructure, population's education and health. Second, debt may be used as a buffer to limit the need to immediately raise taxes to finance increased spending in the view of a sudden and temporary event, for example a war or a natural disaster (see Barro 1979). Third, financing counter-cyclical fiscal policy by issuing debt helps to stabilize the economy and to smooth the business cycle. However, high public debt requires high taxes to repay the debt and puts upward the real interest rates crowding out private investment. A highly indebted government that is no longer able to finance its deficits should raise taxes or curtail spending often at a time when fiscal policy is needed to help stabilize the economy. In other words, fiscal policy becomes pro-cyclical instead of being counter-cyclical. When the government cannot find revenues to finance debt issue, a debt crisis occurs and the government is forced to default or inflate the debt away. Both actions entail large economic and social costs due to resulting painful periods of financial consolidation and economic adjustment.

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[21] The excessively high rates of the public debt ratio are mainly attributed to the war of 1999.

As seen in Figure 5, after a peak in 2000 total public debt as per cent of GDP followed a downward trend during the period 1998-2008, largely as the result of the painful fiscal consolidation process pursued over the last years. Compared with the value that the ratio takes for the euro area over the same period (70%), we see that for the SEE countries the mean rate was 1.5 times lower (Figure 6). Debt as a percentage of total public revenues is also lower in SEE (see Figure 7). However, Albania and Turkey have higher ratios; they are more than 2.5 times higher. Moreover, as seen in Figure 8, external debt was 2 times as high as internal debt, with Serbia, Bulgaria and FYROM show a higher proportion of external to internal debt.

Figure 5
Public debt in SEE
(% of GDP, 8 countries 1998-2008)
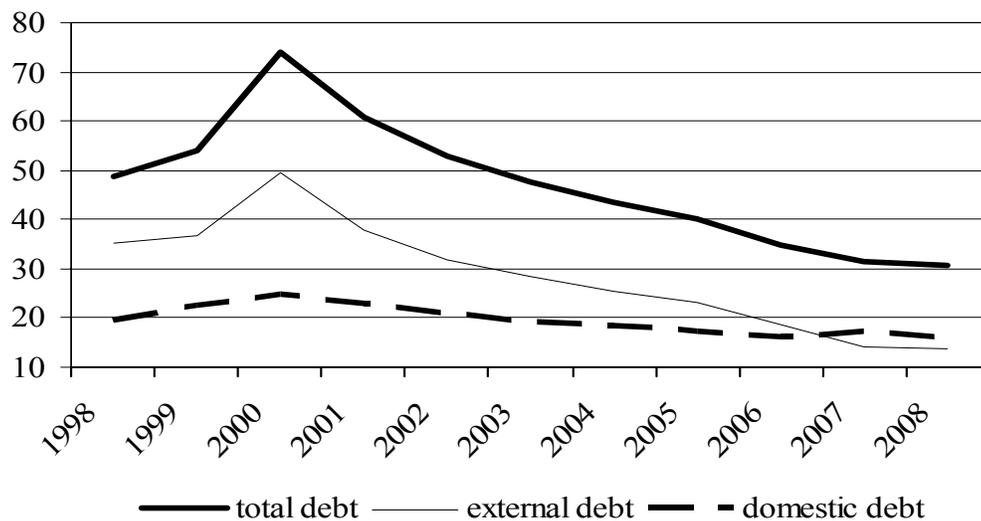
Notes: gross debt of general government, simple unweighted country averages, end of period data. For Turkey, the data refer to the non financial public sector and for FYROM, to consolidated central government. The data entries for the years 2007 and 2008 are preliminary, projected or estimated. The time period for Serbia (Montenegro is excluded) is 2000-2008; for Bosnia-Herzegovina, 1999-2008. See also the data appendix.

Sources: IMF *Country Reports*, SDW ECB, AMECO *General Government Data* (spring 2009) and national central banks.

Figure 6
**Comparison of public levels in SEE and EA**
(% of GDP, 1198-2008)
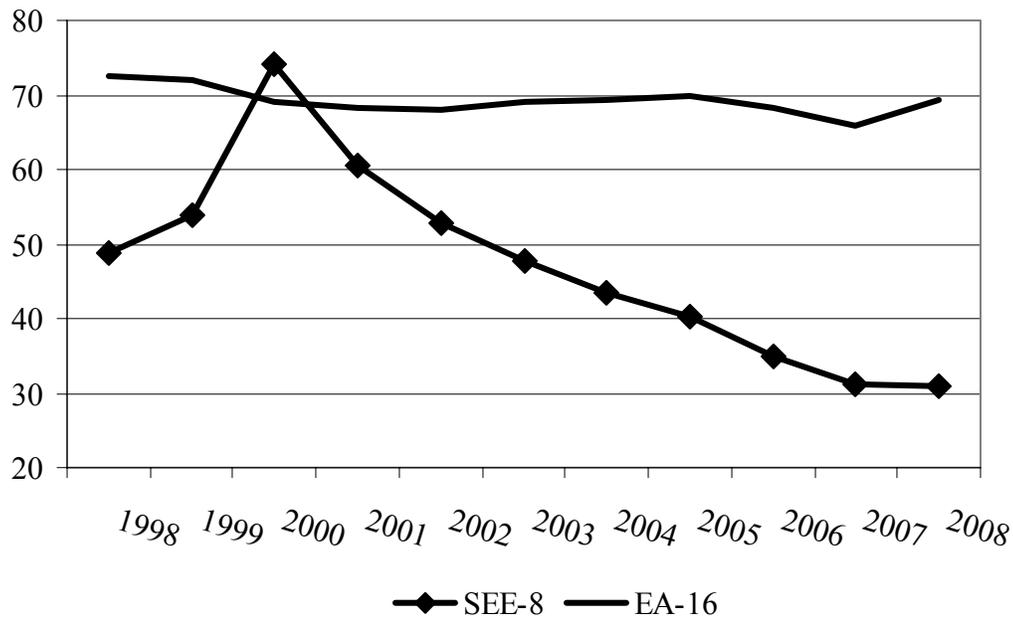
What are the main explanations behind the developments in SEE markets' public debt? Figure 9 highlights the changes in the debt stock by using a simple public debt dynamics equation using the 2008 data entries. In particular, it gives a quantitative expression of the debt dynamics, giving the influence of the flow variables on the evolution of the outstanding stock of government debt. According to the debt dynamics or the budgetary constraint of a country, public debt changes are influenced by the primary fiscal deficit (non interest expenditures less revenues), the nominal GDP growth rate and the interest rate and 'other factors'. The last item captures a wide range of factors, including the accumulation of financial assets, exchange rate depreciations, and fiscal costs arising from the resolution of banking sector crises and receipts from

privatization deals (off-balance sheet items, contingent liabilities as well as remaining statistical adjustments).[22]

Figure 7
**Public debt, ratio to revenue**
(% average, 1998-2008)
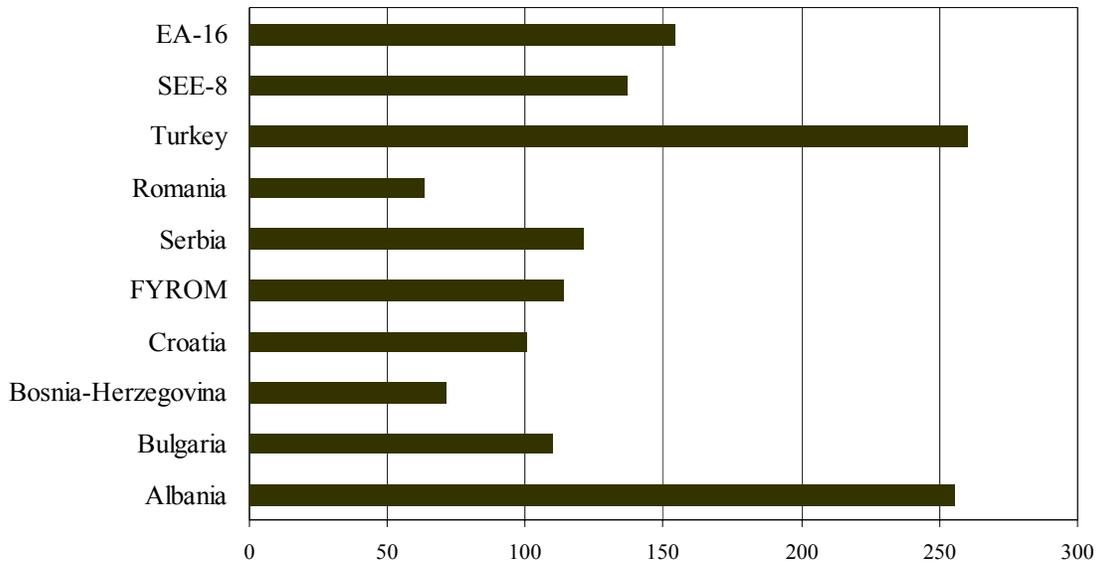
Notes: simple arithmetic unweighted country averages. General government total debt; total public revenues. End of year data.

Sources: IMF *Country Reports*, SDW ECB, AMECO *General Government Data* (spring 2009) and national central banks.

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[22] It is known as stock-flow adjustment or debt-deficit adjustment (SFA). It ensures the consistency between a flow variable such as net borrowing and the variation in the stock of gross debt. Analytically, SFA is made up of the following elements. First, the net acquisition of financial assets leads to changes of the stock of debt even though it does not contribute to the primary deficit. Second, the appreciation or the depreciation of foreign currency debt reflects the impact of changes in exchange rates on these debt components that are denominated in foreign currencies. Third, corrections are also needed due to the fact that the debt is measured at face value and therefore accrued interest is excluded. Fourth, adjustment may arise due to changes in sector classification and volume changes in financial liabilities. The last element of SFA is the statistical discrepancy which reflects differences arising from the diversity of data sources and statistical practices. For an analysis of the elements of FSA for the EU27 for the period 2005-08, see Eurostat (2009), April, EDP notification.

Figure 8
**Public debt in SEE**
(average, 1998-2008)
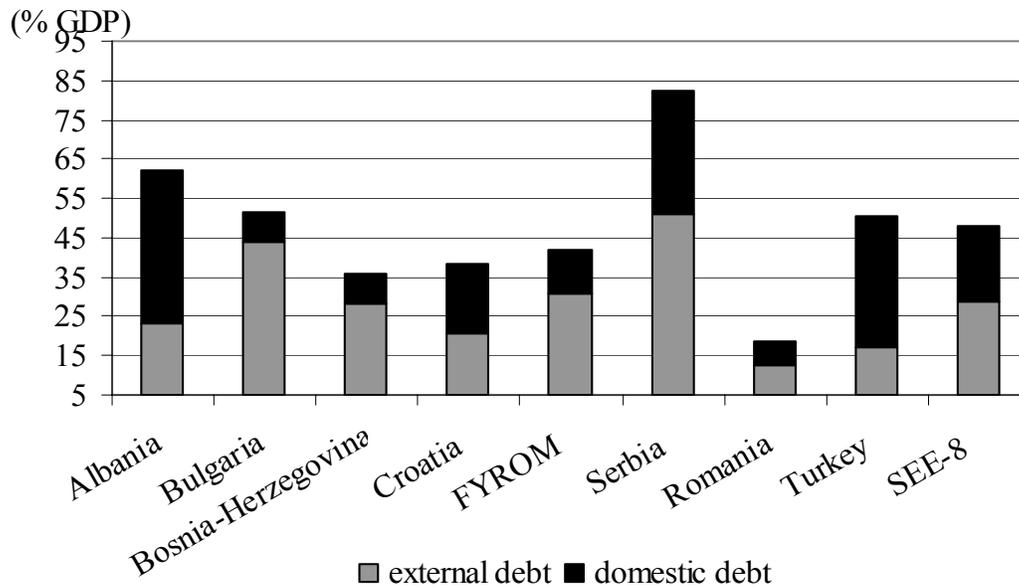
Notes: year averages and simple arithmetic unweighted country averages. The sample period is for Romania, 2000-2008 and for Croatia, 1998-2007.

Sources: IMF *Country Reports*, SDW ECB and national central banks.

We note that in almost all countries in the sample, with the exemption of Turkey, the impact of output growth and the interest rate was favourable in reducing the stock of debt. The contribution of the primary balance, however, was not strong enough so as to cut debt. This was true particular for Turkey, but not for Bulgaria. The broad picture is that the primary government balances were often insufficient to significantly reduce the debt-to-GDP-ratio. Primary deficits in Albania, Croatia, Serbia and Romania either constrained the downward trend of debt or reinforced its upward movement. In Turkey, in particular, the contribution of the primary surplus, even though it was large in value, did not seem strong so as to eventually contain debt. With regard to the 'other factors', in only two cases, Albania and FYROM, seemed to have contributed to debt fall. In all other

cases, their contribution was positive and particularly strong in Bosnia-Herzegovina[23], Bulgaria and Turkey.

Figure 9
Contribution to changes in the total government debt stock
(2008, % of GDP)

□ change in gross debt ratio   □ primary deficit
■ nominal growth and interest contribution   □ other contribution
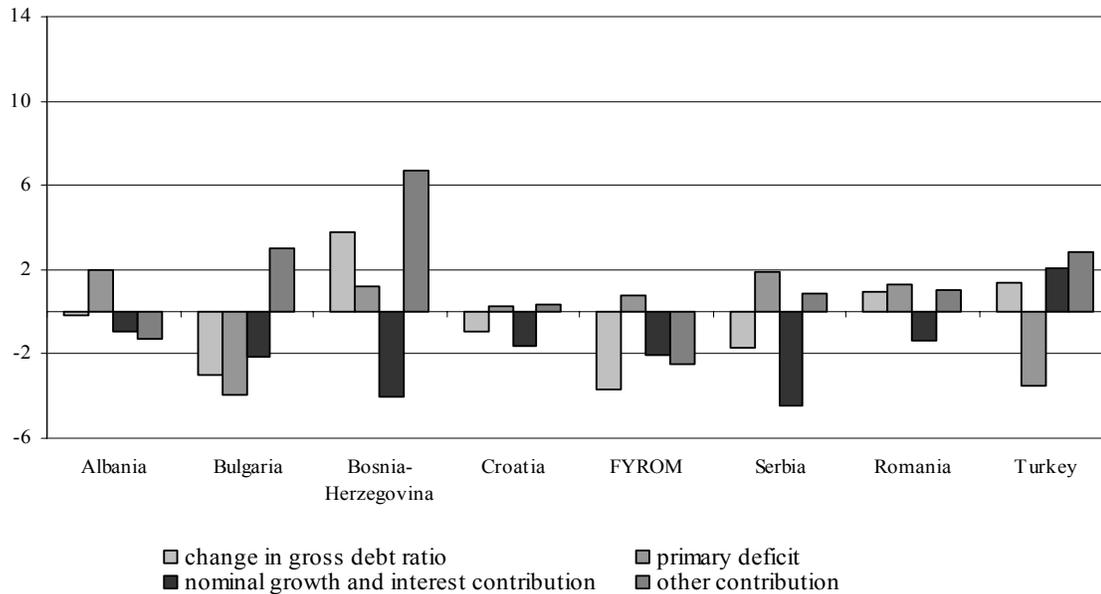
Notes: The debt dynamic equation emphasizing the role of the primary (non interest) deficit can be written in terms of output:

$$\frac{D_t}{Y_t} = \frac{D_{t-1}}{Y_{t-1}} \times \frac{(1+i_t)}{(1+y_t)} + \frac{P_t}{Y_t} + \frac{SFA_t}{Y_t} \qquad (1)$$

or

$$\frac{D_t}{Y_t} - \frac{D_{t-1}}{Y_{t-1}} = \frac{P_t}{Y_t} + \frac{SFA_t}{Y_t} + \frac{D_{t-1}}{Y_{t-1}} \times \frac{i_t - y_t}{1 + y_t} \qquad (2).$$

Based on equation 2, the total change in the gross debt ratio has been assessed as the contribution of primary balance (P_t, deficit), the stock flow adjustment and the contribution of nominal output growth and the nominal interest rate. The implicit interest rate i_t is derived as the nominal interest expenditure divided by previous period debt stock. For the most countries in the sample, data entries for the year 2008 are preliminary, estimates or projections.

Source: Own calculations based on data from IMF *Country Reports*.

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[23] Till 2006, the country's total public debt was dominated in foreign currencies and in conjunction with the strong devaluation pressures against the dollar, stock flow adjustment was high.

5. Assessing debt sustainability

5.1 Actual and debt stabilizing primary balances

What are the specific features of the fiscal structure in SEE countries that determine the level of public debt that they can sustain? We can nominate the following:

(i)   SEE countries generally have lower and more volatile revenue ratios (see Figure 10). On average, the revenue to GDP ratio is about 33 per cent for the period 1998-2008, compared with 45 per cent in the euro area during the same period. There are, however, considerable differences among the countries with, for example, Serbia and Bosnia-Herzegovina having ratios almost par with the euro area.[24] On the other hand, Turkey, Albania and FYROM are the countries with the lowest revenue ratio. The volatility of revenues measured as the coefficient of variation in SEE countries is generally much higher than in the euro area. Volatility is four times as high as in the euro area.[25]

(ii)   Interest costs account for a high proportion of government expenditure in SEE countries (see Figures 11.1 and 11.2). At 11 per cent of total expenditure, interest costs are 1.5 times as high in SEE countries as in the euro area, even though they account for an average of 3.5 per cent of GDP, which is at par with the EA-16. Interest expenditures are also more volatile because of the structure of public debt. As seen in Figure 11.2, the coefficient of variation is 2.5 times as high in SEE countries as in the euro area. Currency mismatches and maturity mismatches can explain in a great extent high volatility. With a large proportion of public debt either

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[24] It may be more important to assess the effective direct and indirect tax rate in an attempt to detect the reasons of the observed low revenue ratios. However, lack of data on key variables for many countries in the sample does not allow us to carry out this task. According to the methodology proposed by Mendoza, Razin and Tezar (1994), the effective direct tax rate is calculated as the ratio of total tax and non tax revenues net of domestic taxes on goods and services divided by the sum of compensation of employees and total operating surplus. The effective indirect tax rate is calculated as the ratio of all domestic taxes on goods and services divided by private consumption.

[25] It has been empirically shown (see IMF 2003, Kose, Prasad and Terroner 2003) that, for most of the emerging economies, the impact of commodity prices and commodity exports on government revenues and thus on primary budget balance is important even for the emerging market economies that have diversify their exports away from primary commodities.

external or denominated in foreign currency,[26] and government revenues in domestic currency, high exchange rate volatility resulted in large spikes in interest payments relative to government income. Further, domestic debt is often of a short maturity so interest costs are more sensitive to changes in the domestic interest rates.

Figure 10
Revenue ratios in SEE, 1998-2008

in per cent

☐ ratios of public revenue to GDP ■ coefficient of variation
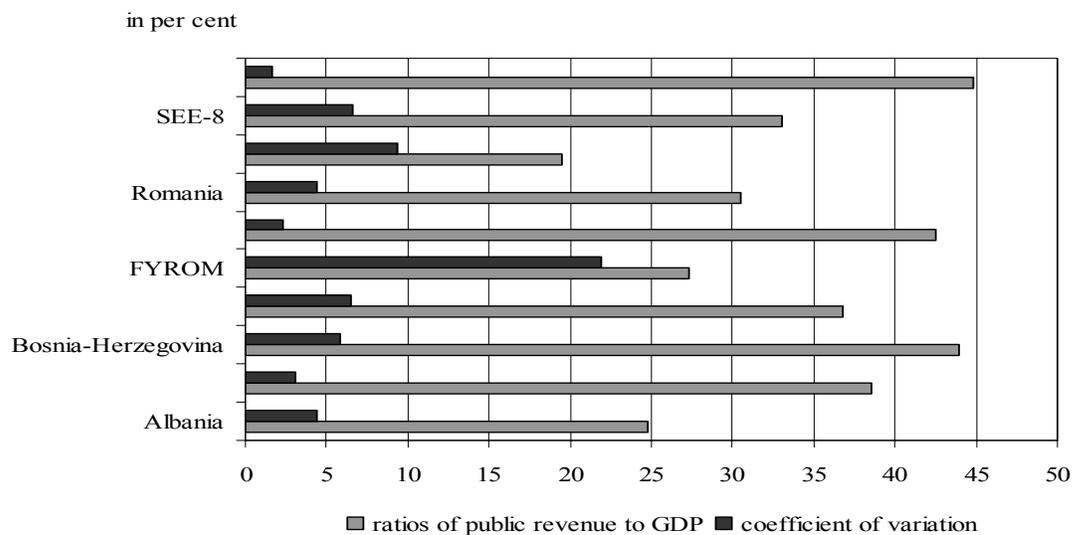
Notes: gross public debt to total government revenues, mean averages and simple arithmetic unweighted country averages. The coefficient of variation measures the standard deviation relative to the series' mean. End of period data. The sample period for Serbia is 2003-2008 and for Croatia is 1998-2007. See also the data appendix.

Sources: IMF *Country Reports*, SDW ECB, AMECO *General Government Data* (spring 2009) and national central banks.

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[26] For all countries, foreign currency denominated debt accounts for a very large proportion of total public debt. For example, in Bulgaria, Croatia, Bosnia-Herzegovina, Serbia and FYROM the stock of debt that is denominated in foreign currencies accounts for more than two thirds of the total stock.

Figure 11.1
Interest costs in SEE, 1998-2008
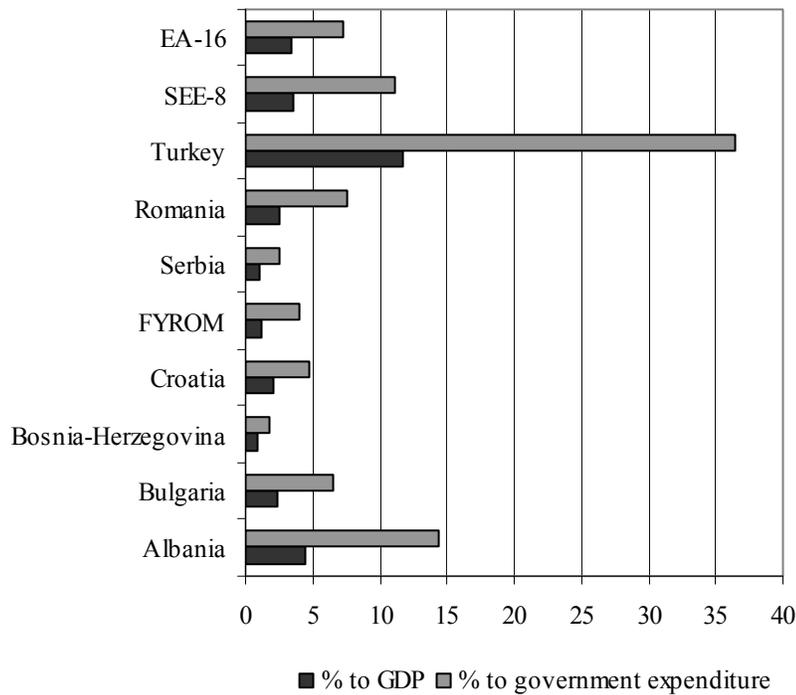
■ % to GDP ▨ % to government expenditure

Notes: simple arithmetic unweighted country averages. The sample period is 2003-2008 for Serbia (Montenegro is excluded). Data entries for the year 2008 are preliminary, estimates or projections. See also the data appendix.

Sources: IMF, *World Economic Outlook* (April 2009), AMECO *General Government Data* (spring 2009), IMF *Country Reports*, Central Bank of Bosnia-Herzegovina *Annual Report*, Ministry of Finance of the Republic of Serbia, Ministry of Finance of Croatia.

These differences in public debt structures may have important implications for debt sustainability. A quite simple approach to public debt sustainability starts from the basic accounting identity that links the public sector budget balance to the change in the debt stock. A fiscal policy can be viewed as sustainable if it delivers a ratio of public debt to GDP that is stable. The difference between the actual and the debt stabilizing primary balance indicates the degree of fiscal adjustment that is needed to achieve a constant debt to GDP ratio (see Blanchard *at al.* 1990).[27] If the actual primary balance is less than the

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[27] The budget identity indicates that the stock of public debt at the beginning of period t+1 (B_{t+1}) results from the inherited debt (B_t) to which the period t interest requirements are added. Since interest costs are not a fiscal policy variable but depend on the stock of debt, the identity can be re-written relating the primary (non interest) balance, P_t (surplus), to the change of public debt stock:

debt stabilizing balance, current fiscal policy implies an increasing ratio of public debt to GDP. Based on the historical averages for the years 2005-2007, one can conclude that most countries in the sample had run primary (non interest) balances consistent with what was required to stabilize or reduce the debt to GDP ratio (see Figure 12). In all cases, public debt was below 60 per cent of GDP, i.e. the benchmark established for the EU members in the Maastricht Treaty. In Serbia and Turkey, both countries with a high debt ratio, the actual primary balance was more than the debt stabilizing balance, meaning that fiscal policy pursued over the past few years implied a decreasing ratio of public debt to GDP and therefore, it was viewed as sustainable. The reverse, however, is true for Romania or even Albania.[28] Many factors might explain the favourable prospects for SEE government debt dynamics. All countries had recently made considerable efforts to increase their primary fiscal surpluses. Further, a smaller primary surplus would be needed to stabilize or reduce the debt ratio as real growth was stronger and the real interest rate was much lower in the past few years.

$$B_{t+1} = (1+r_t) B_t - P_t \qquad (1)$$

or in terms of ratios to GDP to account for the effect of growth on borrowing capacity

$$(1+g) b_{t+1} = (1+r) b_t - p_t \qquad (2)$$

where g is the nominal growth rate and r is the nominal interest on government debt. From equation (2) the primary surplus that stabilizes the debt ratio (b_{t+1}) is given by

$$p^*_t = b_t (r-g) \qquad (3)$$

where g and r can be also measured in real terms as the effect of inflation disappears with the use of GDP ratios. From equation (3), the primary surplus consistent with a constant debt to GDP ratio increases with the initial debt stock and the difference between the real interest rate and the real growth rate, insofar as that the real interest rate is higher than real growth. The main drawback of this simple indicator of debt sustainability is that is based upon an arbitrary definition of sustainability (i.e. to stabilize the debt to GDP ratio). This is because it is unlikely a country to maintain a stable debt ratio at all times while incurring temporally high debt levels may be appropriate in some circumstances (see IMF 2003).

[28] Romania had the lowest debt ratio, but actual primary balance was less than the debt stabilizing balance. Albania had the highest debt ratio among all countries in the sample while the difference between actual primary balance and debt stabilizing balance was near zero.

Figure 11.2
Volatility of interest costs in SEE, 1998-2008
(Coefficient of variation)
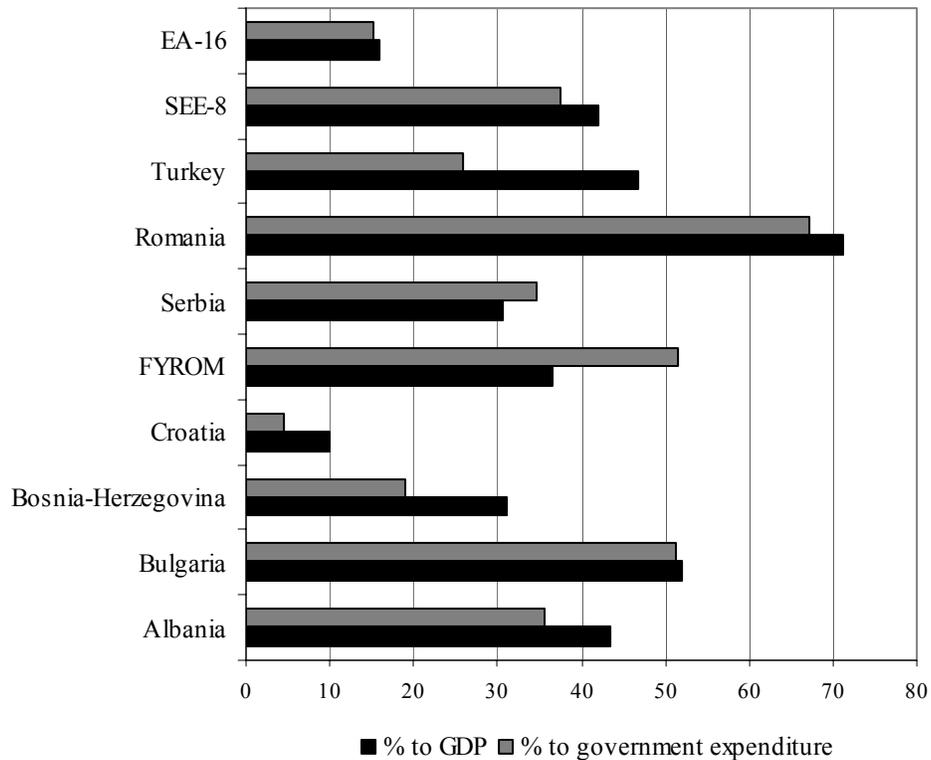
■ % to GDP ▨ % to government expenditure

Notes: simple arithmetic unweighted country averages. The sample period is 2003-2008 for Serbia (Montenegro is excluded). The coefficient of variation measures the standard deviation relative to the series' mean. Data entries for the year 2008 are preliminary, estimates or projections. See also the data appendix.

Sources: IMF, *World Economic Outlook* (April 2009), AMECO *General Government Data* (spring 2009), IMF *Country Reports*, Central Bank of Bosnia-Herzegovina *Annual Report*, Ministry of Finance of the Republic of Serbia, Ministry of Finance of Croatia.

5.2 Fiscal policy response to debt accumulation

A more formal approach to assessing debt sustainability is to look at the relationship between the fiscal policy tools and objectives. In other words, we estimate the 'fiscal policy rule' or the 'fiscal policy reaction function'.[29] In the context of the fiscal policy decision making process, we consider primary fiscal surplus as the key operating

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[29] For fiscal policy studies for the industrial countries see, Bohn (1998), Mélitz (1997), Debrun and Wyplosz (1999) and Gali and Perroti (2003). For a comparison between industrial countries and emerging market economies, see IMF (2003).

target that reflects the actions of the fiscal authorities and maintaining debt sustainability as their primary objectives. Therefore, we assume that primary fiscal surplus responds to public debt changes (see Bohn 1998). Short-run consistent borrowing schedule requires that the primary balance systematically and positively responds to past changes in the public debt, that is the parameter λ in equation (4) (see footnote)[30] takes a positive value. Specifically, we refer to the association between the primary surplus as per cent of GDP and the ratio of public debt to GDP observed at the end of the preceding year. For assessing this connection, we used pooled data for 8 SEE countries over the period 2000-2008.

Figure 12
Actual and debt stabilizing primary balances
(8 SEE countries, % of GDP, 2005-2007)
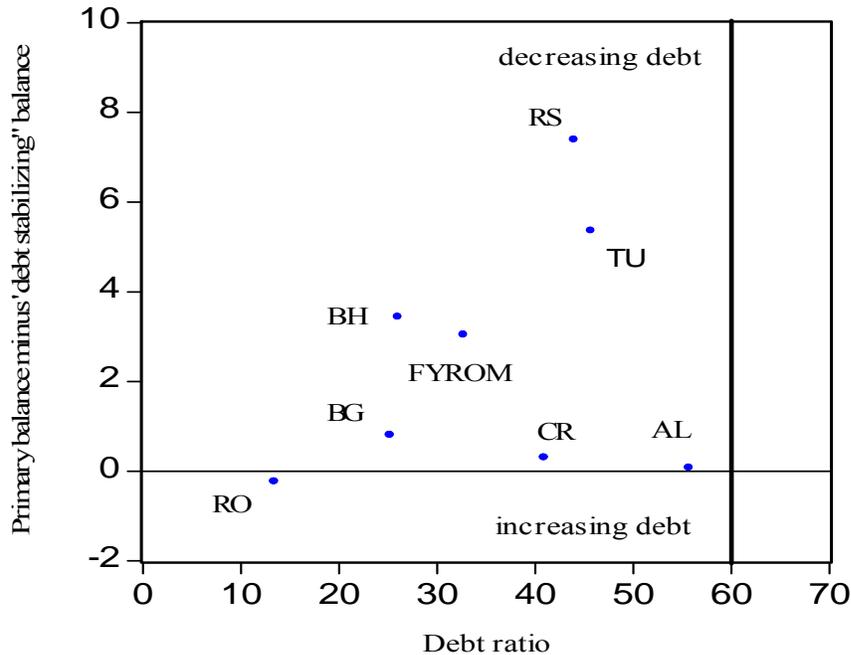
Notes: real interest rate= nominal rate on public debt minus change in GDP deflator. See also the data appendix.

Source: Own calculations (see eq. 3) based on data from IMF *Country Reports*.

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[30] Following Bohn (1998), the fiscal policy reaction function can be written as follows

$$p_{it} = a_i + \Sigma_j b_i X_{ijt} + \lambda\, b_{it\text{-}1} + u_{it} \qquad (4)$$

where p_{it} is the primary surplus of country i at period t , X_{ijt} is a vector of temporary factors (j=1..N), $b_{it\text{-}1}$ is the debt level at the end of the previous period, a_i is the country specific constant (fixed effect) account for heterogeneity in the group of the countries in the sample and u_{it} is an error term.

However, surpluses are also affected by other macroeconomic variables that explain changes in primary balances unrelated to debt sustainability. According to Barro's tax smoothing policy (1979) these variables reflect temporary shocks to government spending that are due to business cycle fluctuations or exceptional events (such as wartime emergencies, natural disasters or economic crises and financial panics) that increase spending to abnormal levels. Therefore, apart from the ratio of public debt to GDP, we consider two temporary factors that affect the primary balance: the business cycle and the inflation rate. Specifically, the output gap defined as the deviation of real GDP from its H-P filtered trend is included to capture the impact of the business cycle on the primary surplus. The CPI inflation rate accounts for shocks to seigniorage revenues.

Figure 13 brings together the primary balance[31] and public debt. As seen, the link between them seems to be positive at almost any level of debt below 50 per cent of GDP. However, the response of the primary surplus weakens and turns to be negative as the debt to GDP ratio exceeds that level and it stops altogether when the debt ratio exceeds 60 per cent of GDP. We should mention that this behaviour rests on the average of the countries in the sample and it does not refer to each individual country.

The empirical results presented in Table 5 verify the above conclusion. Taking into account the influence of temporary factors and the existence of a non linear relationship (quadratic and cubic powers of public debt have been added in the regression equation) between the primary surplus and public debt (both as per cent of GDP), we find that at low levels of debt the primary surplus does respond positively although slightly to a rise of the debt to GDP ratio. At mid levels, this response weakens and turns to a negative sign while at higher levels it seems that the primary surplus does not at all react as debt rises. It is worth noting that both transitory factors of the fiscal policy have the expected signs but only inflation is statistically significant. In particular, in line with the effect on seigniorage revenues, higher inflation is associated with a larger primary surplus. By contrast, the primary surplus appears to be only slightly reactive to cyclical fluctuations.

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[31] Not adjusted for the influence of transitory changes.

Figure 13
Public debt and primary balance
(8 SEE countries, 2000-2008, % of GDP)
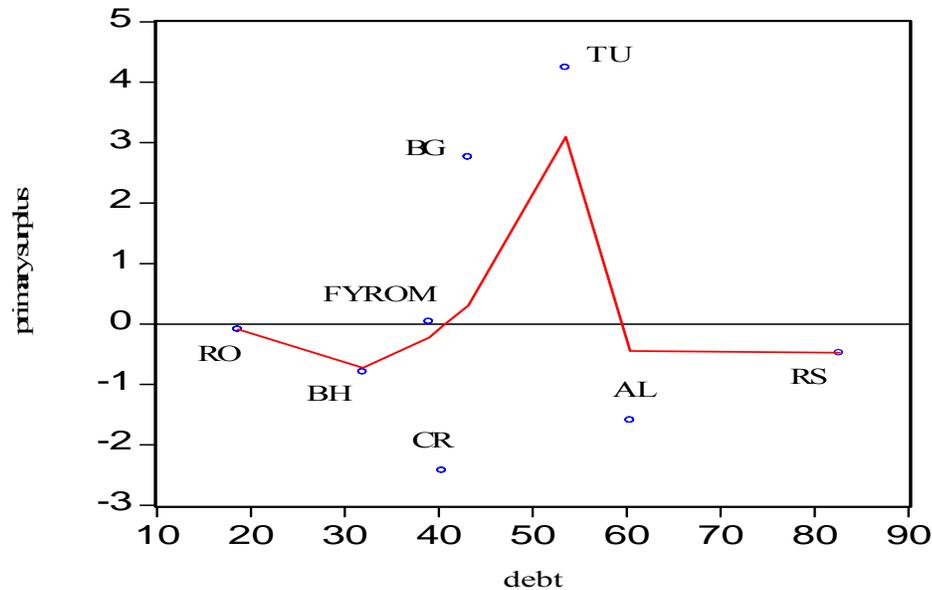
Note: The Kernel is the function used to weight the observations in each local regression; mean averages, end-of-year data.

These results suggest that – on average – the conduct of fiscal policy in SEE countries is not consistent with ensuring sustainability when debt exceeds a threshold of 50 per cent of GDP. However, the validity of this finding could be also attributed by the presence of two other factors. First, we examine developments over a short time period (2000-2008) and second, during that period, all counties in the sample reduced their debt ratios by taking measures towards fiscal restructuring and consolidation.

Broadly speaking, the results are suggestive of a weak link between debt sustainability and the short-run conduct of fiscal policy. They are primarily driven by the behaviour of primary spending, which, as per cent of GDP, appears to be slightly pro-cyclical (see Table 5, block II).[32] This means that in cyclical upswings primary spending increases slightly faster than output and fall faster in a downturn when revenues also decline and lending condition tighten. Pro-cyclical fiscal policy likely reflects the inability to control spending and thus reflects the absence of the automatic stabilizers that

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[32] The coefficient of output gap is positive and statistically significant only at a level higher than 10%.

give to government spending a stabilizing role against macroeconomic volatility. Finally, the results in Table 5 also suggest that SEE countries react to debt accumulation by decreasing spending while inflation has a negative effect on spending.

Table 5
SEE countries: fiscal policy reaction functions and expenditure equations
2000-2008

Block I. Fiscal Policy Reaction Functions *Dependent variable*: primary surplus as per cent to GDP		*Block II. Expenditure Equations* *Dependent variable*: primary (non interest) spending as per cent to GDP	
Explanatory variables		*Explanatory variables*	
	(1)	*(1)*	*(2)*
constant	-2.644	36.482	19.596
	(-1.854)	(87.625)	(3.953)
Operational fiscal target			
Lagged public debt (% GDP)	0.073	-0.009	-0.011
	(1.875)**	(1.817)***	(-1.854)***
Lagged public debt^2 (% GDP)	-0.006		
	(-1.596)***		
Lagged public debt^3 (% GDP)	0.001		
	(0.760)		
Control variables			
Output gap	15.034	8.736	8.084
	(1.505)***	(1.753)***	(1.752)***
CPI inflation	0.111	-0.038	-0.018
	(3.627)*	(-2.156)**	(-1.818)***
Lagged spending			0.474
			(3.497)*
Adjusted R^2	0.821	0.988	0.984
Se	1.150	2.463	2.238
Hausman statistic	No endogeneity	No endogeneity	No endogeneity
	(0.358)**	(0.187)**	(0.227)**
Number of observations	64	64	64

Notes: pooled cross section and time series data. The equations have been estimated with GLS allowing for fixed effects (country and period) and using a heteroskedasticity-consistent White variance-covariance matrix. *se* is the standard error of the regression. A constant term is automatically included so that the fixed effects estimates sum to zero. They should be interpreted as deviations from an overall mean. A Hausman (1978, Davidson and Mackinnon 1989, 2003) specification test has been also carried out testing whether the estimates are consistent. Debt service payments are chosen as an instrument in the auxiliary regression. The p-values of rejecting the hypothesis of consistent estimates are reported in the parentheses. (*) significant at 1%, (**) significant at 5%, (***) significant at 10%. See also the data appendix.

Sources: IMF *Country Reports* and *World Economic Outlook*, April 2009.

6. Conclusions

The main purpose of the paper is to assess any potential pressure on Greek banks from their activities in SEE and study the key risk determinants. We focus on two factors: the 'exposure' of the banks and the probability of a 'sovereign risk event'. In particular, we are first interested in detecting a diversification effect of the concentration risk facing the Greek banks that operate in SEE. And second, we examine the country specific factors that may determine a 'sovereign risk event'. We place an emphasis on the countries' fiscal structure in a comparative perspective since a high probability of a 'sovereign risk event' implies deterioration in the government balance sheet that will eventually adversely affect the health of the balance sheets of both households and firms and ultimately the health of the bank balance sheets. This happens because an increase in the debt ratio today implies that taxes will go up tomorrow impairing firms' profitability and thus reducing their ability to repay their debts to the banks.

Our main empirical findings are as follows. First, even though the degree of regional lending concentration of the Greek banking system is high, a diversification effect is present. Specifically, we use the well-known CAP model to divide total country risk into a non diversifiable systematic element and to an unsystematic country specific part. Based on a panel data for 8 SEE countries and 10 selected leading risk indicators over the period 1995-2007, empirical results support the view that, for the most SEE countries in the sample, the non systematic risk is much more important than the systematic one. This implies that a mechanism for balancing the adverse effects of a country specific and a non systemic shock is set in motion. Second, examining the 'sovereign risk quality', we conclude although all SEE countries have made recently significant efforts towards successful fiscal consolidation – largely supported by strong output growth and low real interest rates over the last few years – the empirical evidence is, however, suggestive of a weak link between debt sustainability and the short-run conduct of fiscal policy. This finding is validated by the evidence on the pro-cyclical character of primary government spending.

However, some caveats are in order. First, the empirical findings are only suggestive, tentative and in no way definitive. This is due to the existence of serious

constraints on data availability and to the short time horizon that we choose to study these developments. Second, we rely on the analytical framework of the CAP model. However, this model is a single index market model and it suffers from certain limitations: (i) it is a linear model whereas the real world is non linear; (ii) we are only interested in examining the 'riskiness' of the Greek banks abroad and not the 'riskiness' of a particular country in which a Greek bank resides. To this end, we use complementary risk factors that allow us to reach certain conclusions that may be helpful in an expert's judgement; (iii) the CAP model cannot be used to rate countries. There are concerns, for example, about how can we weight the relative importance of each risk indicator? How can we define overall 'riskiness'? How can we treat the existence of unobservable relations between selected risk factors? And (iv) the model is often used to compare different portfolio structures. However, in our analysis a portfolio manager does not exist. This means that we cannot compare different portfolio structures but can only take as given a certain portfolio structure that holds at a certain time. Third, we look at the variance of some macroeconomic variables thus distinguishing between the systematic and the unsystematic part of the risk. Alternatively, following Genberg and Sulstarova (2008), we could assume that the risk of sovereign bonds depends not only on the expected future path of debt but also on its entire probability distribution. This is because even if the expected time path of the debt ratio looks sustainable, it is possible that some realizations of the underlying macroeconomic variables will bring it to levels that are considered too high. The entire distribution of the future debt ratio can be seen as a function of the nature of the stochastic process that governs the macro variables taking into account their interactions. And finally, since SEE countries are characterized by both domestic and foreign (public and private) debt, a possible way of examining sustainability would be to examine the link between fiscal and external sustainability. This involves the national income identity, the evolution of net foreign liabilities and the government's budget constraint. In this latter case, the credit risk is covered by the exchange rate risk with two parts to be studied: (i) the probability of the domestic currency depreciation and (ii) currency mismatch.

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Data Appendix

In the empirical analysis we choose a set of macroeconomic variables for which a continuous data series is available for all countries in the sample. However, the use of different data sources and the frequent update concerning the variables' definitions or the method of data evaluation raise the problem of the existence of significant statistical discrepancies.

The data set for public debt (see Section 5) focuses on gross public sector debt rather than on net debt (where public sector assets are netted out) or the present value of the debt because of data limitations. The data are on a general government basis.

The set of fiscal variables refers to

EA-16. Debt: outstanding, general government; total public revenue: total current revenue (i.e. total of current taxes, social security contribution and other current revenue received by general government, capital transfers are not included, ESA 95) (SDW ECB, AMECO); interest includes flows on swaps and forward rate agreements, excessive deficit procedure (AMECO *General Government Data*, spring 2009).

Romania. Debt: consolidated general government, excluding public debt guarantees (SDW ECB, AMECO and Romanian National Bank); interest, total government expenditure: consolidated general government (IMF *Country Reports*).

Bulgaria. Debt: general government, total public revenue: general govern ment (taxes, grants and non tax revenues) (IMF *Country Reports*); interest and total government expenditure: excluding social insurance contributions paid by the general government on behalf of its employees (IMF *Country Reports*).

Croatia. Debt: general government, arrears and guarantees stock are excluded; total revenue: consolidated central government (IMF *Country Reports*, Croatian National Bank); interest and total government expenditure: consolidated general government (Ministry of Finance).

Turkey. Debt: non financial public sector (i.e. general government= central government plus local administration and funds minus financial institutions), total central government revenue (IMF *Country Reports* and Central Bank of Turkey); interest and total government expenditure: central government (IMF *Country Reports*).

FYROM. Consolidated central government for domestic and total debt while general government for external debt, central government revenue (total revenues and grants), (IMF *Country Reports*); interest and total government expenditure: consolidated central government (IMF *Country Reports*).

Albania: Debt: general government, including arrears; total government revenue: taxes and grants (IMF *Country Reports* and Bank of Albania); interest and total government expenditure: general government (IMF *Country Reports*).

Serbia (Montenegro was excluded). Government guaranteed debt was included while IMF was excluded, general government (IMF *Country Reports*); interest and total government expenditure: Ministry of Finance. The data on primary surplus and primary spending for the years prior to 2003 refer to Serbia and Montenegro.

Bosnia-Herzegovina. Debt increases in 2007 reflect the estimated recognition of domestic claims and in 2008 the projected recognition of domestic claims, consolidated general government (IMF *Country Reports* and the Central Bank of Bosnia-Herzegovina, *Annual Reports*); interest and total government expenditure: consolidated general government (IMF *Country Reports* and the Central Bank of Bosnia-Herzegovina, *Annual Reports*).

For SEE countries, the data for GDP (at current and constant market prices in national units) and for CPI inflation (2000=100, year averages) are from the database of *World Economic Outlook*, IMF, April 2009. For EA-16, GDP time series (at current market prices, ESA 95) are from AMECO.

Discussion

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1. Short description of the paper

This paper focuses on determining the concentration rates of the Greek banking system in the South-East Europe. In this attempt, the authors use macroeconomic variables –and particularly fiscal ones, like public debt and deficits– as an instrument in order to determine the benefits and risks for the Greek banks that operate in south-eastern European countries.

The paper is very interesting and it clearly required a lot of work by the authors. In my discussion, I focus on a couple of extensions. Before doing that –and in order to ease my way to these points– I will go through the framework of the paper, seen from another point of view.

Let me start with the <u>government's budget constraint</u>: it shows the relation between revenues (composed of taxes (T), government bonds (B) and seigniorage (S)) and spending (including public spending (G) and the interest (r) paid on government's debt). These can be expressed by the following equation:

$$T_t + B_t + S_t = G_t + \left(1 + r_t\right) \cdot B_{t-1}$$

where after the appropriate rearrangements and dividing by GDP we get the governments' budget constraint at time *t*:

$$b_t = \left(g_t - \tau_t\right) + \frac{1 + r_t}{1 + n_t} \cdot b_{t-1} - s_t \qquad (1)$$

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which can also take the following form.

$$\Delta b_t = \left(g_t - \tau_t \right) + \frac{r_t - n_t}{1 + n_t} \cdot b_{t-1} - s_t \qquad (2)$$

From these equations we can observe that fiscal policy variables (b, g and τ) are related to monetary policy variables (r and s), as well as to the rate of growth of the economy (n).

Let me now turn to the banking sector: since the banks include –among others– government debt in their portfolio, the relevant arbitrage equation relates positively the interest rate on government's bond (r_b) to the probability of default (p) and to the risk free interest rate (r_f) – for example the German interest rate

$$r_b = f\left(\underset{+}{r_f}, \underset{+}{p} \right)$$

Thus, unsustainable public debt, which is related to higher probability of default, is linked with a higher interest rate on government's bonds. This explains the way in which the risk for the banking sector is related to the macroeconomic as well as to the fiscal variables, and it justifies the theoretical framework of the paper just presented. Having said this, I want to turn now to my suggested extensions. These include an alternative way for evaluating the risk and a suggestion regarding the interest rate and debt sustainability.

2. An alternative way to evaluate risk

In order to estimate the risk, the authors look at the variance of macroeconomic variables (using the Capital Asset Pricing Model - CAPM) thus distinguishing between the systematic and the unsystematic part. Alternatively, they could assume that the risk of sovereign bonds depends not only on the expected future path of debt, but also on its entire probability distribution. This is justified by the fact that, even if the expected time

path of debt looks sustainable, it is possible that some realizations of the underlying macro variables (and their interactions) will bring it to levels that are considered (by the creditors) too high. The likelihood of such realizations depends on the variances and covariances of the underlying determinants of the debt ratio. The entire distribution of the future debt ratio can (alternatively) be seen as a function of the nature of the stochastic process that governs these variables (taking into account their interaction).

Thus (following Genberg and Sulstarova 2008) a risk index (for country *i* at time *t)* can be constructed, as shown:

$$Risk_{i,t} = 1 - \frac{\overline{b}_{i,t}}{b_{i,t}^{h}}$$

$\overline{b}_{i,t}$: the mean of debt to GDP ratio for *i* country at time *t*

$b_{i,t}^{h}$: the 95th percentile (or whichever is appropriate) of the distribution of the debt to GDP ratio for country *i* at the horizon *h*.

3. Interest rate for sustainability

My second point is related to the real interest rate the authors use in order to make inferences regarding the sustainability of the government's debt. South-eastern European countries are characterized by both domestic and foreign debt, each related to a corresponding interest rate (*on domestic denominated debt and on foreign denominated debt*). Hence, (instead of looking at the interest rate as being composed by the nominal interest rate less the percentage change of GDP deflator), an interest rate that incorporates both a domestic and a foreign component can be used.

In that case, the real interest rate can be written as the weighted sum of the real interest on domestic denominated debt (r_t^{d}) and the real interest on foreign denominated debt (r_t^{f}), i.e.

$$r_t = r_t^d \cdot \frac{b_{t-1}^d}{b_{t-1}} + r_t^f \cdot \frac{b_{t-1}^f}{b_{t-1}}$$

where

r_t^d : real interest on domestic denominated debt

r_t^f : real interest on foreign denominated debt

b^d : domestic currency denominated debt

b^f : foreign currency denominated debt

b : public debt

4. Sustainability

Turning now to my last point, let me first say that sustainability shows a long-run relationship that requires short-run primary surpluses at a certain level given by the following equation:

$$PS^* = \frac{r_t - n_t}{1 + n_t} \cdot b_{t-1}$$

In the paper, it appears that, at least for some countries, the snowball effect is very important for sustainability and also that there are countries with primary deficits. This fact reveals the structural problems related to public finance, that is, the structure of the tax system and spending. These problems are related to economic as well as to social factors and their relation. They are usually problems that come from the past and they take a long time to be resolved (for example, they require a legal framework, a change on the behavior of the economic agents etc.).

However, since the countries are characterized by both domestic and foreign debt, I would like to suggest an alternative way of examining the link between fiscal and

external sustainability. This involves the national income identity, which relates the trade balance to private investment and saving and to primary balance,

$$TB_t = (S_t - I_t) - D_t \qquad (3)$$

TB_t : Trade balance in real domestic currency

I_t : Private investment

S_t : Private saving

D_t : Primary balance

the evolution of net foreign liabilities, given by the following equation:

$$e_t \cdot F_{t+1} = e_t \cdot R_t^* \cdot F_t - TB_t \qquad (4)$$

F_t : Net foreign liabilities

e_t : Inverse of average real exchange rate

$R_t^* = 1 + r_t^*$: World interest factor

r_t^* : Foreign real interest rate

and the government's budget constraint,

$$B_{t+1} = (1 + r_t) \cdot B_t + D_t \qquad (5)$$

B_t : Government's debt

$R_t = 1 + r_t$

Combining equations (3) to (5) and after the appropriate rearrangements, we end up with:

$$e_t\left(F_t R_t^* - F_{t+1}\right) = \left(S_t - I_t\right) + \left(B_t \cdot R_t - B_{t+1}\right),$$

Forward iteration of which, gives the following dynamic equation:

$$e_t\left(F_t - \lim_{T\to\infty} \frac{F_{t+T+1}}{R^*(t,t+j)}\right) = \left(B_t - \lim_{T\to\infty} \frac{B_{t+T+1}}{R(t,t+j)}\right) + \sum_{j=0}^{\infty} \frac{\left(S_{t+j} - I_{t+j}\right)}{R(t,t+j)} \quad (6)$$

Thus both fiscal and external sustainability requires that these two conditions hold,

$$\lim_{T\to\infty} \frac{F_{t+T+1}}{R^*(t,t+j)} = 0 \quad \text{and} \quad \lim_{T\to\infty} \frac{B_{t+T+1}}{R(t,t+j)} = 0$$

Or, in other words, that –in this case– the dynamic equation takes the form shown

$$e_t \cdot F_t = B_t + \sum_{j=0}^{\infty} \frac{S_{t+j} - I_{t+j}}{R(t,t+j)} \quad e_t \cdot F_t = B_t + \sum_{j=0}^{\infty} \frac{S_{t+j} - I_{t+j}}{R(t,t+j)} \quad (7)$$

Special Conference Papers

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1. Hardouvelis, Gikas, Keynote address: "The World after the Crisis: S.E.E. Challenges & Prospects", February 2011.

2. Tanku, Altin "Another View of Money Demand and Black Market Premium Relationship: What Can They Say About Credibility?", February 2011.

3. Kota, Vasilika "The Persistence of Inflation in Albania", including discussion by Sophia Lazaretou, February 2011.

4. Kodra, Oriela "Estimation of Weights for the Monetary Conditions Index in Albania", including discussion by Michael Loufir, February 2011.

5. Pisha, Arta "Eurozone Indices: A New Model for Measuring Central Bank Independence", including discussion by Eugenie Garganas, February 2011.

6. Kapopoulos, Panayotis and Sophia Lazaretou "International Banking and Sovereign Risk Calculus: the Experience of the Greek Banks in SEE", including discussion by Panagiotis Chronis, February 2011.

7. Shijaku, Hilda and Kliti Ceca "A Credit Risk Model for Albania" including discussion by Faidon Kalfaoglou, February 2011.

8. Kalluci, Irini "Analysis of the Albanian Banking System in a Risk-Performance Framework", February 2011.

9. Georgievska, Ljupka, Rilind Kabashi, Nora Manova-Trajkovska, Ana Mitreska, Mihajlo Vaskov "Determinants of Lending Rates and Interest Rate Spreads", including discussion by Heather D. Gibson, February 2011.

10. Kristo, Elsa "Being Aware of Fraud Risk", including discussion by Elsida Orhan, February 2011.

11. Malakhova, Tatiana "The Probability of Default: a Sectoral Assessment", including discussion by Vassiliki Zakka, February 2011.

12. Luçi, Erjon and Ilir Vika "The Equilibrium Real Exchange Rate of Lek Vis-À-Vis Euro: Is It Much Misaligned?", including discussion by Dimitrios Maroulis, February 2011.

13. Dapontas, Dimitrios "Currency Crises: The Case of Hungary (2008-2009) Using Two Stage Least Squares", including discussion by Claire Giordano, February 2011.