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Stops and Bonanzas in the EU: Does Being Part of the Euro Area Make a Difference?

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Abstract

In this paper, we investigate whether being part of the euro area influences the conditional probability of going through a sudden stop or a bonanza of capital flows. Our sample period is from 1995 until 2014. We identify these two phenomena and we evaluate which push and pull factors help predict the conditional probability of experiencing one of them. We find that most countries had significant capital inflows until 2008 and that there were more sudden stops during the recent financial crisis than in any other moment in our sample. The factors that better help forecast the conditional probability of a sudden stop are global uncertainty (represented by the push factor "Volatility Index"), and the domestic economic activity (pull factors "GDP growth" and "consumer confidence"). An indicator of country risk (pull factor "change in credit rating") is the most significant one for predicting bonanzas. Ultimately, we find no evidence that being part of the euro area influences the conditional probability of going through a sudden stop or a bonanza.

Keywords: capital flows, sudden stops, bonanzas, push and pull factors, European Union

Contents

1. Introduction

High capital mobility creates challenges to policy makers (Calvo and Reinhart, 1999; Calvo, 2003). Bonanzas of capital flows consist in large and rapid increases of foreign capital inflows (Reinhart and Reinhart, 2008), which can lead to lending booms and a rise in asset prices. They can also be followed by a sudden stop of capital flows. These sudden stops, on the other hand, are large and unexpected reductions in international capital flows (Calvo, 2003), which can limit the financing sources and, therefore, affect the total amount of output produced by an economy (Cúrdia, 2008). Moreover, they origin bankruptcies, currency or banking crisis and decrease the productivity of the existing capital stock (Calvo and Reinhart, 1999; Caballero and Krishnamurthy, 2004; Calvo, 1998).

Sudden stops and bonanzas have been identified and extensively analyzed in the literature for emerging economies (e.g. Calvo, Leiderman and Reinhart, 1993; Chuhan, Claessens and Mamingi, 1993; Yazdani and Tayebi, 2012; Hutchison and Noy, 2006; Sula, 2006), but only a small number of authors studied them for Europe. During the recent financial crisis, sudden stops became more frequent and there was a reawakening of the debate about these extreme capital flow movements and the factors behind them. Some authors addressed the particular case of the EU (e.g. Alcidi and Gros, 2013; Merler and Pisani-Ferry, 2012), and some of them pointed out that the current account imbalances that had been accumulated over time with the significant capital flows from the core countries of the EU to the periphery were actually a reflection of the specific problems that were affecting some countries (Alcidi and Gros, 2013). This adverse environment eventually led to a sudden stop in the capital flows to the periphery countries, although the financing channel of the Euro system protected the banking systems of the euro countries from its immediate effects (Merler and Pisani-Ferry, 2012; Alcidi and Gros, 2013). Nevertheless, other authors argued that being part of the euro

area let the countries more vulnerable and exposed to these capital flow reversals (e.g Paul de Grauwe, 2011)[1]. Still, none of the existing literature actually formally tested if being part of the euro area amplified these vulnerabilities. Therefore, in our paper we contribute to the literature by analyzing if being part of the euro area influences the conditional probability of a sudden stop or of a bonanza, distinguishing between euro and non-euro countries. In contrast to previous studies which focus in a broad variety of countries or only in emerging economies, we focus on all European Union countries from 1995 until 2014. We follow the methodology of Merler and Pisani-Ferry (2012) to identify these extreme capital flow movements, and we test for the most relevant push and pull factors that explain them following the approach suggested by Forbes and Warnock (2011). We then add a dummy variable for the euro area to test the hypothesis of whether being part of the euro area influences (or not) the probability of a sudden stop or of a bonanza. In line with the existing literature, we divided the determinants of capital flows into push - external variables outside the country's control - and pull factors - related to domestic economic conditions and policies- (e.g Calvo, Leiderman and Reinhart, 1993).

We discover that there were significant capital inflows for most EU countries until 2008 and that there were more sudden stops during the recent financial crisis than in any other moment in our sample, although the precise timing in which these sudden stops occurred varied across countries. Moreover, almost all countries had a huge drop in private capital inflows at some point between 2008 and 2012, even though some of them did not reach a sudden stop. We also find evidence that proportionally, euro countries experienced more bonanzas, but also more sudden stops, than the non-euro

[1] "Because of the liquidity flows triggered by changing market sentiments, member countries of a monetary union become vulnerable to these market sentiments. These can lead to "sudden stops" in the funding of the government debt (Calvo 1988), setting in motion a devilish interaction between liquidity and solvency crises. For the liquidity crisis raises the interest rate which in turn leads to a solvency crisis. This problem is not unique for members of a monetary union. It has been found to be very important in emerging economies that cannot issue debt in their own currencies." **De Grauwe, Paul. 2011. "*Managing a Fragile Eurozone*" (Voxeu article)**

ones. In addition, we test which push and pull factors are more important in determining the conditional probability of going through one of these phenomena. We find that global uncertainty (represented by the push factor "Volatility Index") and the domestic economic activity (pull factors "GDP growth" and "consumer confidence") are the most consistently significant factors to predict the probability of experiencing a sudden stop. On the other hand, the indicator of country risk (pull factor "change in credit rating") is the one that better helps forecast bonanzas. Our findings are accordingly to the recent theoretical literature that argues that global risk is the main source of crises, but suggest that in this particular period global liquidity has not been a major driver of capital flows. Ultimately, we find no evidence that being part of the euro area influences the probability of going through a sudden stop or a bonanza.

As to the structure of the paper, section 2 reviews the literature on sudden stops, bonanzas and push and pull factors, as determinants of capital flows; section 3 focuses on our identification of sudden stops and bonanzas; section 4 reports the estimation strategy used to discover what are the most relevant push/pull factors, the results associated with it and the sensitivity tests performed; and section 5 presents the final remarks.

2. A Brief Literature Review

A. Sudden Stops and Bonanzas

Economic theory argues that free capital movement across countries is beneficial since it leads to an efficient allocation of resources, faster capital accumulation, technological catch up and economic growth. Nevertheless, large fluctuations of capital flows can also create challenges for policy makers (Calvo and Reinhart, 1999; Calvo, 2003).

Bonanzas (or surges) are characterized by large and rapid increases of foreign capital inflows (Reinhart and Reinhart, 2008). They can have negative impacts on a country's competitiveness through an appreciation of the real exchange rate and they can cause an

increase in the asset prices, lending booms and financial risks. Moreover, since they are temporary events, they can eventually end up in sudden stops (Montiel, 2003).

Calvo (2003) described sudden stops as large, clear and unexpected reductions in international capital flows. These phenomena limit the financing sources and, therefore, affect the total amount of output produced by an economy (Cúrdia, 2008). After going through a sudden stop, the country needs to adjust through a reversal of the current account (unless it receives a large balance of payments assistance), which in general comes with a contraction of the economic activity. Often, central banks are induced to raise interest rates in order to reduce the drain of capital (Caballero and Krishnamurthy, 2004). Moreover, sudden stops can origin bankruptcies, currency or banking crisis and decrease the productivity of the existing capital stock (Calvo and Reinhart, 1999; Caballero and Krishnamurthy, 2004; Calvo, 1998). These phenomena also lead to monetary policy challenges by causing higher volatility of inflation, output and interest rates (Fraga et al, 2003).

Merler and Pisani-Ferry (2012) analyzed extreme capital flow movements for Spain, Greece, Ireland, Portugal and Italy, and found that all of these countries experienced sudden stops at some point between 2002 and 2011. In particular, they showed that sudden stops were concentrated in 2008, the spring of 2010 and the second half of 2011. Alcidi and Gros (2013) considered only GIIPS (Greece, Ireland, Italy, Portugal and Spain) and BELL (Bulgaria, Estonia, Latvia and Lithuania) countries, and found that non-euro countries had a shorter and more acute adjustment after a sudden stop than the euro ones. They argued that the main possible causes for this difference were the availability of credit, and different fiscal policies and patterns of bank ownership.

B. Determinants of Capital Flows: Push and Pull Factors

Push factors are external variables outside the host (capital importing) country's control. Examples of push factors are global shocks to liquidity, risk/uncertainty and asset

prices. Pull factors, on the other hand, are related to domestic economic conditions, policies and performance, as well as the country's institutions and creditworthiness. Calvo, Leiderman and Reinhart (1993) were pioneers in discussing the determinants of capital flows and distinguishing between push and pull factors. They believed it were push factors (such as a decrease in interest rates and recession in some industrial countries) that drove capital flows to emerging economies. Fernandez-Arias (1996) argued about the importance of push factors (in particular, low US interest rates) in the evolution of capital flows to emerging economies, stating that these low international interest rates allowed some highly-indebted countries to improve their creditworthiness and increase their capital inflows. Conversely, other authors considered that capital flows for emerging economies were instead more driven by pull factors (see for example, Mody, Taylor and Kim, 2001; Dasgupta and Ratha, 2000). Montiel and Reinhart (1999) stressed that these two factors were complementary for developing countries: push factors determined the timing and scale of the flows, while pull factors determined their geographical distribution.

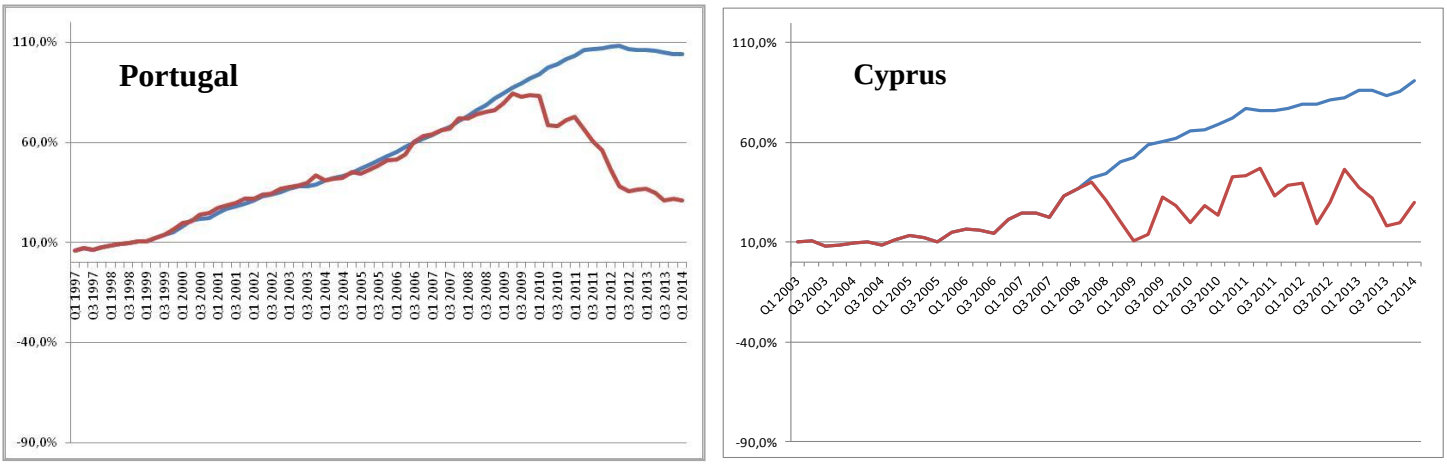
As for the recent financial crisis, Fratzscher (2011) analyzed data for advanced and emerging economies, and found that push factors (mainly, shocks to liquidity and risk) were important drivers of capital flows from 2005 to 2008. However, since 2009, pull factors seemed to better explain the pattern of capital flows, in particular for emerging economies. Forbes and Warnock (2011) included over fifty emerging and developed countries in their sample and showed that surges, flight, retrenchment and stop phenomena had some global, contagion and domestic components, even though the most important were the first ones. Ghosh et. al. (2012) argued that global factors were more likely to be responsible for the occurrence of an inflow surge in an emerging economy, while domestic factors were more likely to be responsible for the size of it.

3. Identifying Sudden Stops and Bonanzas

The first step of our investigation is to identify episodes of bonanzas and of sudden stops in our sample, which consists in all EU countries from 1995 to 2014. In doing so, we first need to define a measure of capital flows in which our calculations will be based. We follow the methodology of Merler and Pisani-Ferry (2012) who constructed a measure of "private" capital inflows which consisted in the financial account as a whole, net of official inflows from changes in Target 2 balances and assistance under IMF/EU programs (refer to table 1 in appendix for alternative measures of private capital inflows). This measure allows us to get a better understanding of the capital flows during this period and to get more realistic results. Unlike Merler and Pisani-Ferry (2012), we use quarterly data for the financial account obtained from Eurostat, since most of the sources that had this data available for all EU countries only offered this or annual frequency. The monthly values for Target 2 balances are from the "Eurocrisis Monitor" and were adapted to quarterly data by assigning the values available for March, June, September and December to the first, second, third and fourth quarters, respectively. We consider this data from the earliest period available, even though it is not the same for all European countries. The inflows from assistance under IMF/EU programs are from the European Commission and the IMF. They were also only available at a monthly frequency, so we adapted them to quarterly data by grouping them together. Data on IMF disbursements were on SDRs and were converted to Euros using end of period exchange rates. We take into account all the countries that are currently part of the European Union, even though some of them weren't at the beginning of the data under analysis. France is excluded from our sample because of data availability. After calculating our measure of "private" capital inflows for all countries in each quarter, we compute the total (financial account) and "private" cumulated capital inflows in percentage of the 2007 GDP at current market prices.

Figure 1 represents this for Portugal and Cyprus and also offers evidence about the sudden stops and bonanzas that they experienced. The remaining graphs are reported in appendix.

<u>Figure 1:</u> Total and Private Capital Inflows, Cumulated (in % of 2007 GDP)



Note: The blue line represents total inflows and the red line stands for "private" capital inflows. Source: Own calculations based on data taken from Eurostat, Euro Crisis Monitor, the IMF and the European Commission.

These cumulative graphs show that Cyprus experienced a drop in "private" capital inflows during the second quarter of 2008, and that Portugal also suffered a tremendous decrease in these inflows in the first quarter of 2010.

Looking at the cumulative graphs of all EU countries, some of them always presented financial account surpluses between 1995 and 2014. Denmark, Germany, Luxembourg, Netherlands, Austria, Finland and Sweden had financial account deficits at some point. Our measure of "private" capital inflows suggests that most countries experimented significant capital inflows until the 2008 financial crisis and that a lot of them had sudden stops and capital outflows afterwards, as a result of the economic environment. The outflows were particularly large for southern European countries such as Portugal, Greece, Ireland, Italy, Spain and Cyprus. The outflows were also significant, although smaller, for countries like Bulgaria, Estonia, Lithuania, Latvia, Hungary and Romania. The exact time in which the reversals occur, though, differs across countries. In Greece,

Ireland, Latvia and Hungary outflows started earlier (2008/2009), while in Portugal, Spain and Italy outflows began in 2010/2011.

Note that some of the bonanzas and sudden stops that we identify are a reflection of what was going on in other countries. That is, some countries (like Sweden, Netherlands, Germany, Finland, Belgium, Austria, Luxembourg) experienced "surges" during the 2008 financial crisis because the capital that was flowing out of some countries went to these ones that were not in such bad conditions. Similarly, in 2013, Germany, Netherlands and Finland had a "sudden stop" due to the improved conditions that were felt in the periphery countries and that made capital flow from the former to these ones.

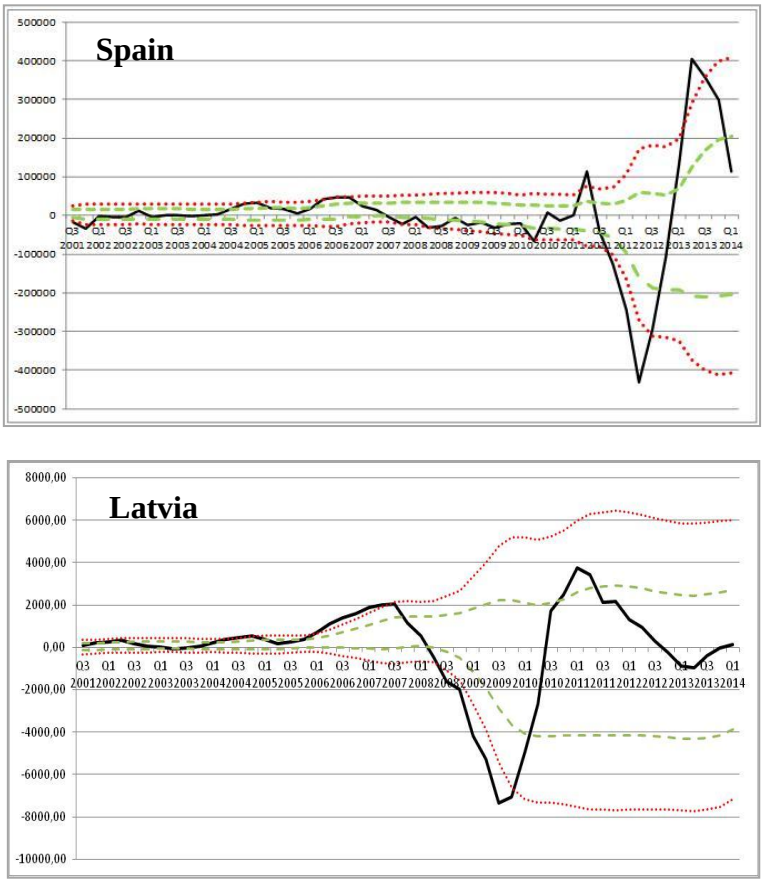
Having defined a measure of "private" capital flows, we now use the methodology proposed by Calvo et. al (2004) to identify the episodes of bonanzas and of sudden stops in our sample. Although, there are many alternative definitions of sudden stops and bonanzas (see table 2 in appendix for a detailed description of these definitions), we choose Calvo et. al's (2004) approach because it allows us to detect the moment in which a sudden stop or surge occurred and their duration, (Merler and Pisani-Ferry, 2012), and also because it captures the "unexpected" and "persistent" part of these phenomena (Calvo et. al, 2004).

Following Calvo et al. (2004), we define a criterion to identify surges and sudden stops based on a threshold: a sudden stop starts when the year-over-year change in "private" capital inflows goes through the one standard deviation (bellow its historical rolling mean) line ("unexpected" part of a sudden stop) and it ends when it crosses back that same line, provided that the year-over-year change in "private" capital inflows falls below the two standard deviation line at some point between that ("persistent" part of a sudden stop). The same reasoning applies to bonanzas but with the threshold being one

standard deviation above the historical rolling mean. Although Calvo et al.(2004) used monthly data, we adapted it to fit our quarterly data, following Forbes and Warnock (2011). First, we compute a 4-quarter moving sum of St and year-over-year changes in St. Then, we calculate historical rolling means and standard deviations of these year-over-year changes in St over the last twenty quarters. Since we compute historical rolling means and standard deviations over the last twenty quarters, we can only identify these phenomena from the third quarter of 2001 until 2014. For some countries, however, the identification starts a bit after 2001 because the necessary data to calculate private capital inflows is only available after 1999 (refer to table 3 in appendix for a thorough description of the period representation).

Figure 2 shows the year-over-year changes in "private" capital inflows and the corresponding thresholds for Spain and Latvia, using Calvo et. al's (2004) approach. The remaining graphs are presented in appendix.

Figure 2: Construction of Sudden Stops and Bonanzas



Note: The black line represents the year-over-year change in "private" capital inflows, the red line stands for the two standard deviation threshold and the green one for the one standard deviation threshold.

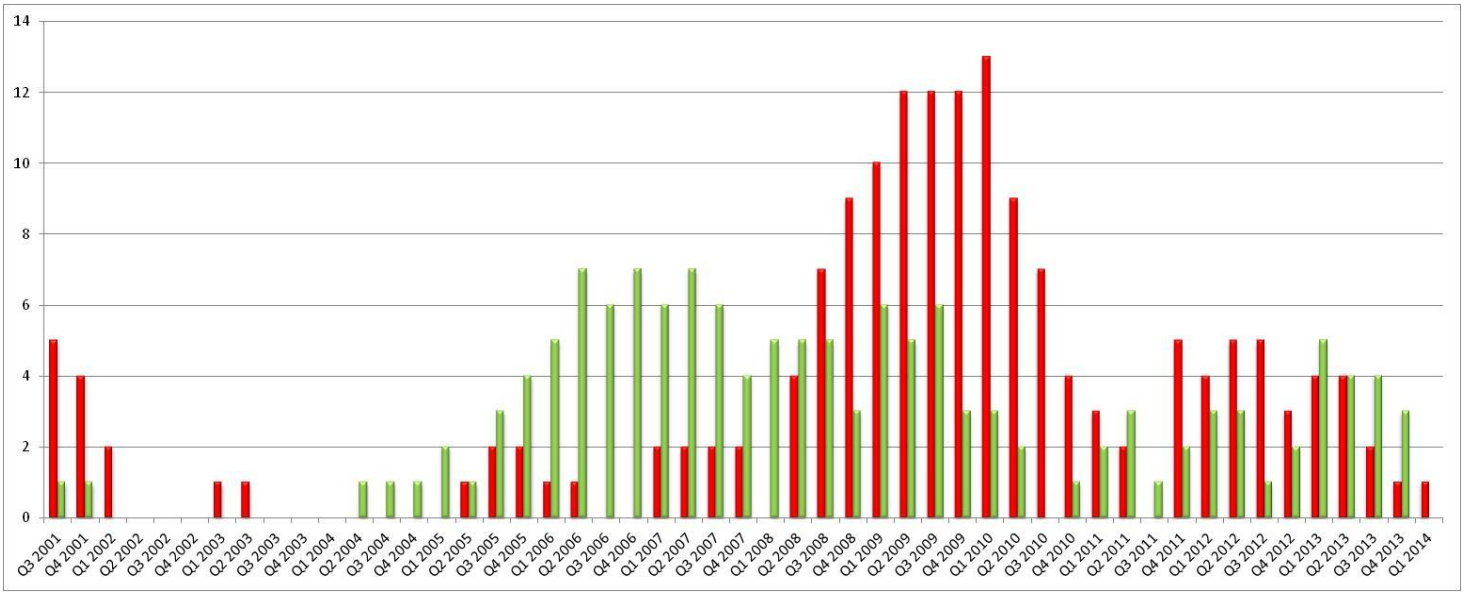
Source: Own calculations based on data taken from Eurostat, Euro crisis monitor, the IMF and the European Commission.

These graphs suggest that during the recent financial crisis, Spain experienced a sudden stop from the fourth quarter of 2011 until the third quarter of 2012, and a "bonanza" between the first quarter of 2013 and the fourth quarter of 2013. Latvia, on the other hand, had a sudden stop from the second quarter of 2008 until the first quarter of 2010. Through the analysis of these graphs and the ones in appendix it is evident that almost all countries had a huge drop in "private" capital inflows at some point between 2008 and 2012, even though some of them did not reach a sudden stop. Moreover, the graphs show that "private" capital inflows were much less volatile before the 2008 financial crisis.

Besides the previously mentioned measure of "private" capital inflows (baseline measure), we computed one which excludes foreign direct investment (FDI), since it is argued that this type of capital flow is driven by long term profit opportunities and, hence, less likely to be disturbed by short term changes in market sentiment (Levchenko and Mauro, 2006). When we took FDI from our measure of "private" capital inflows, the periods of sudden stop and bonanza changed significantly for several countries, and we identified much more periods of bonanzas than with the baseline measure.

Taking into account the baseline measure of "private" inflows, figure 3 represents the number of countries that experienced **sudden stops (red bars)** and **surges (green bars)** in each quarter.

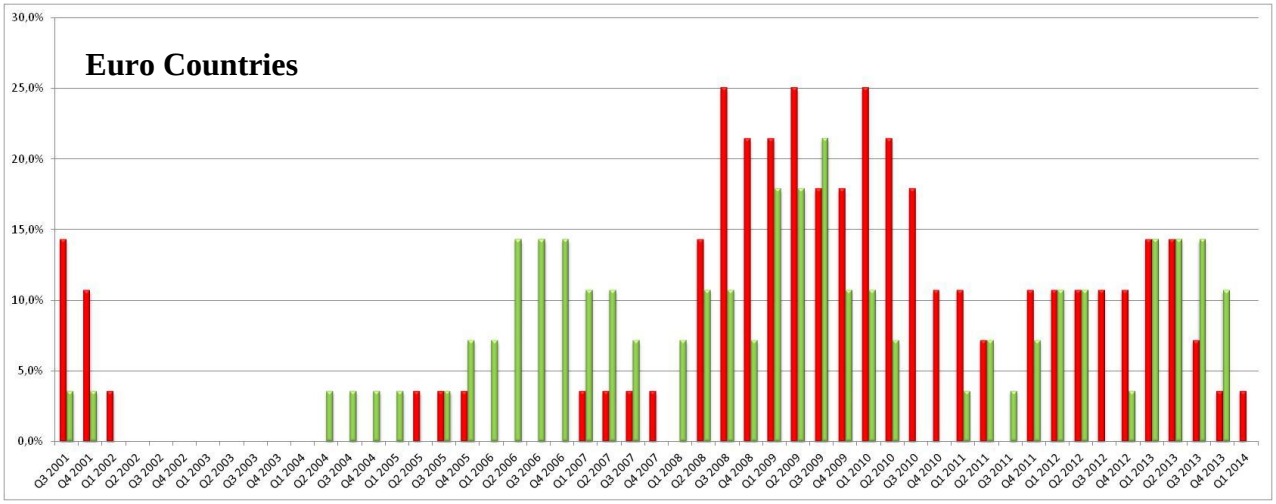
Figure 3: Countries in Sudden Stop and Bonanza

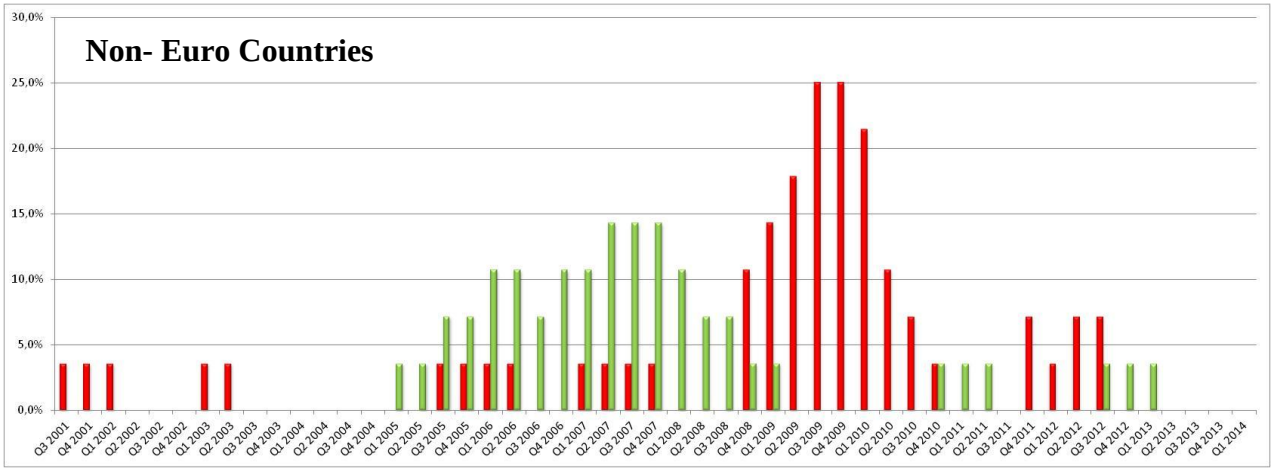


Source: Own calculations based on data taken from Eurostat, Euro crisis monitor, the IMF and the European Commission.

This figure shows that there was a tremendous increase in sudden stops during the 2008 crisis. Moreover, there were more countries experiencing sudden stops in the first quarter of 2010 and more experiencing surges in the second and fourth quarters of 2006 and second quarter of 2007. The graph for the measure of "private" capital inflows without FDI was similar to this one. Figure 4 shows two analogous charts in which we separated the EU between euro and non-euro countries.

Figure 4: Euro and Non-Euro Countries in Sudden Stop and in Bonanza (in % of total EU countries)





Source: Own calculations based on data taken from Eurostat, Euro crisis monitor, the IMF and the European Commission

These last two graphs show that there were more euro countries experiencing bonanzas, but also more sudden stops than the non-euro ones between 2001 and 2014.

Table 3 in appendix presents an exhaustive list of all sudden stops, surges and respective dates for each country between 2001 and 2014. From this table, we are able to distinguish a number of "waves" in terms of capital inflows and capital flow reversals. These "waves" were **2001 and 2002:** The terrorist attacks to the US, the increase in oil prices, and the burst of the dot-com bubble in 2000 deeply affected the EU countries. As a result, capital started flowing out of some EU countries; **2003 to 2006:** In May 2004, ten new members (Estonia, Latvia, Lithuania, Poland, Czech Republic, Hungary, Slovakia, Slovenia, Cyprus, Malta) joined the EU. Due to the positive expectations from this adhesion and the favorable economic environment, they experienced bonanzas.[2] Also, countries like Bulgaria and Romania had a surge of capital inflows due to successful economic policies that were implemented and an increasingly secure EU accession in the near future; **2007:** Given the attractive economic conditions, some countries were experiencing a boom by 2007, with surges of

[2] Although we aren't able to identify surges for all of these countries through Calvo et. al's (2004) method, we observe in the cumulative graphs that private capital inflows continue to rise during this period.

capital flows, unsustainable growth, strong leveraging and the development of bubbles in the real estate sector. This started to give rise to large imbalances, financial vulnerabilities and overheating; **2008 and 2009:** After the Lehman-Brothers bank filed for bankruptcy, many EU countries experienced a sharp reversion of capital flows due to a decrease in demand and output; **2010:** From 2009 to 2010, financial market conditions improved and a small and uneven recovery started to take place due to exceptional crisis measures that were implemented. Nevertheless, Greece, Portugal and Ireland asked for external help; **2011 and 2012:** The international economic conditions deteriorated and the sovereign debt crisis aggravated, causing more capital outflows; **2013:** Some of the periphery countries of the EU that had entered a recession in 2008 started to show signs of recovery and, consequently, experienced a "surge" in capital flows.

4. Uncovering the Determinants of Capital Flows

A. Data and Methodology

After discovering the sudden stops and surges that occurred between 2001 and 2014, we assess which push and pull factors better help forecast the conditional probability of going through one of these phenomena and, ultimately, if being part of the euro area influenced it.

We decide to choose Germany, the United Kingdom and the United States as the "center economies", where capital is flowing from. Hence, these are the countries considered for the push factors.

Recent authors suggested a division of push factors can be divided into risk (Bacchetta and Van Wincoop, 2010); liquidity and credit (Brunnermeier, 2009); wealth and leverage (Dedola and Lombardo, 2010; Devereux and Yetman, 2010). As for the pull factors, the literature has emphasized four main domestic economic fundamentals: size

and strength of the financial system (Forbes, 2010); financial market liberalization (Milesi-Ferretti and Tille, 2010); growth and productivity (Broner et al., 2010). In order to capture some of these different factors, we selected the following variables as push factors: the Volatility Index (VIX) from the Chicago Board Options Exchange as a measure of global risk, and the year-over-year growth in money and quasi-money (M2) as a measure of global liquidity. Although many authors include interest rates among the push factors, we decide not to because they can be a cause but also an effect of sudden stops or bonanzas. In addition, the large interest rate cuts made by Central Banks in response to the 2008 financial crisis would change the expected sign for the regression's coefficient.

As for the pull factors, we focus on a consumer confidence index; the change in sovereign credit rating, which reflects the issuer's creditworthiness and its ability to meet its debt obligations; public debt to GDP ratio, as an indicator of the country's fiscal position and leverage; and the real GDP growth.

The monthly values for the push factor "VIX" and for the pull factor "consumer confidence" were converted through quarterly averages. We consider the M2 stock for the EU (push factor) as the one for the ECB. Furthermore, data for the real GDP was at an annual frequency and it was transformed to quarterly using the "frequency conversion" function of Eviews. We use the S&P's credit rating (local currency long term debt) and changed it into a quantitative variable by assigning a number to each rating, with the lowest value corresponding to the highest rating (AAA = 1). Through this attribution, we implicitly assume that there is an equal probability of moving from one rating to another, no matter the rating position that you are in at that moment or that you were in the past. In the regressions, we use the change in credit rating since it is a better representation of the deteriorating/improving creditworthiness of a country. We

also use the change in public debt because the original variable had a unit root (not stationary). Moreover, in order measure if we have a multicollinearity problem in our regressions, we calculate the correlations between independent variables (see figure 5 in appendix). In our calculations, we assume that the conditional probability of being in a sudden stop or surge today does not depend on being in sudden stop or surge in the previous period.

After having all the necessary data, we initially estimate a probit model following Forbes and Warnock (2011):

$$Prob(eit = 1) = F(\beta 1 * \theta t - 1 + \alpha i) \quad (1)$$

where eit is a dummy variable, equal to one if the country is experiencing a surge or a stop phenomenon in quarter t; θt-1 is a measure of the push factor in the previous quarter; and αi are country dummy variables. At this point, we consider only one push factor at a time and leave the pull factors to be captured in the country dummies. Again following Forbes and Warnock (2011), we estimate equation (1) using a complementary logarithmic since sudden stops and bonanzas do not occur in a regular, but in a skewed way and, therefore, the cumulative distribution function is not symmetric. Moreover, in order to be able to correctly interpret the coefficient results, we compute the marginal effects of the explanatory variables. We can't simply interpret the coefficients as in a linear regression because in a complementary logarithmic model they are exponential. Afterwards, we use a similar model but with more push and pull factors, to find out specifically which ones are more relevant to explain the probability of going through a sudden stop or bonanza. That is, we estimate the equation:

$$Prob(eit = 1) = F(\beta 1 * \theta t - 1 + \beta 3 * \alpha i, t - 1) \quad (2)$$

similar to (1) but where θt-1 and αi, t-1 are vectors of push and pull factors, respectively.

Instead of estimating a probit model, Fratzscher (2011), for example, used a factor model with a set of push and pull factors and a financial crisis dummy variable, and Hernández and Rudolph (1997) estimated a model in which the dependent variable was the total long-term private flows in percentage of GNP and the independent variables were economic indicators such as the volatility of the real effective exchange rate and US interest rates.

Note that the number of observations varies between regressions because we have to exclude from our calculations the countries that don't have any sudden stops or bonanzas (the dependent variable is always equal to zero) during the period under analysis. We also perform several sensitivity analysis applying a different estimation method (probit instead of the complementary logarithmic); using additional "interaction" variables; focusing only in the countries that experienced sudden stops during the crisis period (between the first quarter of 2008 and the last quarter of 2010); and concentrating exclusively on GIIPS (Greece, Italy, Ireland, Portugal and Spain) and BELL (Bulgaria, Estonia, Latvia and Lithuania) countries.

B. Empirical Results

The table below shows the results obtained for regression (1) for both phenomena.

	Baseline		Without FDI	
	Sudden Stops	**Bonanzas**	**Sudden Stops**	**Bonanzas**
VIX (risk)	0.0660*** (0.0101)	-0.0267 (0.0389)	0.0527*** (0.0130)	-0.0374 (0.0280)
Country dummies	χ2 ***	χ2 ***	χ2 ***	χ2 ***
Observations	1300	1144	1144	1144
M2 growth (liquidity)	-0.2032*** (0.0649)	0.1240 (0.1076)	-0.1856** (0.0804)	0.1577* (0.0841)
Country dummies	χ2 ***	χ2 ***	χ2 ***	χ2 ***
Observations	1300	1144	1144	1144

Note: * is significant at 1% level, ** at 5% level and * at 10% level.**

It reports the respective marginal effects, standard deviations (in brackets) and significance levels for each variable. We also compute a χ^2 joint significance test for the country dummies. Considering our baseline measure of "private" capital inflows, VIX and M2 growth are highly significant when predicting sudden stops, but not significant for surges. VIX presents a marginal effect of 0,0660 for sudden stops, which indicates that for each unit increase in VIX, the conditional probability of going through a sudden stop goes up by an estimated 6,6%, ceteris paribus. That is, in periods of high volatility and uncertainty, capital is more likely to stop flowing to countries. M2 growth, on the other hand, is negatively correlated with the probability of sudden stops: if there is a one unit increase in the year-over-year growth in M2, the probability of experiencing a sudden stop decreases by 20,32%, ceteris paribus. Since this variable is a measure of global liquidity, it is expected that when it increases (through quantitative

easing or an equivalent measure), sudden stops of capital flows to other countries become less frequent. Furthermore, the χ^2 tests for the country dummies indicate that they are jointly statistically significant in the two regressions. For our "private" capital inflows' measure "without FDI", the variable "growth in M2" becomes significant when forecasting bonanzas.

The tables below report the results for two additional regressions, in which we assess the effects of specific push and pull factors in determining the probability of going through one of these two phenomena. In regression (A) we use GDP growth as one of the pull factors, and in the other one (B) we use the consumer confidence index instead. Since these two variables are highly correlated, we can't include them simultaneously in the regression.

	Baseline		**Without FDI**	
	Sudden Stops	**Bonanzas**	**Sudden Stops**	**Bonanzas**
Push Factors				
VIX (risk)	0.0285* (0.0168)	-0.0180 (0.0341)	0.0301* (0.0160)	-0.0302 (0.0275)
M2 growth (liquidity)	-0.1529 (0.0935)	0.1206921 (0.1044275)	-0.1480 (0.0927)	0.1624** (0.0769)
Pull Factors				
GDP growth (activity)	-0.2702** (0.1209)	0.0702 (0.1841)	-0.2402** (0.1137)	0.0793 (0.1756)
Change in public debt (fiscal position and leverage)	0.0598* (0.0313)	0.0353 (0.0544)	0.0563** (0.0282)	0.0490 (0.0607)
Change in credit rating (creditworthiness)	-0.0467 (0.1120)	0.4557** (0.1835)	-0.2450** (0.1238)	0.2964* (0.1747)
Euro Area Dummy	0.0474 (0.2931)	-0.2872 (0.2969)	-0.0467 (0.2170)	0.1530 (0.1648)
Observations	1272	1122	1119	1122

	Baseline		Without FDI	
	Sudden Stops	**Bonanzas**	**Sudden Stops**	**Bonanzas**
Push Factors				
VIX (risk)	0.0321** (0.0162)	-0.0178 (0.0362)	0.0329** (0.0159)	-0.0316 (0.0342)
M2 growth (liquidity)	-0.1127 (0.0998)	0.1139 (0.0974)	-0.1074 (0.0987)	0.1545** (0.0720)
Pull Factors				
Consumer confidence index (activity)	-0.0338** (0.0159)	0.0089 (0.0260)	-0.0304** (0.0159)	0.0111 (0.0277)
Change in public debt (fiscal position and leverage)	0.0498*** (0.0262)	0.0367 (0.0512)	0.0474* (0.0249)	0.0548 (0.0594)
Change in credit rating (creditworthiness)	-0.0641 (0.1061)	0.4690** (0.1902)	-0.2596** (0.1167)	0.3028* (0.17402)
Euro Area Dummy	-0.0577 (0.2818)	-0.2935 (0.2863)	-0.0563 (0.1989)	0.1403 (0.1741)
Observations	1241	1116	1088	1116

Note: * is significant at 1% level, ** at 5% level and * at 10% level.**

Considering the baseline measure of "private" capital inflows, we estimate regression (A) and find that VIX, GDP growth and change in public debt are significant in predicting the probability of sudden stops. However, only the change in credit rating is meaningful for bonanzas. The results for regression (B) are similar, with the alternative variable "consumer confidence index" also being statistically significant for sudden stops. For both regressions, higher levels of risk are positively associated with sudden stops. On the contrary, higher GDP growth and consumer confidence are negatively connected to them. That is, when there is more growth in the economy or the consumer confidence rises, sudden stops are less likely to occur. We also find evidence that when a country is more publicly indebted, sudden stops' conditional probability goes up. For the "private" capital inflows' measure "without FDI", VIX, GDP growth (or consumer

confidence) and the change in public debt remain significant for sudden stops, and the change in credit rating becomes relevant for both types of phenomena, reporting a positive coefficient for bonanzas and a negative one for sudden stops. Therefore, when the change in credit rating decreases by one unit, there is a higher risk of default which discourages capital flows to that country and makes sudden stops more likely. Moreover, for this particular measure, M2 growth is a significant push factor for bonanzas in regressions (A) and (B). We find no evidence that being part of the euro area influences the probability of experiencing a sudden stop or a surge since the "euro area dummy variable" is never significant.

In order to have a more thorough empirical analysis, we conduct a series of sensitivity tests on the results, to determine if that would modify our conclusions. We discover that forecasting the regressions with a probit (instead of a complementary logarithmic) model gives identical results. In addition, we estimate the regressions with additional "interaction terms" between the euro area dummy and the pull factors to see if being part of the euro area along with one of these variables would be significant to predict these two phenomena. We find that in the baseline measure the "interaction" term with the variable "growth in M2" and the one with "GDP growth" (or "consumer confidence" for regression B) are highly significant for bonanzas and have a negative coefficient. This negative correlation indicates that if one these indicators varies x, the probability of going through a surge varies less x than compared to the situation in which the country does not belong to the euro area (dummy variable is equal to zero). Also, the "interaction" with the change in public debt is relevant for forecasting bonanzas and sudden stops in the baseline measure of "private" capital inflows. For bonanzas, for example, if the change in public debt varies x, the probability of experiencing a bonanza varies more x than in the situation in which the country is not a

part of the euro area. Furthermore, when focusing exclusively in the crisis period and in the countries that experienced sudden stops during that time, we find no evidence that the euro area dummy variable is significant for predicting these phenomena. This last sensitivity analysis allows us to distinguish between the countries that actually suffered unexpected drops of capital inflows and the ones that only did because they functioned as a "refuge" of capital flows from other countries during the financial crisis.

Finally, we estimate a regression considering only Greece, Ireland, Italy, Portugal, Spain (GIIPS) and Bulgaria, Estonia, Latvia and Lithuania (BELL) following the same approach as Alcidi and Gros (2013). In their paper, they argued that the ECB let the euro countries maintain current account deficits for longer periods, allowing a slower and less sharp correction of the imbalances in the euro area. Hence, they believed that the ECB was the main difference between the adjustment of the euro countries and the non-euro area ones, who didn't have a similar institution. Our results do not give support to their claim since in this regression, the euro area dummy variable remains insignificant for forecasting the conditional probability of experiencing sudden stops and bonanzas.

5. Concluding Remarks

The recent financial crisis was accompanied by a tremendous increase in capital flow volatility and an exceptional number of sudden stops. There was a reawakening of the debate about these extreme capital flow movements and the factors behind them, with some authors addressing the particular case of the EU. Some of them believed that being part of the euro area let the countries more vulnerable and exposed to these capital flow reversals, but none formally tested it.

In our paper, we use a methodology that allows us to test if being part of the euro area influenced the conditional probability a sudden stop or a bonanza. We follow the approach of Merler and Pisani-Ferry (2012) to identify sudden stops and bonanzas and

we estimate which push or pull factors are more important to predict the probability of going through one of these phenomena, following Forbes and Warnock's (2011). We then add a dummy variable for the euro area to test the hypothesis of whether being part of the euro area influences (or not) the probability of a sudden stop or of a bonanza.

Our analysis finds that almost all countries experienced considerable capital inflows from until 2008. Afterwards, they decreased sharply and a lot of countries went through a sudden stop during the financial crisis. The outflows were substantial for periphery countries such as Portugal, Greece, Ireland, Italy and Spain, and for Eastern countries like Bulgaria, Estonia, Latvia, Lithuania, Hungary and Romania. Moreover, through our method we identify several episodes in which most sudden stops and bonanzas are clustered and are able to relate them to the economic environment of that particular moment. As for the push and pull factors, global uncertainty (represented by the push factor "Volatility Index") and the domestic economic activity (pull factors "GDP growth" and "consumer confidence") are the most consistently significant ones to predict the probability of experiencing a sudden stop. The indicator of country risk (pull factor "change in credit rating") is the one that better helps forecast bonanzas. Hence, our estimations suggest that sudden stops are driven by push and pull factors, while bonanzas are driven only by pull factors. Although we find that euro countries experienced more bonanzas and more sudden stops than the non-euro ones, we don't find any significant evidence that being part of the euro area alone influences the probability of experiencing one of these two phenomena.

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Appendix

Table 1: Alternative Measures of Private Capital Inflows

Study	Measures
"Capital Flow Bonanzas: An Encompassing View of the Past and Present", Carmen M. Reinhart and Vincent R. Reinhart (2008)	Reserve accumulation minus the current account balance
"Capital Flow Waves: Surges, Stops, Flight and Retrenchment", Kristin J. Forbes and Francis E. Warnock (2011)	Quarterly current account balance minus monthly changes in international reserves
"Private Capital Inflows and the Role of Economic Fundamentals", Vittorio Corbo and Leonardo Hernández (1998)	Sum of foreign direct investment, portfolio equity flows and long-term private debt flows; or consider each of one of them separately

Table 2: Definitions of Sudden Stops and Bonanzas

Study	Criteria
"On the Empirics of Sudden Stops", Calvo, Izquierdo, and Mejía (2004)	A sudden stop starts when the year-over-year change in capital flows is one standard deviation bellow its mean, and it ends when it is one standard deviation above its mean. Moreover, the year-over-year change in capital flows must be at least two standard deviations bellow the mean at some point within that interval for the episode to be considered a sudden stop.
"On the Consequences of Sudden Stops", Guidotti, Sturzenegger, and Villar (2004)	This approach states that sudden stops occur when the change in the capital account (divided by GDP) is one standard deviation bellow the mean and bellow 5% of GDP.
"Do Some Forms of Financial Flows Help Protect From Sudden Stops", Levchenko and Mauro (2006)	A sudden stop episode takes place when the financial account balance gets worse by more than 5 percentage points of GDP compared to the period before.
"Capital Flow Bonanzas", Reinhart and Reinhart (2008)	This study identifies bonanzas using a threshold: cutoff of 20th percentile of total net capital flows in percentage of GDP.
"Surges and Sudden Stops of Capital Flows to Emerging Markets", Sula (2006)	There is a period of bonanza when the increase in capital inflows as a percentage of GDP over a 3-year period is greater than 3% and the value of inflows as a percentage of GDP in that year is greater than 3%.
"Overreaction in Capital Flows to Emerging Markets: Booms and Sudden Stops", Agosin and Huaita (2010)	This paper recognizes a surge when the inflows exceed the sample mean by at least one standard deviation and the ratio of capital inflows to GDP is greater than 3%.

Table 3: Country and Period Representation

Baseline	
Countries	**Start Date**
Austria	1995 Q1
Belgium	**2002 Q1**
Bulgaria	1995 Q1
Croatia	**1999 Q1**
Cyprus	**2001 Q1**
Czech Republic	1995 Q1
Denmark	1995 Q1
Estonia	1995 Q1
Finland	1995 Q1
France	**NA**
Germany	1995 Q1
Greece	1995 Q1
Hungary	1995 Q1
Ireland	1995 Q1
Italy	1995 Q1
Latvia	1995 Q1
Lithuania	1995 Q1
Luxembourg	**2002 Q1**
Malta	1995 Q1
Netherlands	1995 Q1
Poland	**2000 Q1**
Portugal	1995 Q1
Romania	1995 Q1
Slovakia	1995 Q1
Slovenia	1995 Q1
Spain	1995 Q1
Sweden	1995 Q1
United Kingdom	1995 Q1

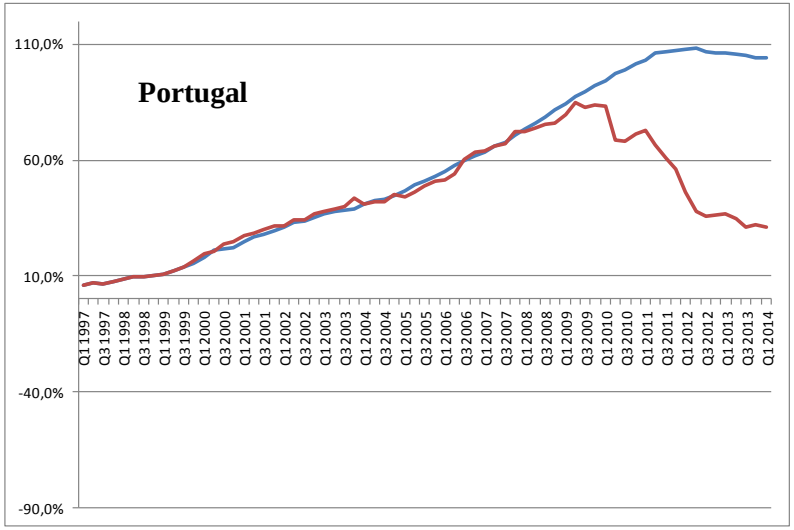
Without FDI	
Countries	**Start Date**
Austria	1995 Q1
Belgium	**2002 Q1**
Bulgaria	1995 Q1
Croatia	**1999 Q1**
Cyprus	**2001 Q1**
Czech Republic	1995 Q1
Denmark	**1997 Q1**
Estonia	1995 Q1
Finland	1995 Q1
France	**NA**
Germany	1995 Q1
Greece	1995 Q1
Hungary	1995 Q1
Ireland	1995 Q1
Italy	1995 Q1
Latvia	1995 Q1
Lithuania	1995 Q1
Luxembourg	**2002 Q1**
Malta	1995 Q1
Netherlands	1995 Q1
Poland	**2000 Q1**
Portugal	1995 Q1
Romania	**1996 Q1**
Slovakia	1995 Q1
Slovenia	1995 Q1
Spain	1995 Q1
Sweden	1995 Q1
United Kingdom	1995 Q1

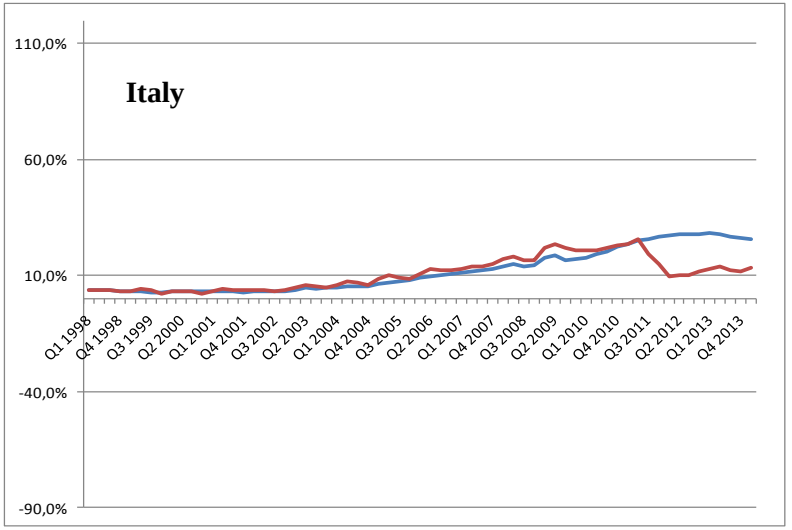
Note: The table shows the European Union countries and the corresponding dates for which there is all the necessary data to calculate private capital inflows.

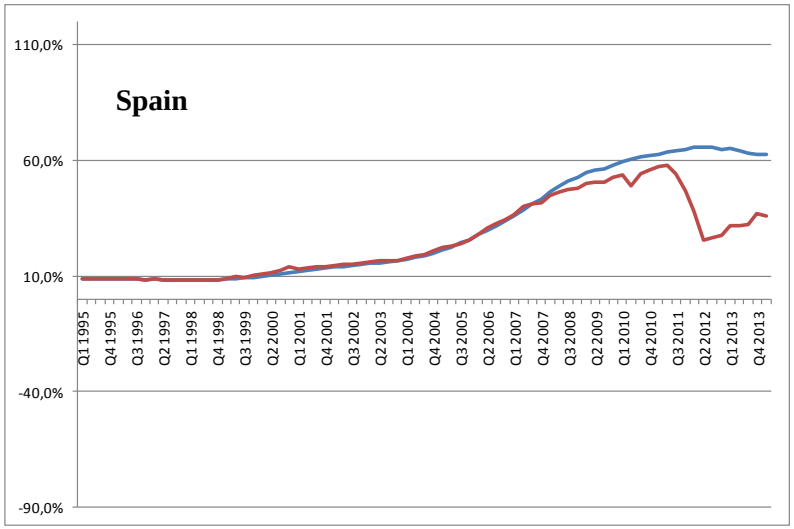
Table 4: Sudden Stops and Bonanzas by Country (2001 to 2014)

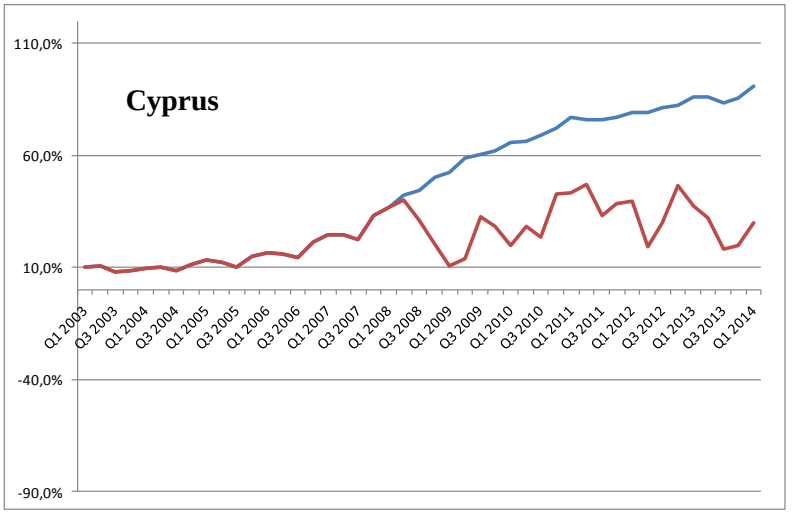
	Baseline				Without FDI			
	Sudden Stops		Bonanzas		Sudden Stops		Bonanzas	
Countries	Start Date	End Date	Start Date	End Date	Start Date	End Date	Start Date	End Date
Austria	Q3 2008	Q4 2008	Q3 2001 Q3 2009	Q4 2001 Q4 2009	Q2 2003	Q3 2003	Q3 2001 Q2 2008 Q4 2009	Q4 2001 Q2 2008 Q4 2009
Belgium	Q3 2008	Q3 2008	Q1 2009	Q1 2010	-	-	Q3 2009 Q4 2012	Q4 2009 Q2 2013
Bulgaria	Q4 2008	Q3 2010	Q1 2005	Q3 2008	Q3 2005 Q3 2009	Q3 2005 Q3 2010	Q4 2005 Q4 2007	Q4 2005 Q4 2008
Croatia	Q2 2009	Q4 2010	-	-	Q1 2010	Q2 2010	-	-
Cyprus	Q4 2008	Q2 2009	Q4 2009	Q2 2010	Q4 2008	Q2 2009	Q4 2007 Q1 2010	Q3 2008 Q2 2010
Czech Republic	Q3 2005 Q4 2011	Q2 2006 Q3 2012	Q4 2010	Q2 2011	Q2 2005 Q1 2012	Q1 2006 Q1 2013	Q2 2003	Q1 2004
Denmark	Q3 2001 Q4 2011 Q2 2012	Q1 2002 Q4 2011 Q3 2012	-	-	Q3 2009 Q3 2011	Q4 2009 Q2 2012	Q3 2005	Q2 2006
Estonia	Q2 2005 Q2 2008	Q4 2005 Q1 2010	Q2 2006	Q3 2007	Q1 2005	Q4 2005	Q2 2006 Q1 2012	Q1 2007 Q2 2013
Finland	Q4 2012	Q3 2013	Q1 2009 Q3 2011	Q3 2009 Q2 2012	Q4 2012	Q3 2013	Q3 2008 Q3 2011	Q3 2009 Q2 2012
France	NA	NA	NA	NA	NA	NA	NA	NA
Germany	Q1 2013	Q4 2013	Q1 2009 Q1 2012	Q3 2009 Q2 2012	Q2 2011 Q1 2013	Q4 2011 Q4 2013	Q3 2001 Q4 2010 Q1 2012	Q4 2001 Q4 2010 Q2 2012
Greece	Q3 2001 Q2 2008 Q4 2008 Q2 2010	Q3 2001 Q2 2008 Q3 2009 Q1 2011	Q1 2013	Q4 2013	Q3 2001 Q2 2008 Q2 2010	Q1 2002 Q1 2009 Q1 2011	Q1 2013	Q4 2013
Hungary	Q1 2007 Q4 2008	Q4 2007 Q4 2009	-	-	Q4 2001 Q4 2008	Q2 2002 Q3 2009	Q4 2002	Q4 2003
Ireland	Q3 2008 Q4 2010	Q2 2009 Q2 2011	Q1 2010	Q2 2010	Q4 2002 Q1 2009 Q4 2010	Q3 2003 Q2 2009 Q2 2011	Q1 2004 Q1 2010	Q1 2005 Q2 2010
Italy	Q1 2010 Q4 2011	Q3 2010 Q2 2012	Q1 2011 Q4 2012	Q2 2011 Q3 2013	Q2 2002 Q1 2010 Q4 2011	Q2 2002 Q3 2010 Q2 2012	Q1 2008 Q1 2013	Q3 2008 Q3 2013
Latvia	Q2 2008	Q1 2010	Q2 2004 Q4 2005	Q1 2005 Q3 2007	Q2 2008	Q1 2010	Q1 2006	Q3 2007
Lithuania	Q4 2008	Q1 2010	Q1 2006	Q3 2007	Q1 2009	Q1 2010	Q2 2003	Q2 2004
Luxembourg	Q3 2010 Q2 2011 Q4 2012	Q3 2010 Q2 2011 Q3 2013	Q2 2009 Q4 2011	Q3 2009 Q2 2012	-	-	-	-
Malta	Q3 2001 Q3 2008 Q4 2009 Q1 2014	Q1 2002 Q3 2008 Q3 2010 Q1 2014	Q1 2009	Q3 2009	Q2 2006 Q1 2010	Q1 2007 Q3 2010	Q4 2002	Q1 2003
Netherlands	Q1 2009 Q3 2012	Q3 2009 Q2 2013	Q1 2008	Q4 2008	Q2 2002 Q4 2007 Q3 2012	Q2 2002 Q4 2007 Q2 2013	Q3 2005 Q4 2008	Q2 2006 Q4 2008
Poland	Q3 2009	Q2 2010	Q2 2007	Q1 2008	Q4 2009	Q2 2010	Q2 2007	Q1 2009
Portugal	Q1 2010	Q1 2011	Q3 2005 Q1 2013	Q2 2007 Q4 2013	Q1 2010	Q1 2011	Q1 2005 Q1 2013	Q3 2005 Q1 2013
Romania	Q1 2009	Q1 2010	Q3 2005 Q4 2006	Q2 2006 Q4 2007	Q3 2004 Q1 2009	Q2 2005 Q1 2010	Q1 2007	Q3 2008
Slovakia	Q1 2007 Q4 2009	Q4 2007 Q2 2010	Q1 2008	Q1 2009	Q1 2012	Q4 2012	Q4 2013	Q1 2014
Slovenia	Q3 2001 Q2 2009 Q4 2011	Q4 2001 Q1 2010 Q3 2012	Q2 2008	Q3 2008	Q2 2009 Q3 2011	Q1 2010 Q3 2012	Q3 2003 Q1 2013	Q3 2004 Q1 2014
Spain	Q3 2001 Q2 2008 Q2 2010 Q4 2011	Q4 2001 Q3 2008 Q2 2010 Q3 2012	Q2 2006 Q2 2011 Q1 2013	Q4 2006 Q2 2011 Q4 2013	Q3 2001 Q2 2008 Q4 2011	Q2 2002 Q1 2009 Q3 2012	Q3 2004 Q2 2006 Q2 2011 Q1 2013	Q3 2005 Q4 2006 Q2 2011 Q4 2013
Sweden	Q3 2009	Q1 2010	Q4 2007	Q1 2009	-	-	-	-
United Kingdom	Q1 2003	Q2 2003	Q3 2012	Q1 2013	-	-	Q1 2007	Q4 2007

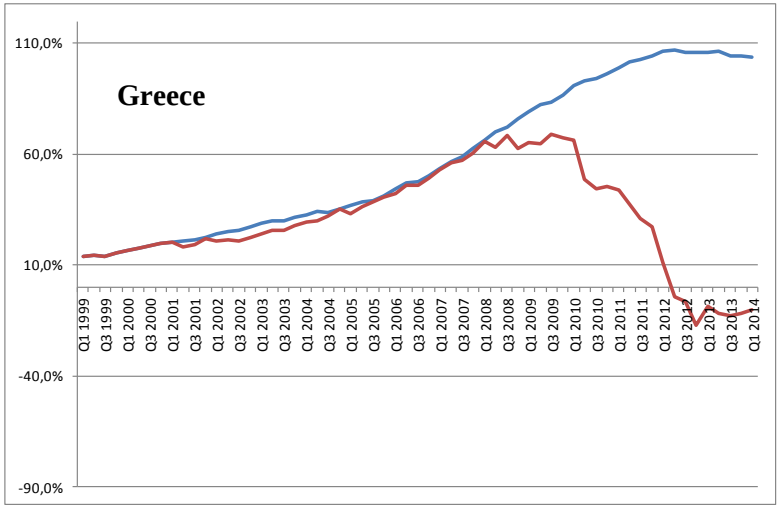
Figure 1: **Total and Private Capital Inflows, Cumulated (% of 2007 GDP)**







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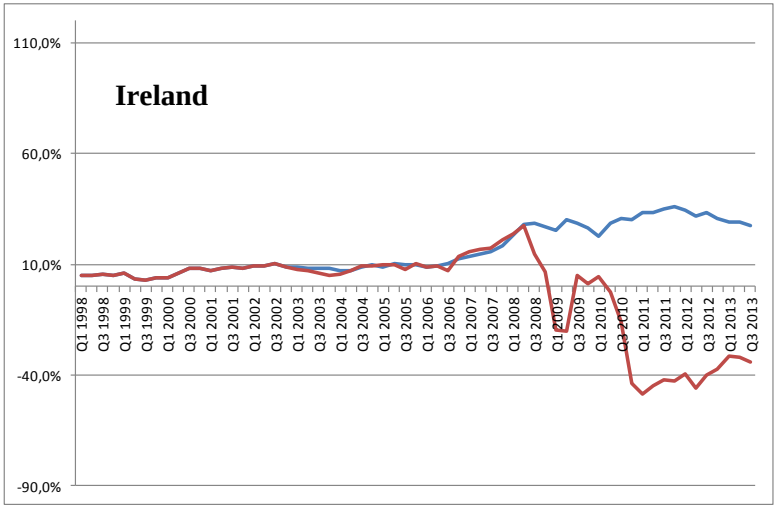
Q1 2014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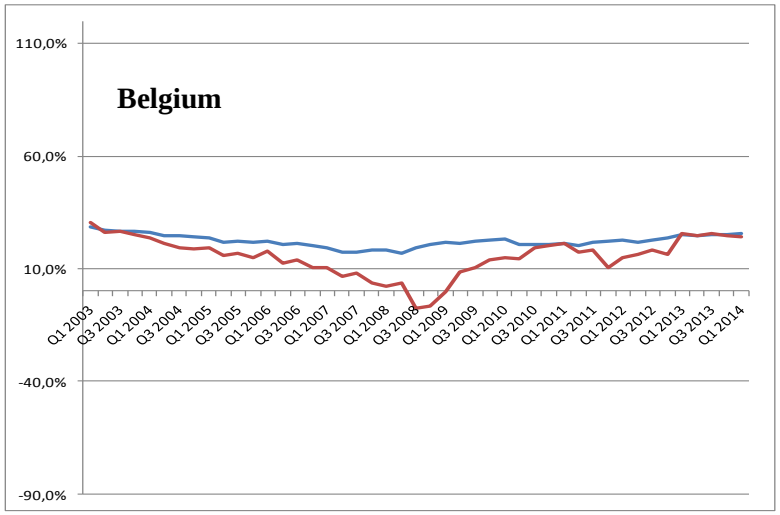
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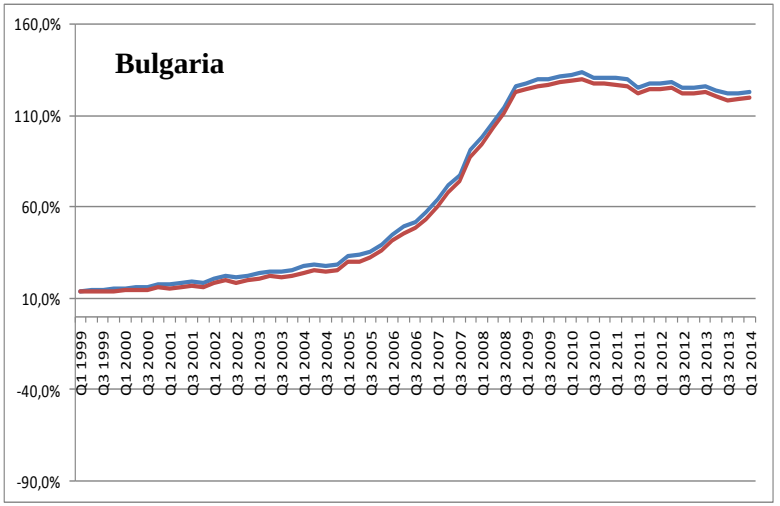
Bulgaria
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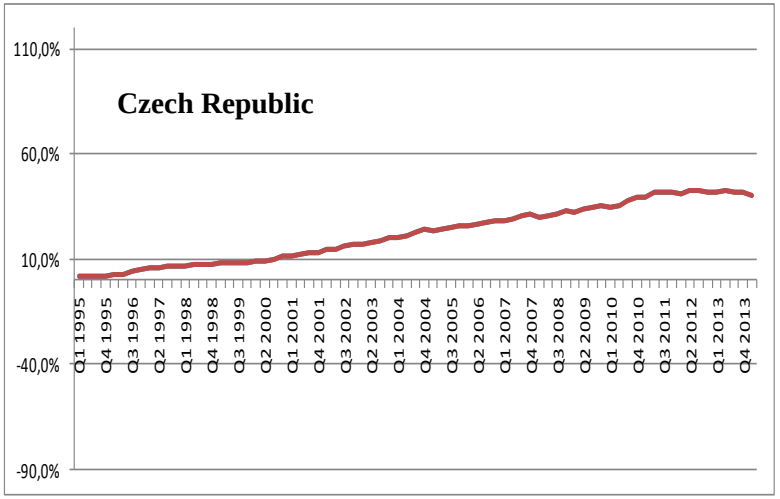
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-90,0%
Q1 1995
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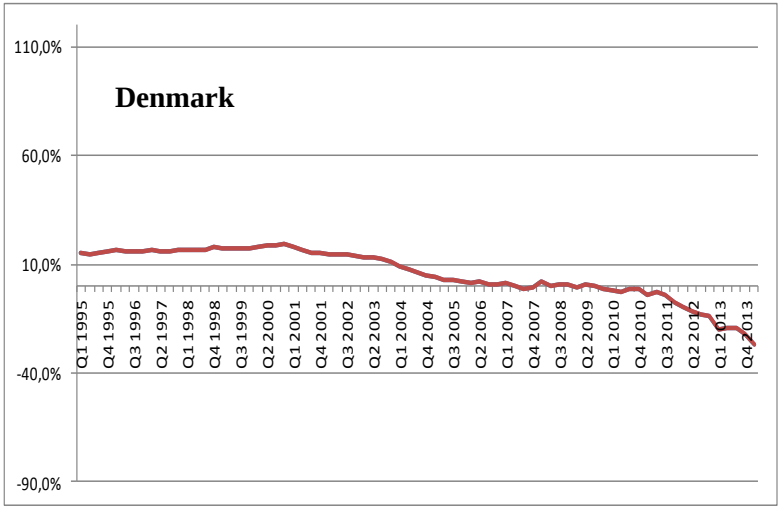
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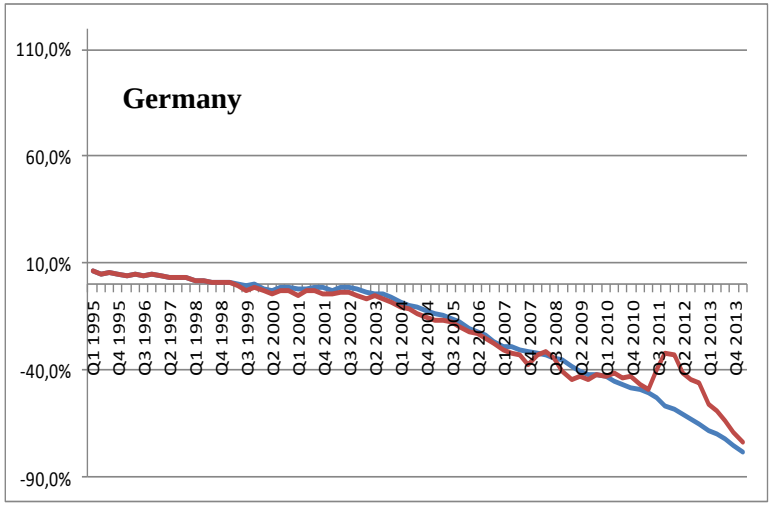
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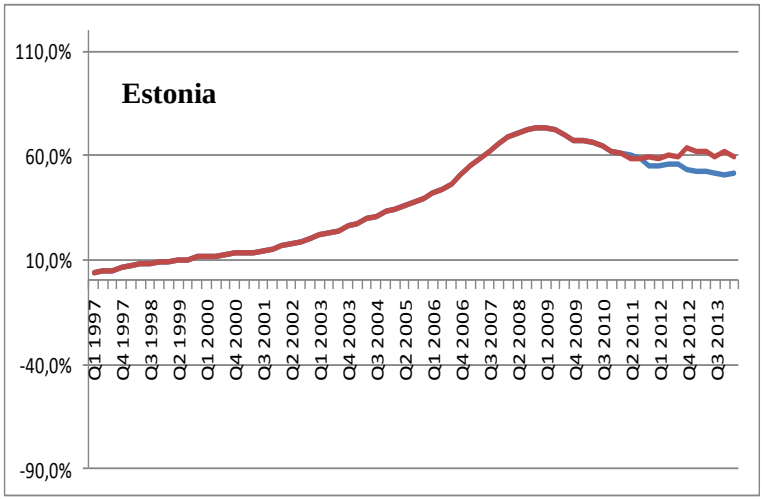
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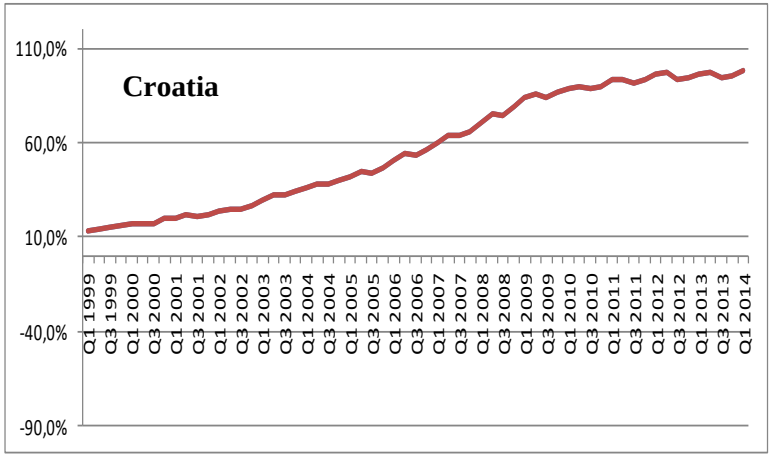
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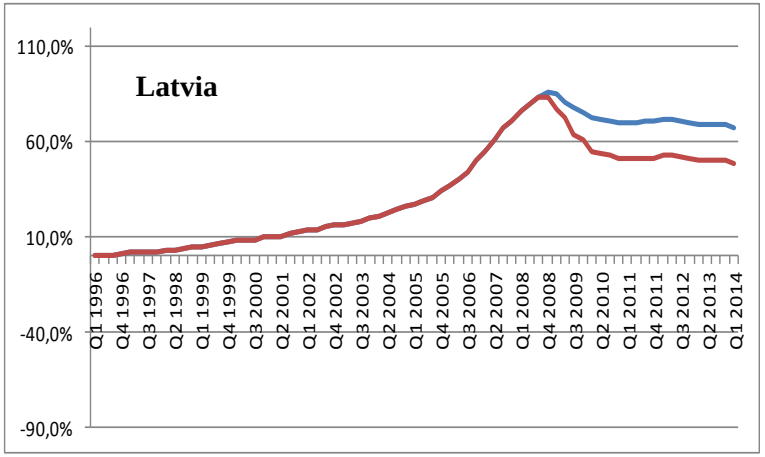
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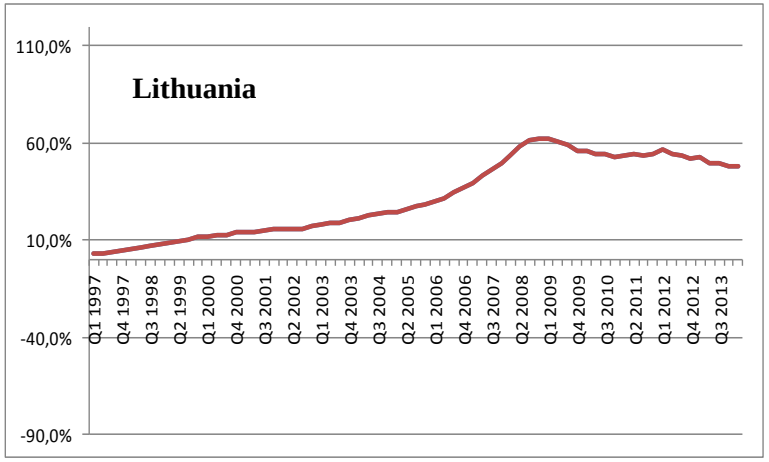
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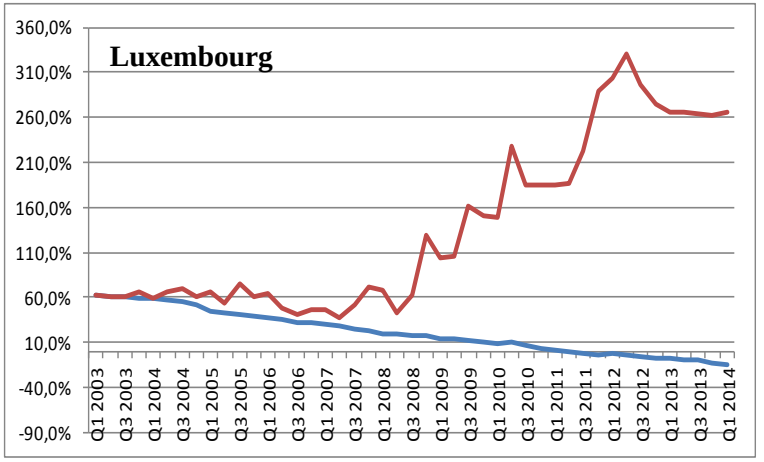
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360,0%
310,0%
260,0%
210,0%
160,0%
110,0%
60,0%
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Q1 2003
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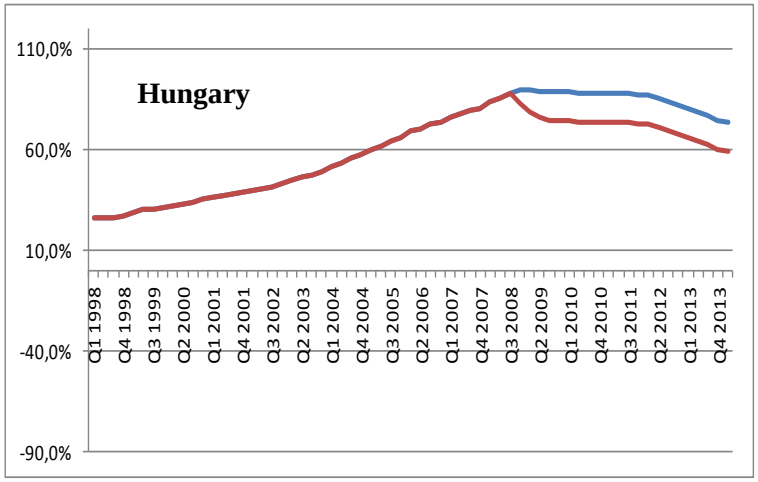
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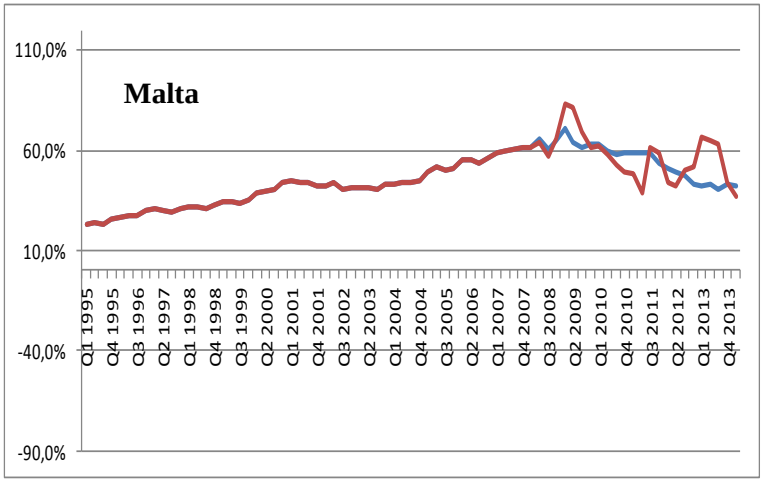
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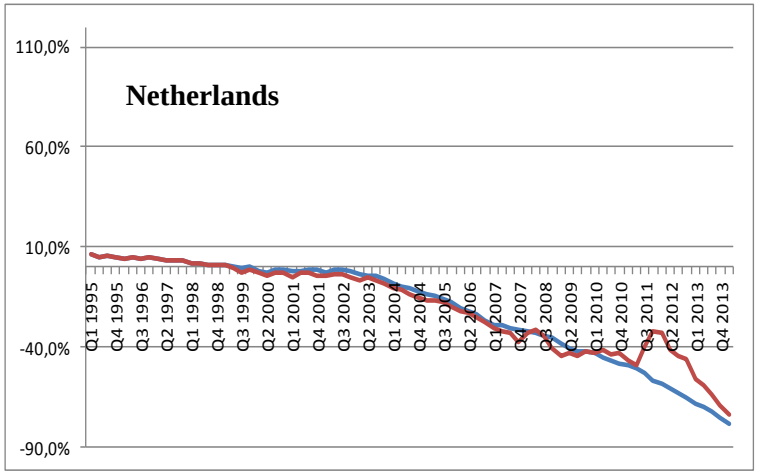
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Q1 1995
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Q4 2010
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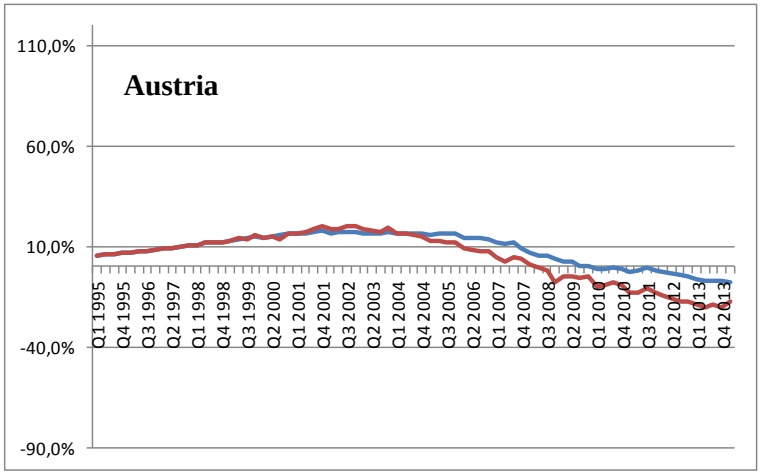
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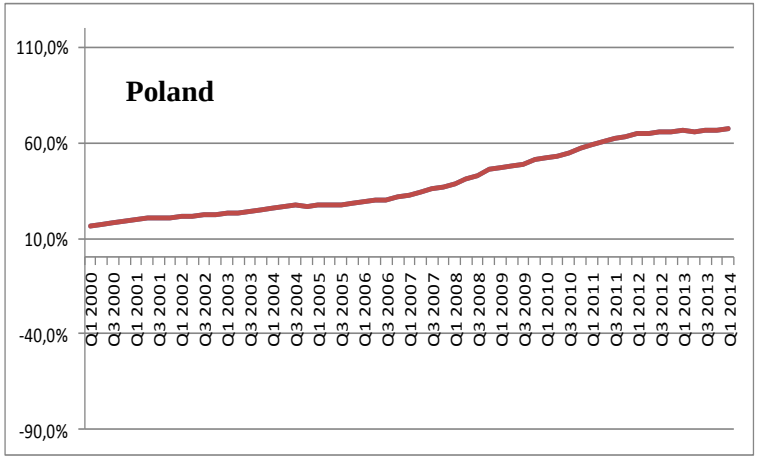
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Q3 2002
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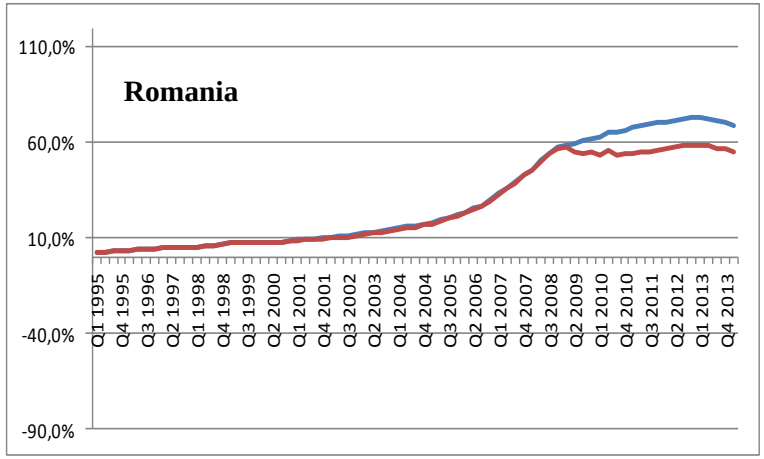
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Q3 1999
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Q4 2001
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Q4 2004
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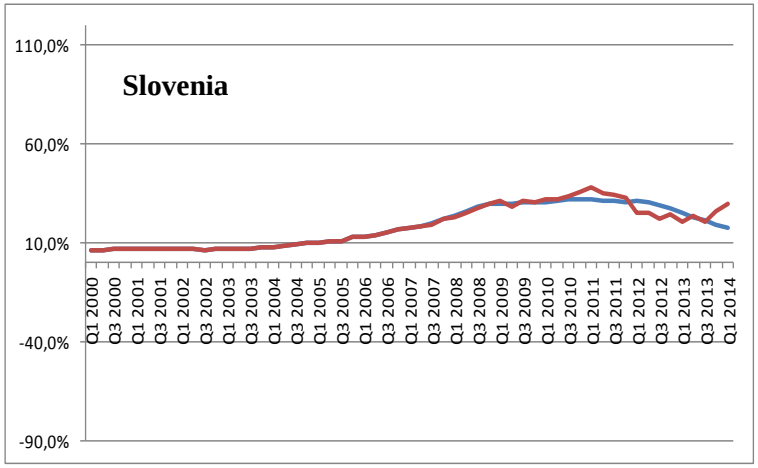
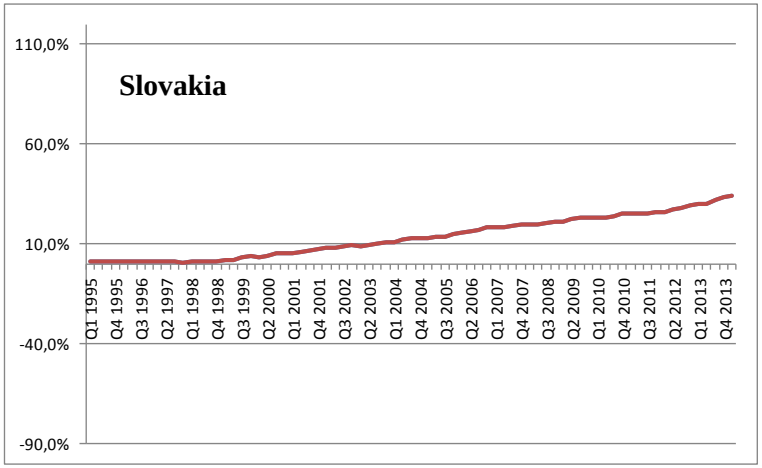
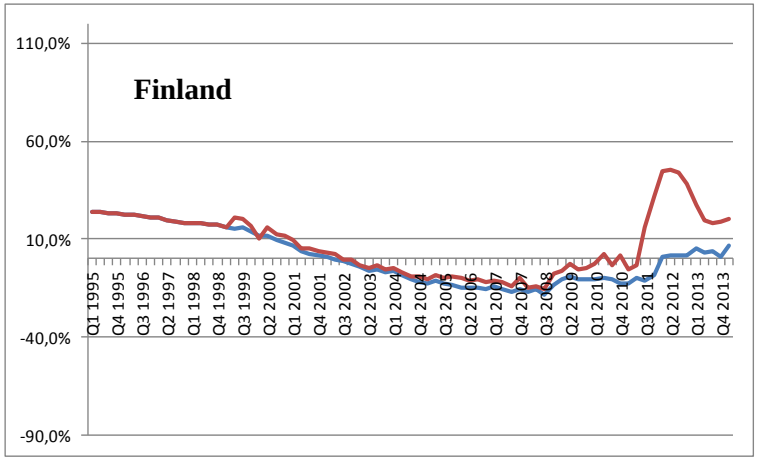
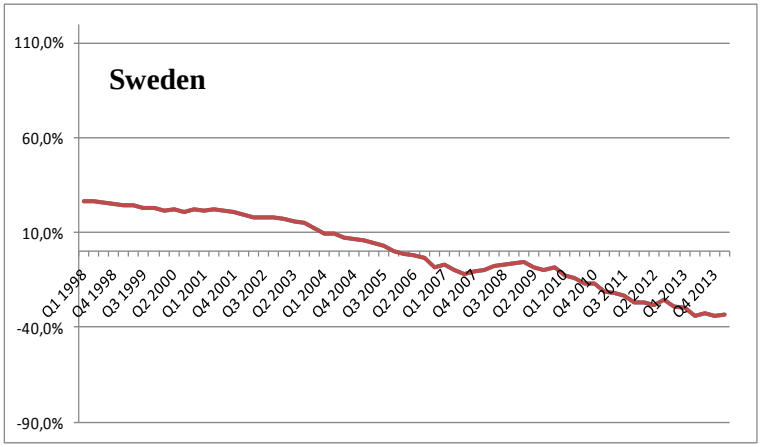
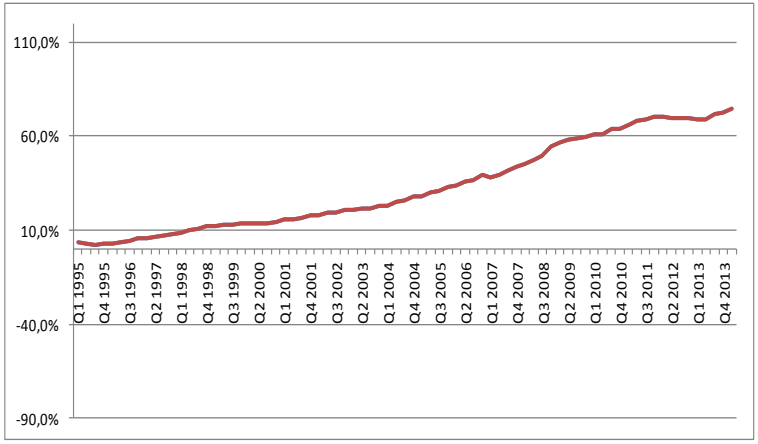
Q4 2013











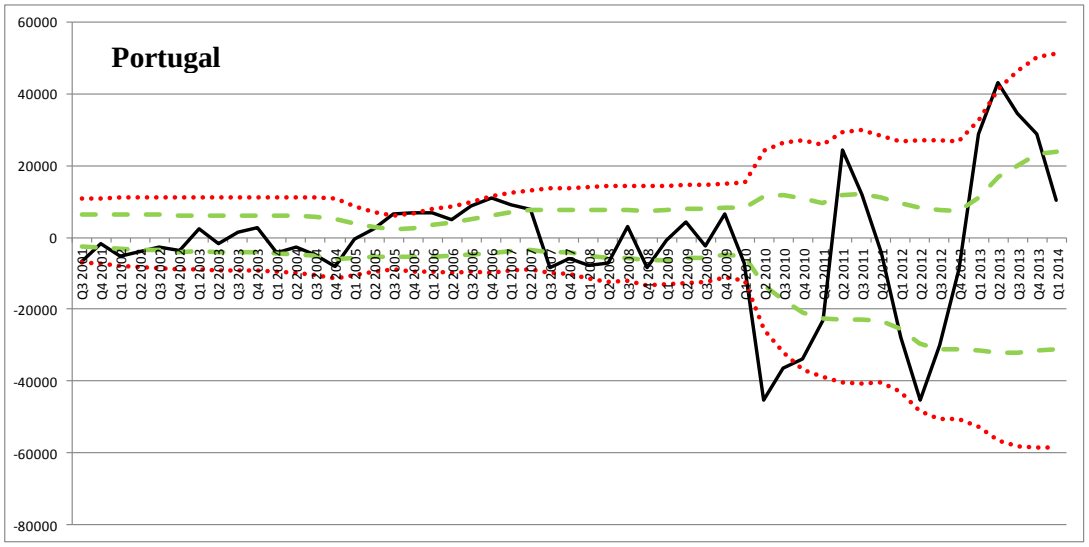
Note: The blue line represents total inflows and the red line stands for private capital inflows. Private capital inflows are the financial account net of changes in Target2 balances and IMF/EU program disbursements.
Source: Own calculations based on data taken from Eurostat, Euro crisis monitor, the IMF and the European Commission.

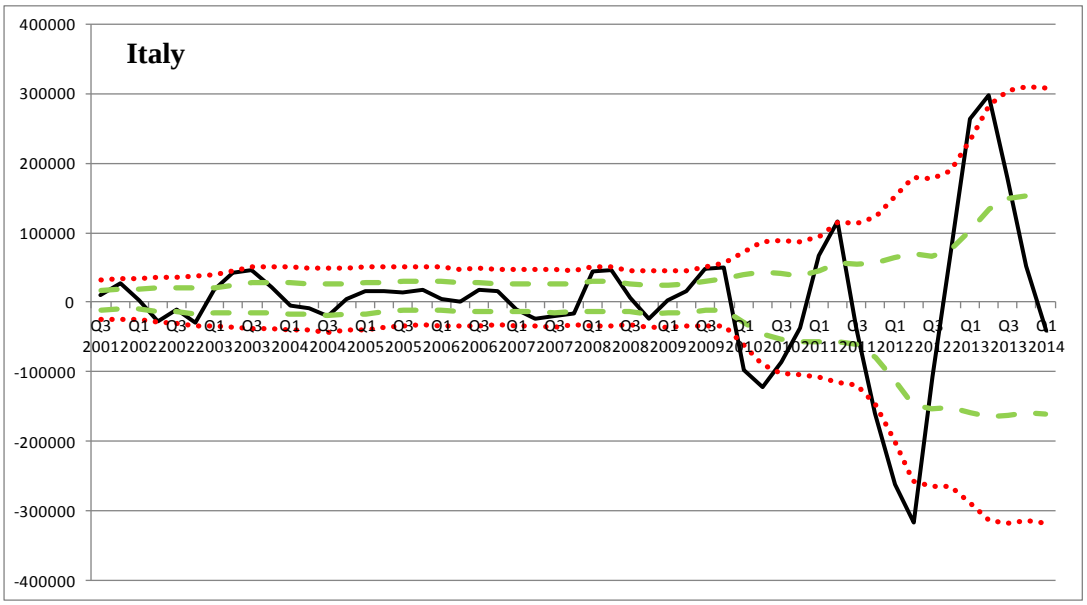
Figure 2: Construction of sudden stops and bonanzas

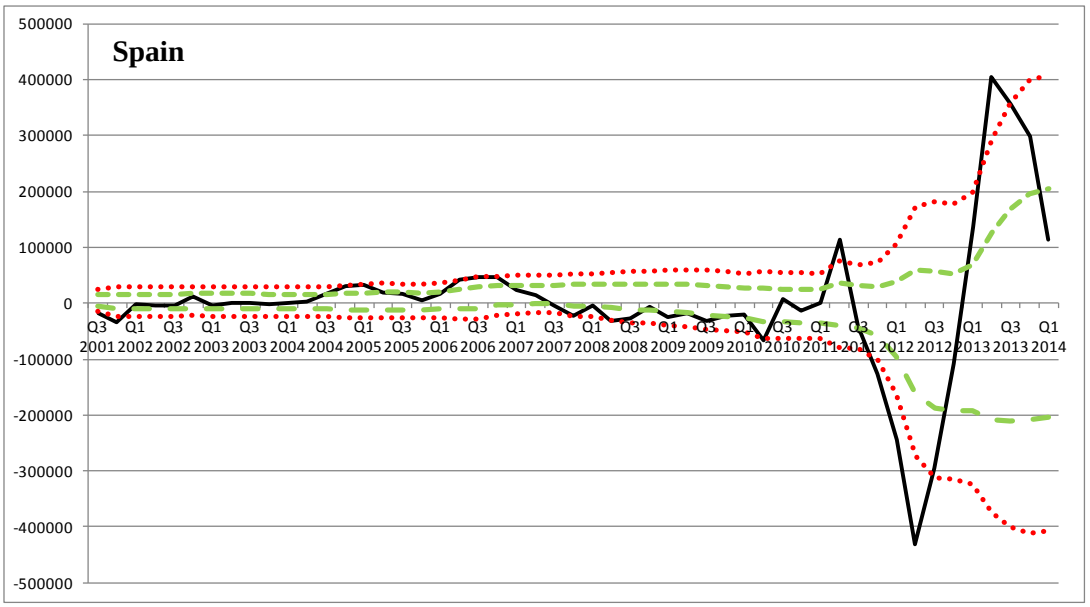
Year-over-year Change in Private capital inflows

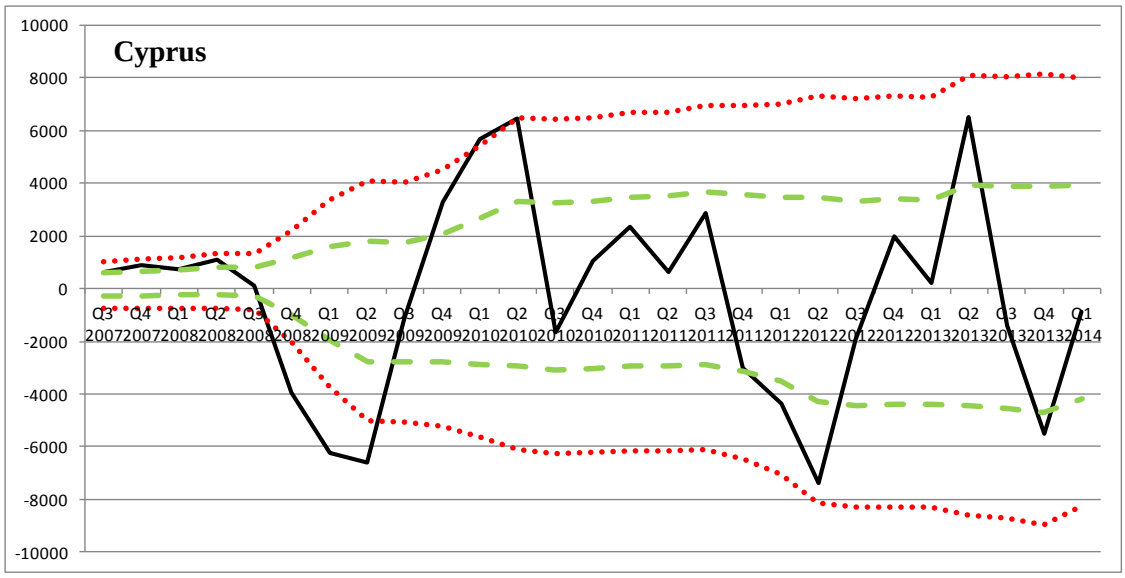
One Standard Deviation Bands

Two Standard Deviation Bands





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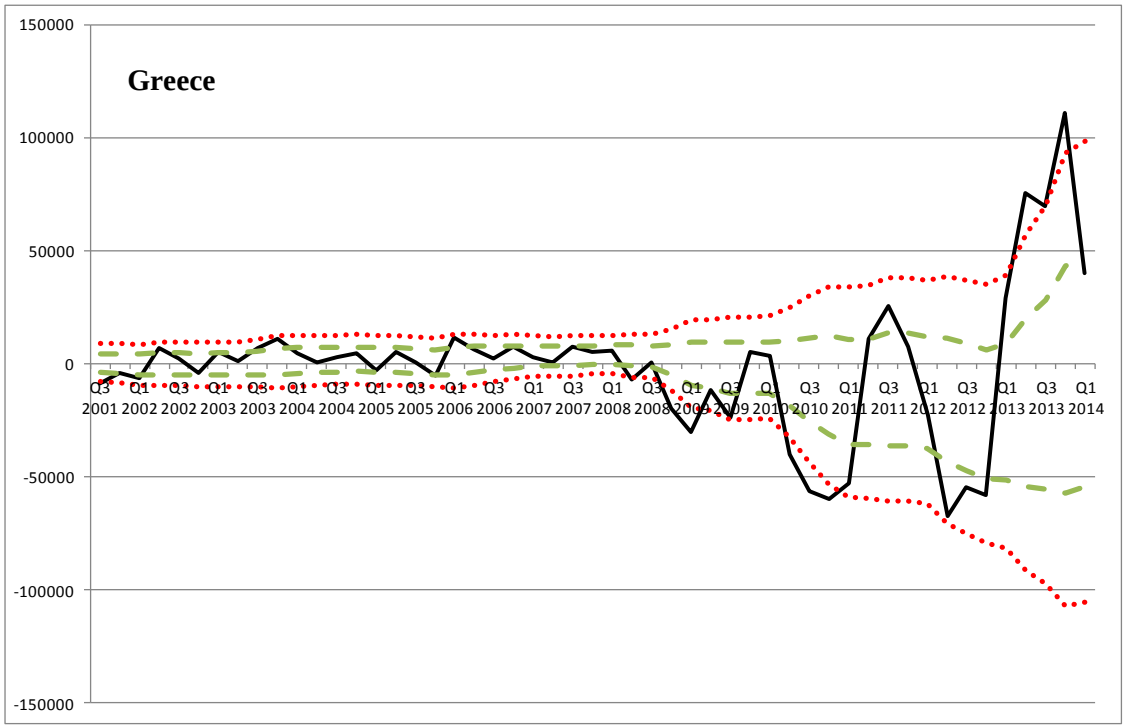
10000
8000
6000
4000
2000
0
-2000
-4000
-6000
-8000
-10000
Q3 2007 Q4 2007 Q1 2008 Q2 2008 Q3 2008 Q4 2008 Q1 2009 Q2 2009 Q3 2009 Q4 2009 Q1 2010 Q2 2010 Q3 2010 Q4 2010 Q1 2011 Q2 2011 Q3 2011 Q4 2011 Q1 2012 Q2 2012 Q3 2012 Q4 2012 Q1 2013 Q2 2013 Q3 2013 Q4 2013 Q1 2014


Greece
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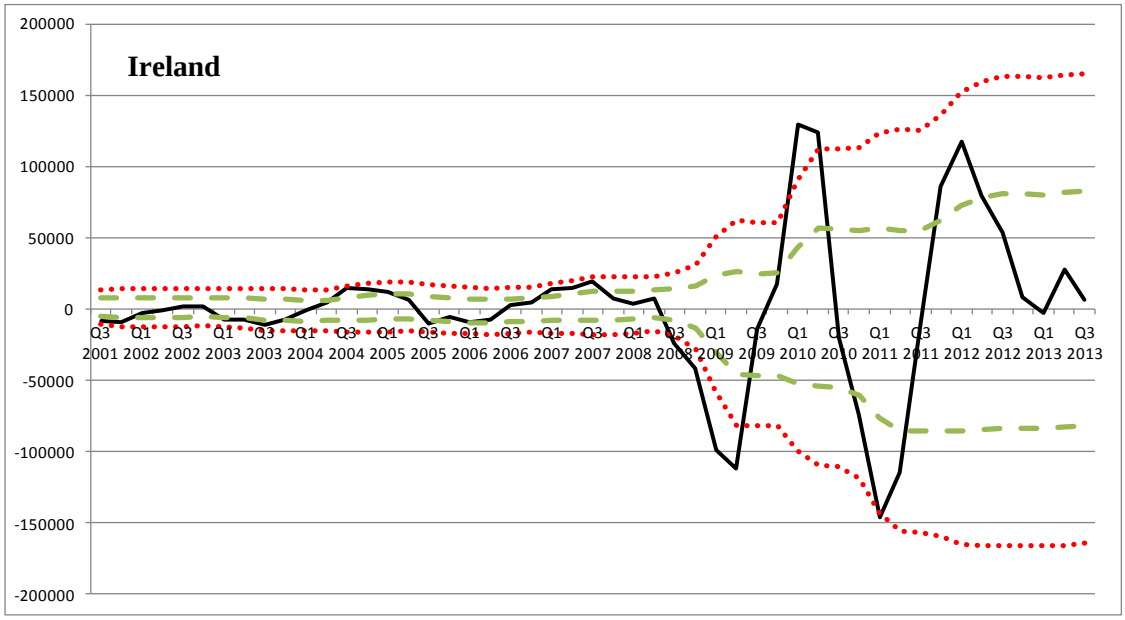
50000
0
-50000
-100000
-150000
Q3 2001 Q1 2002 Q3 2002 Q1 2003 Q3 2003 Q1 2004 Q3 2004 Q1 2005 Q3 2005 Q1 2006 Q3 2006 Q1 2007 Q3 2007 Q1 2008 Q3 2008 Q1 2009 Q3 2009 Q1 2010 Q3 2010 Q1 2011 Q3 2011 Q1 2012 Q3 2012 Q1 2013 Q3 2013 Q1 2014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50000
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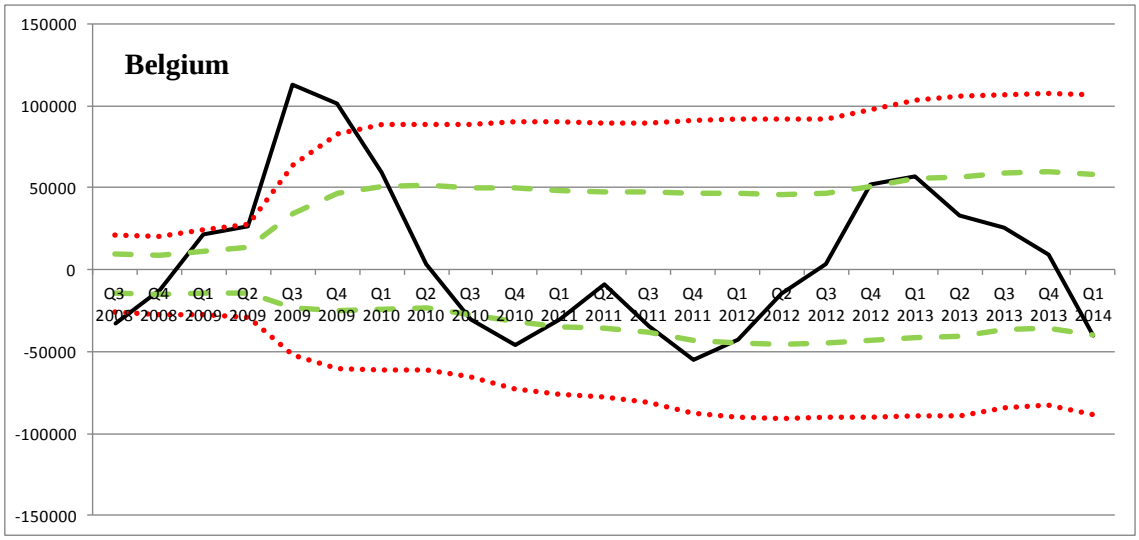
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Q3 2007
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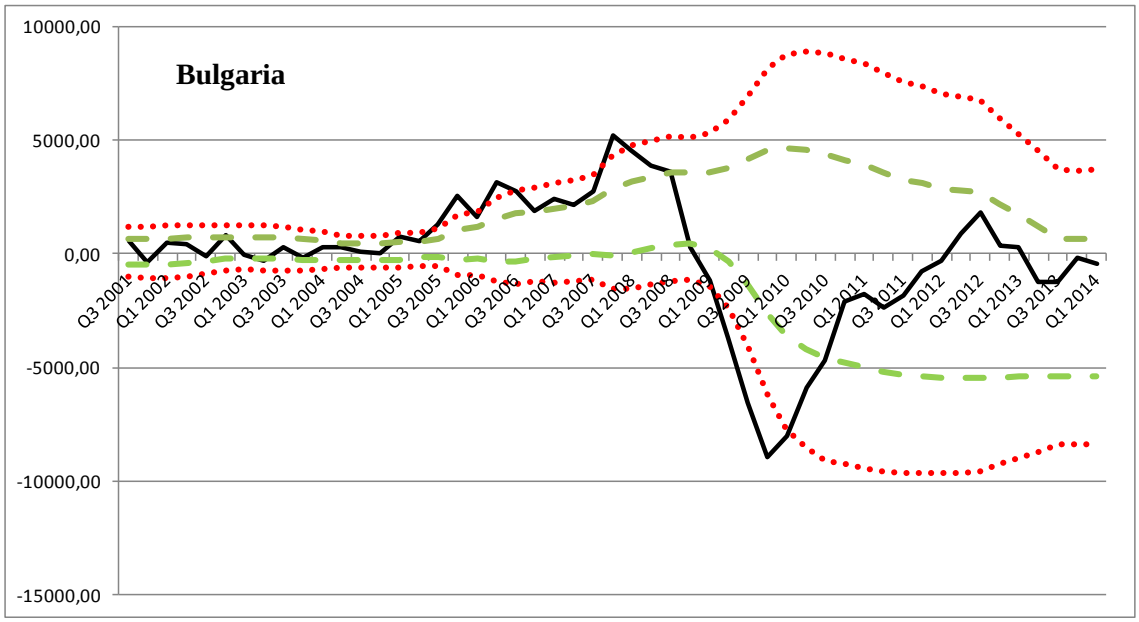
Q1 2014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Q1 2002
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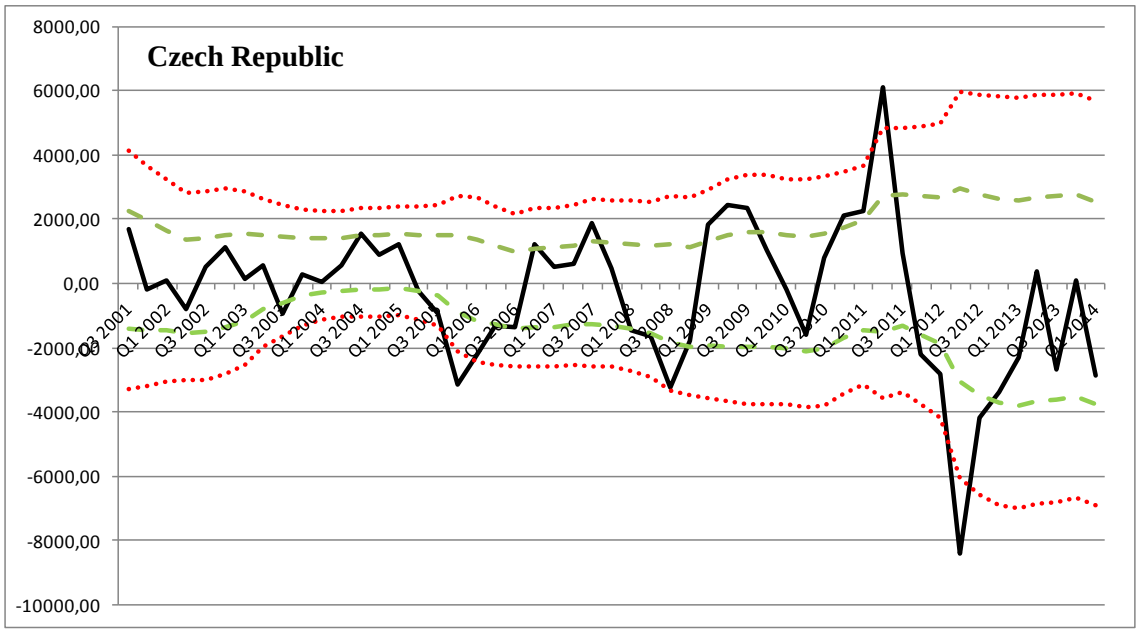
Q1 2013
Q3 2013
Q1 2014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-4000,00
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-8000,00
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Q3 2001
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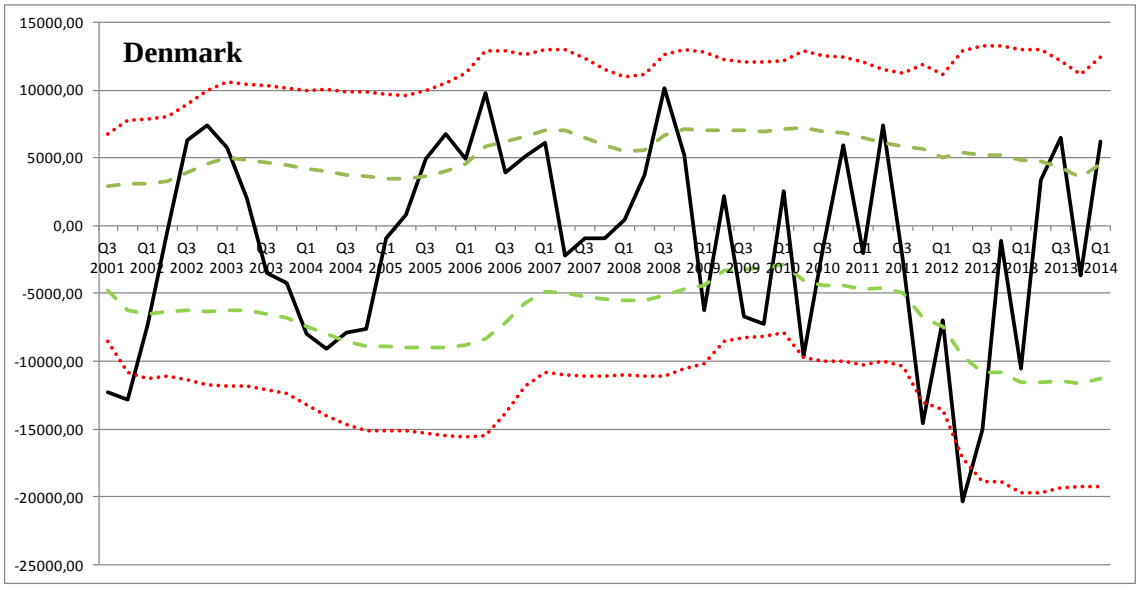
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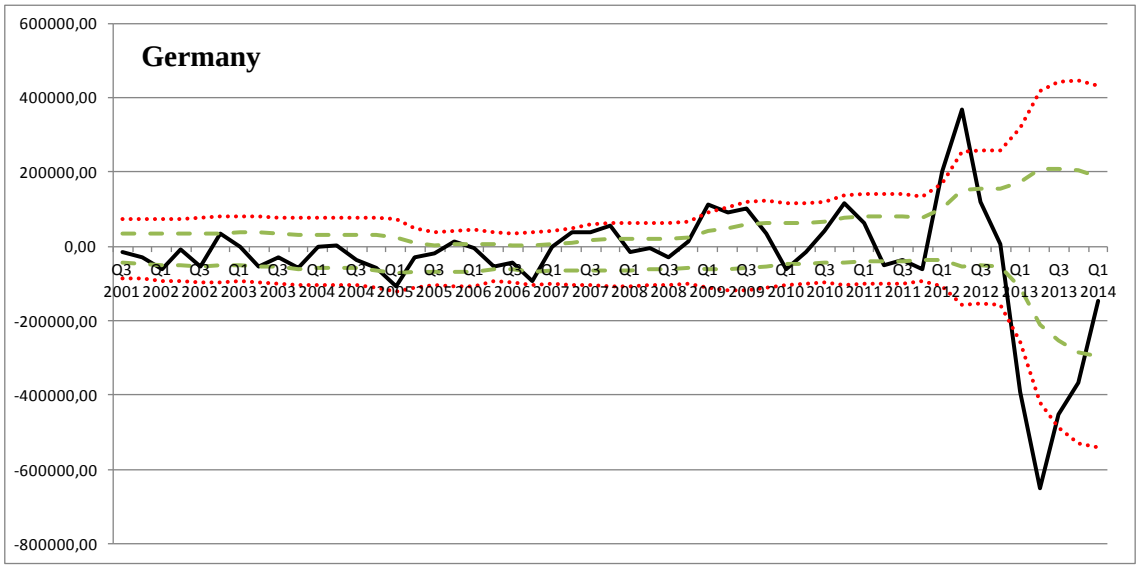
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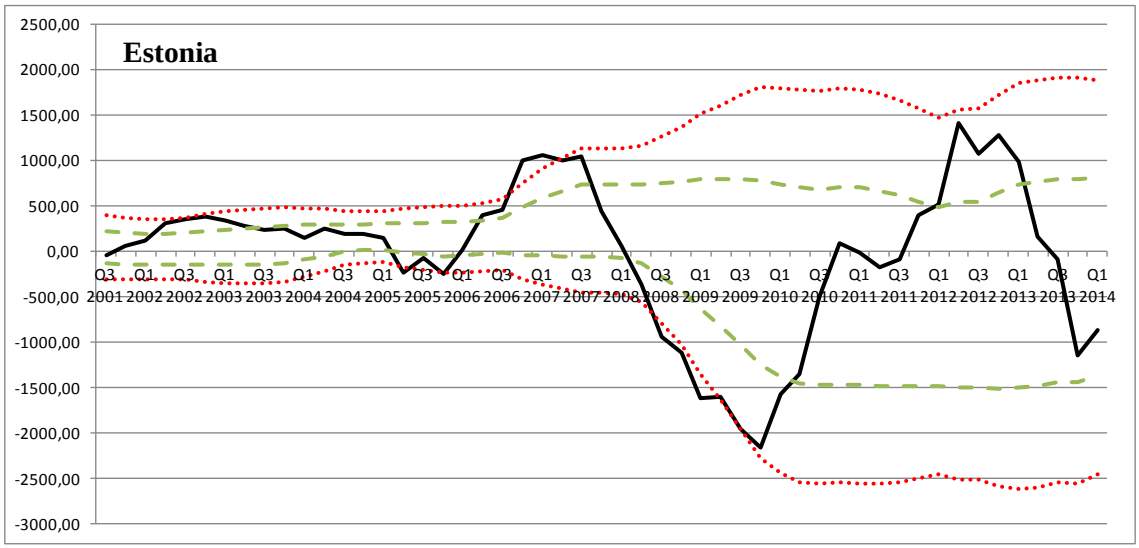
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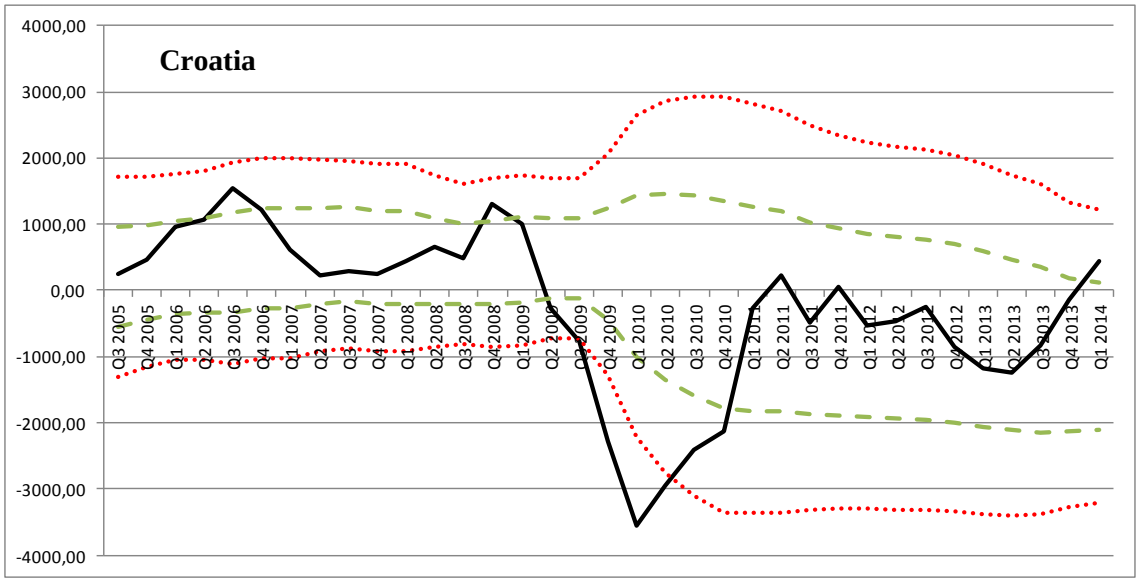
Croatia
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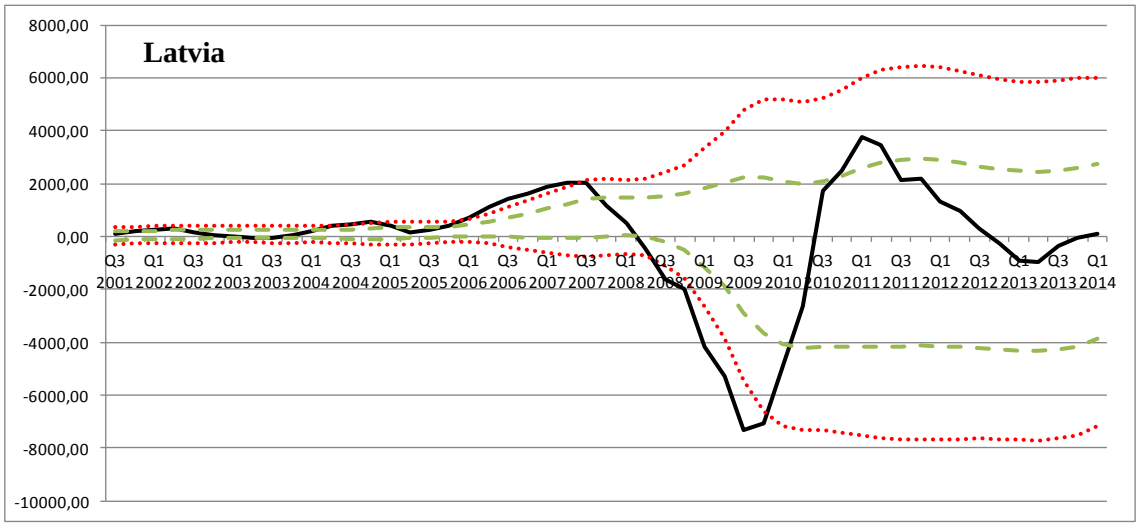
Q1 2014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Q1 2002
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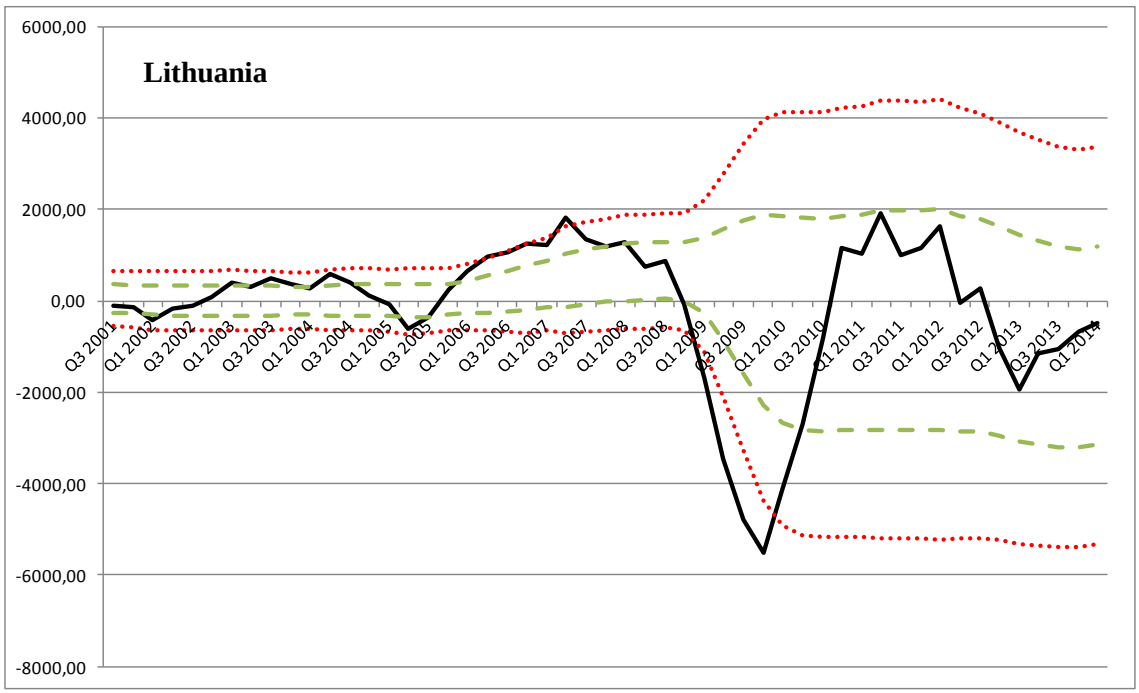
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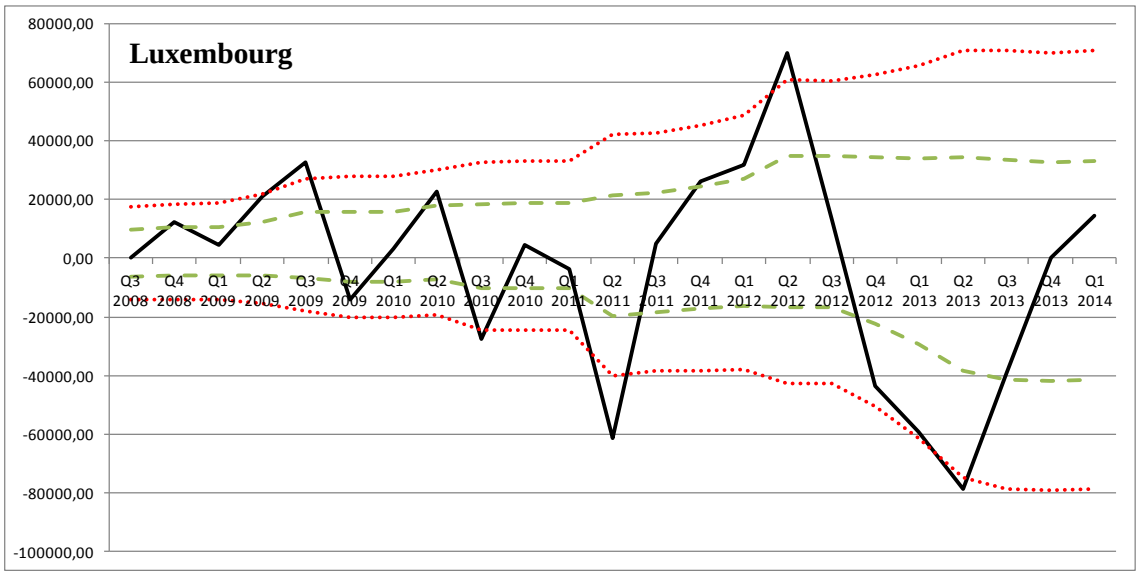
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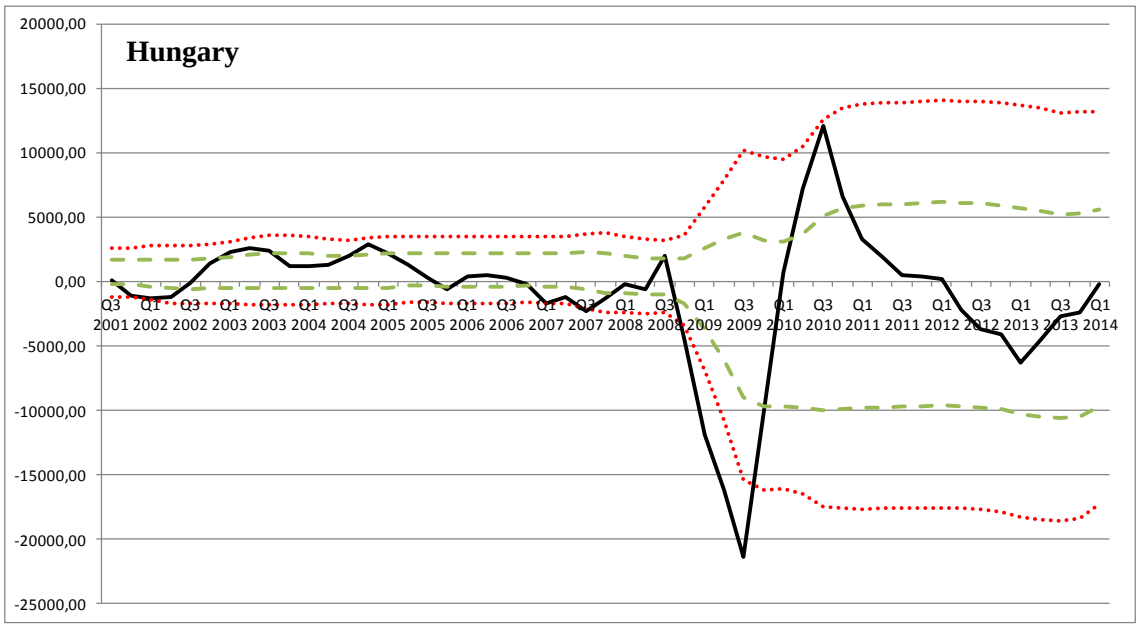
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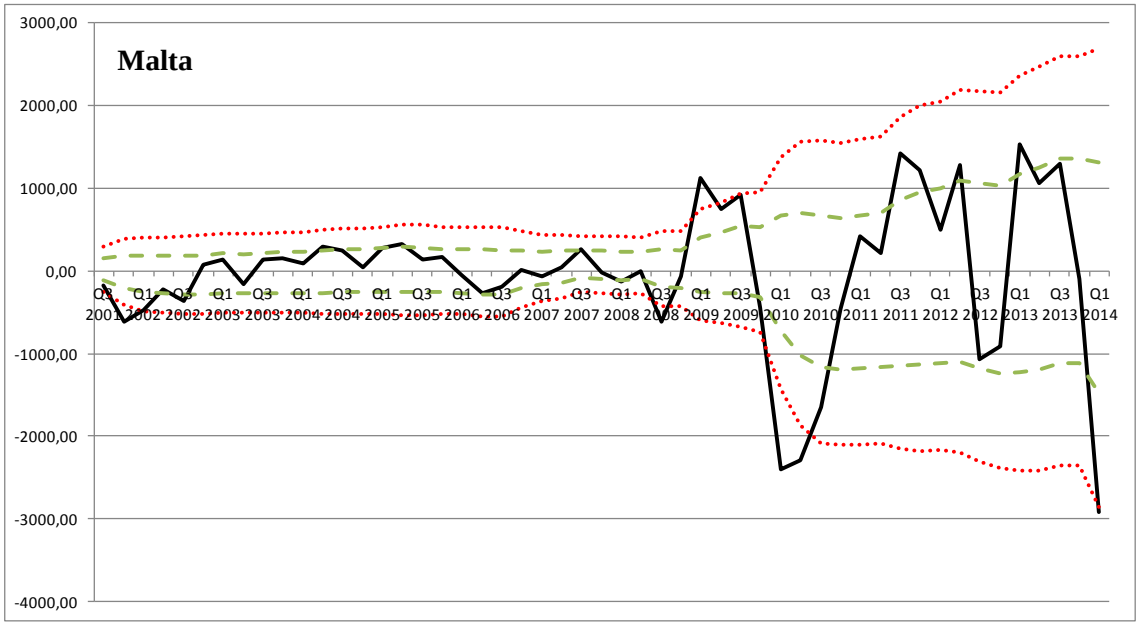
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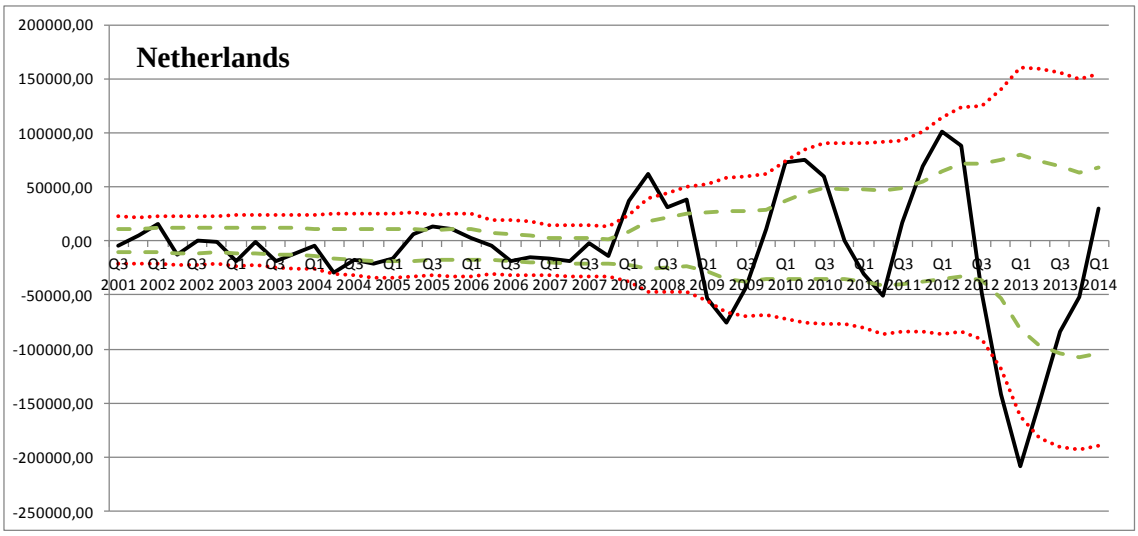
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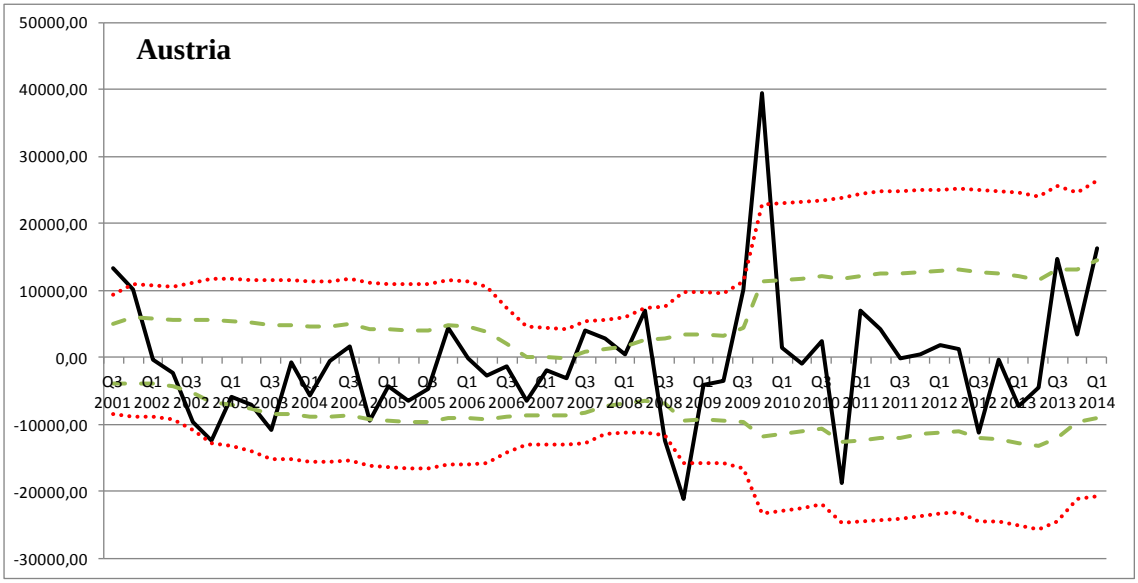
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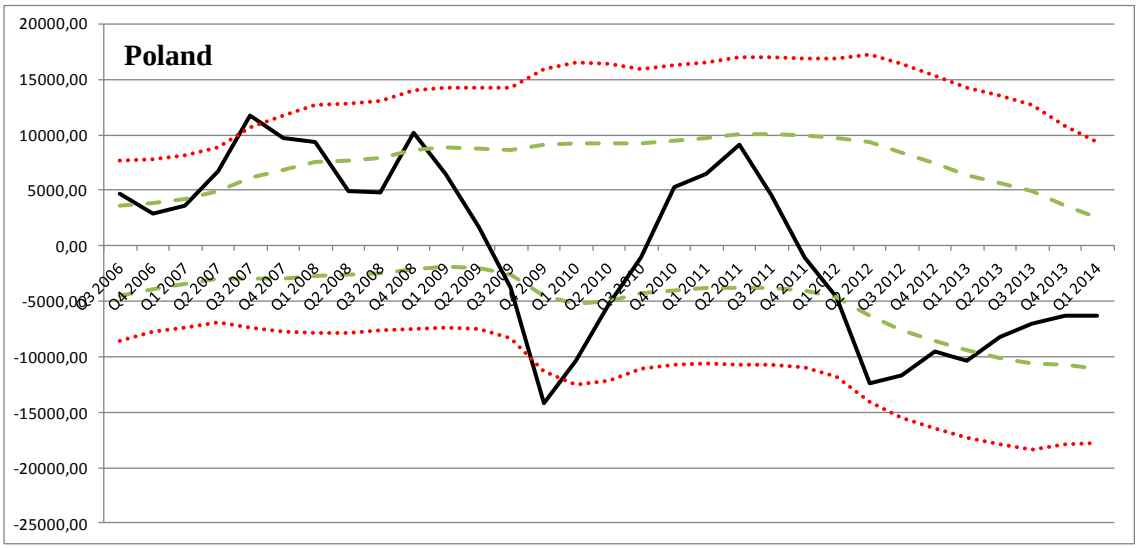
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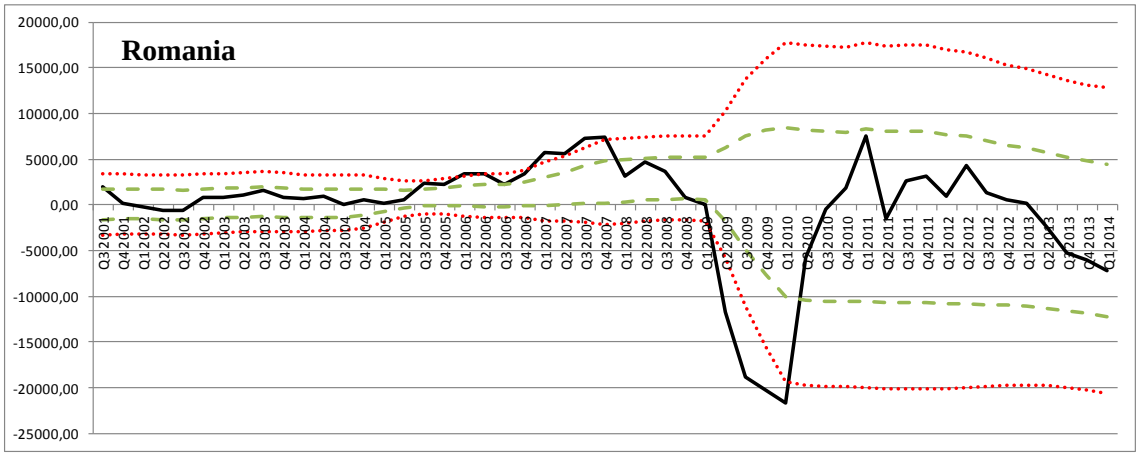
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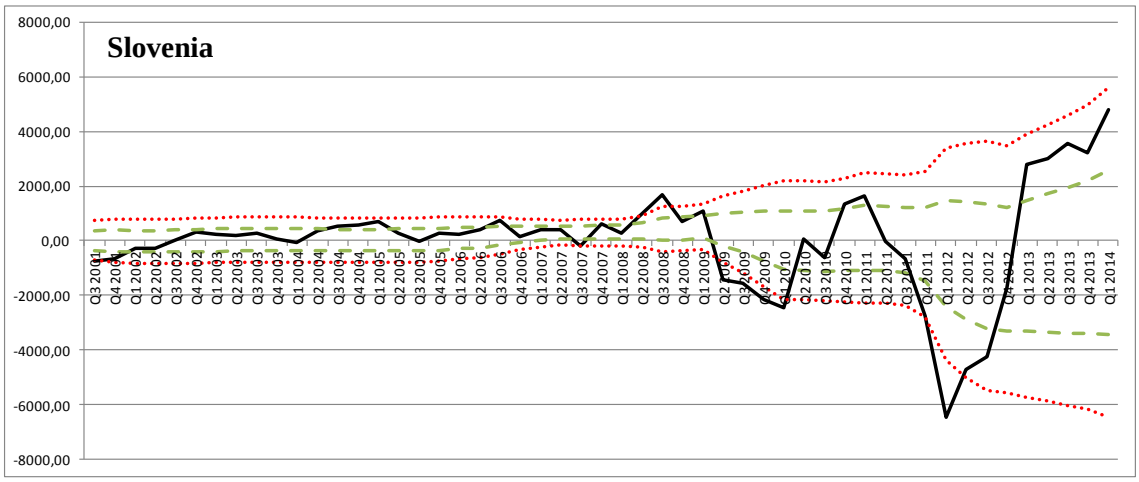
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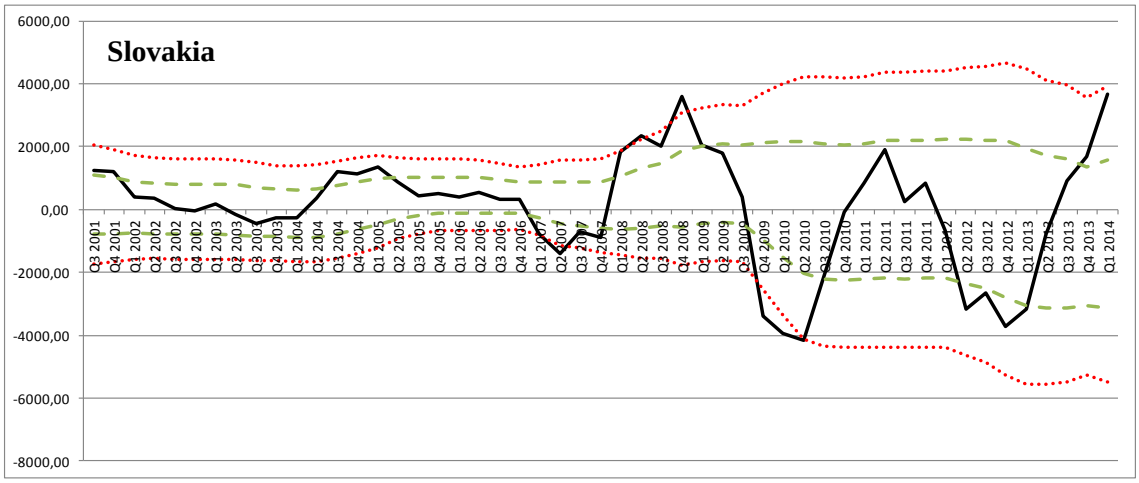
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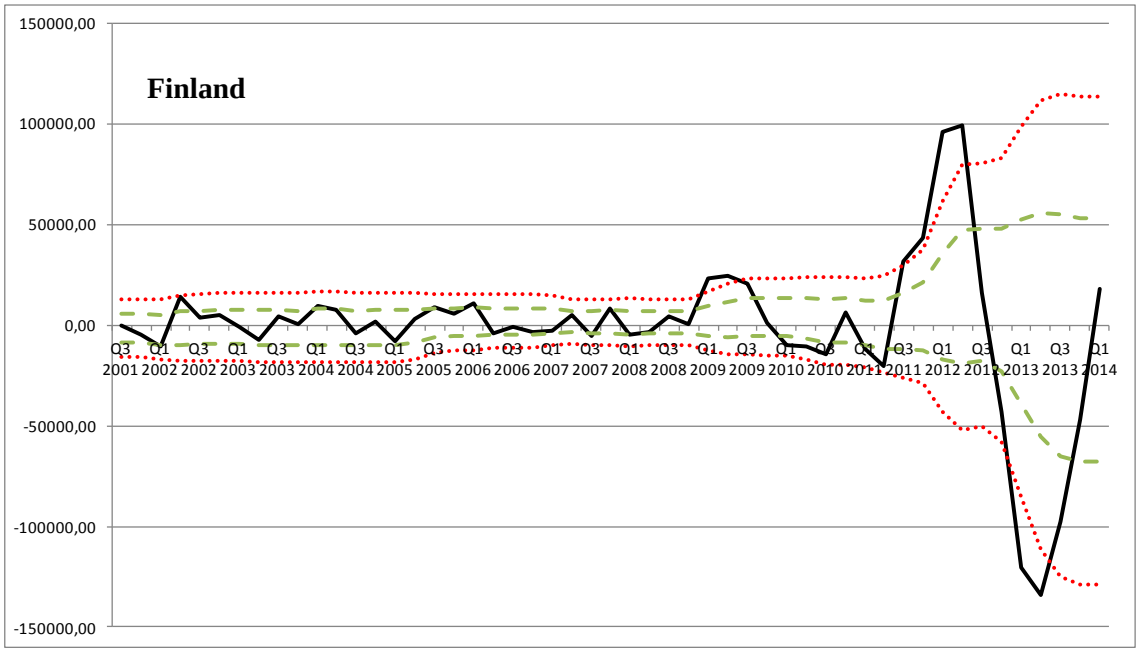

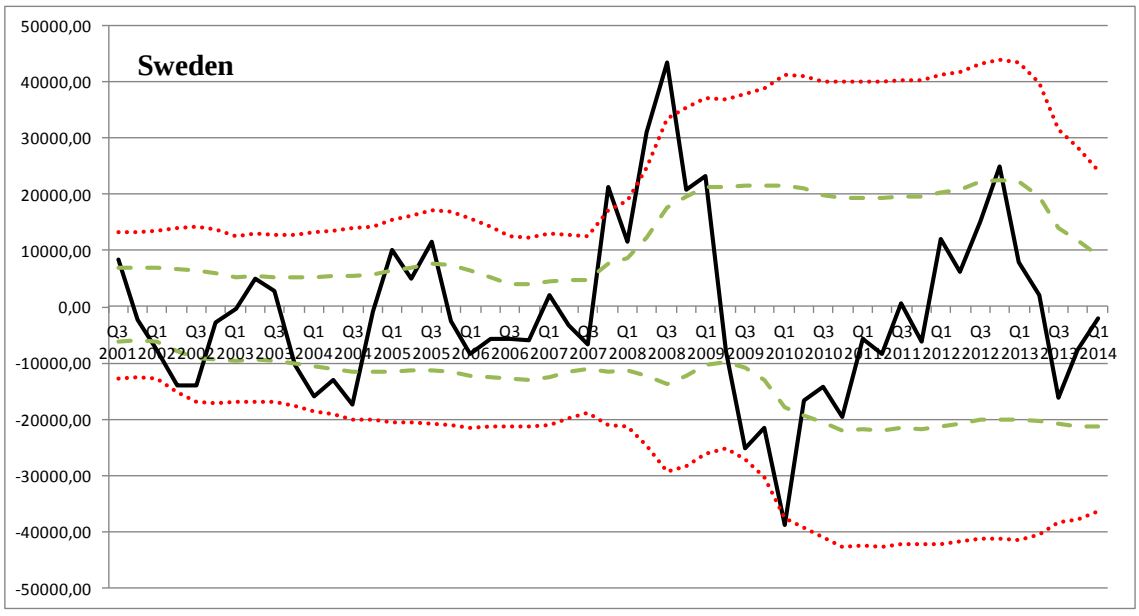

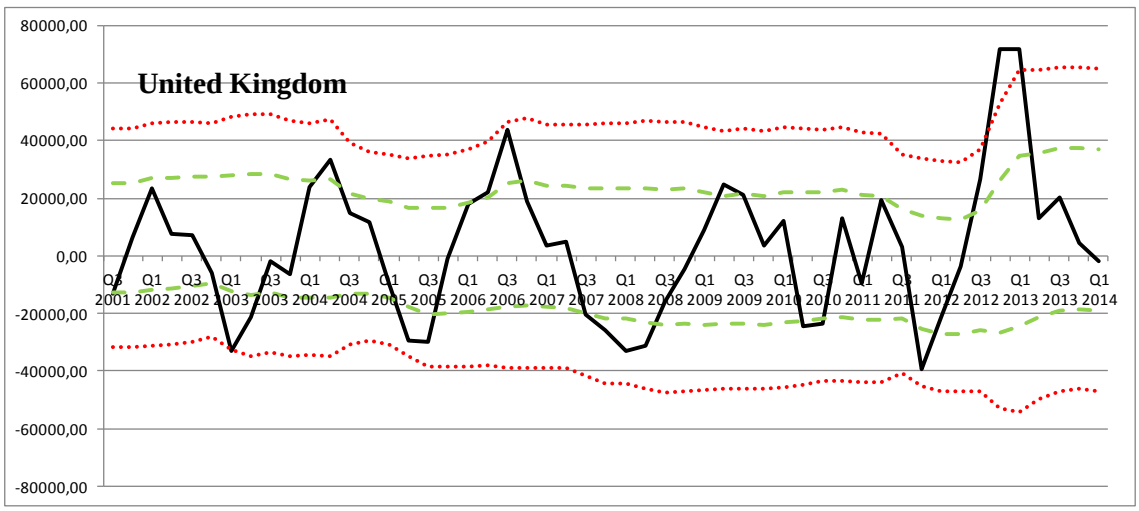

Source: Own calculations based on data taken from Eurostat, Euro crisis monitor, the IMF and the European Commission

Figure 3: **Correlations Between Independent Variables**

	lvix	lm2	lgdpgrowth	lconsumerconfidence	lchangerating	lchangepublicdebt
lvix	1,0000					
lm2	-0,0062	1,0000				
lgdpgrowth	-0,2851	0,1503	1,0000			
lconsumerconfidence	-0,3143	0,3278	0,6825	1,0000		
lchangerating	-0,0735	0,1336	0,1954	0,1562	1,0000	
lchangepublicdebt	0,1902	-0,2248	-0,2350	-0,2994	-0,0523	1,0000