

# Systemic risk in Europe

## due to foreign currency loans\*

Pınar Yeşin<sup>†</sup>

Swiss National Bank, Boersenstrasse 15, CH-8022 Zurich, Switzerland

*13 September 2011*

*First Draft*

---

\*Many thanks to the 19 European central banks, who participated at the SNB's CHF Lending Monitor and commented on an earlier version of this paper. Any remaining errors are my own. The views expressed in this paper are those of the author and do not necessarily represent those of the Swiss National Bank.

<sup>†</sup>E-mail: Pinar.Yesin@snb.ch. Tel.: ++ 41-44-631-3969.

## **Abstract**

Using a novel dataset and following the method suggested in Ranciere, Tornell, and Vamvakidis (2010), I calculate new currency mismatch indices across European countries. These new currency mismatch indices quantify systemic risk arising from foreign currency loans given to the (unhedged) domestic non-bank sector. In particular, I evaluate the net unhedged foreign currency liabilities of the banking sectors in Europe as a share of their total assets. The data allows me to calculate both CHF-induced systemic risk and other-foreign-currency-induced systemic risk separately in 18 European countries in each quarter during 2009:Q1 and 2010:Q4.

I find that the systemic risk in Eastern Europe is substantial, while it is low in the remaining European countries. However, CHF-denominated loans are not the main source behind the systemic risk in Eastern Europe. I find that loans denominated in other foreign currencies contribute to the systemic risk much more than CHF loans. Furthermore, systemic risk is quite persistent and not very volatile over time in the sample.

*Keywords:* Systemic risk, foreign currency loans.

# 1 Introduction

Foreign currency loans are remarkably prevalent in Europe. In 2010:Q4 the majority of the outstanding loans given to the non-bank sector in Eastern Europe was denominated in a foreign currency (Figure 1). To a lesser extent, however still notably, banks in some Western European countries give foreign currency loans to the non-bank sector as well. Even if borrowing in euro might be considered rational for some non-euro area countries that are sooner or later going to adopt the euro, there is still considerable amount of borrowing in other foreign currencies by the non-bank sector in Europe. For example, loans denominated in Swiss franc (CHF) constitute a significant share of total loans in some countries, such as Austria, Croatia, Hungary, and Poland.

Furthermore, in several Eastern European countries, a large fraction of the foreign currency loans is given to the domestic household sector - which is unlikely to be hedged against any exchange rate risk - and to the domestic non-financial corporations - some of which might also not be hedged (Figure 2).

Naturally, some questions arise:

- What is the magnitude of the systemic risk for the European banking sectors due to foreign currency loans given to the non-bank sector?
- To what extent would the banking sectors' balance sheets be affected when the (un-hedged) non-bank sector cannot service its foreign currency debt anymore due to sudden exchange rate movements?
- Are CHF-denominated loans the main driver of a systemic risk in certain countries?

To answer these questions, I quantify the systemic risk in the European banking sectors by calculating a new currency mismatch measure across European countries. For this purpose I use data collected by the Swiss National Bank from European central banks and follow the method suggested in Ranciere, Tornell and Vamvakidis (2010).

This new currency mismatch measure takes into account the indirect exchange rate risk that banks undertake when they lend to unhedged borrowers (i.e., resident households and non-financial corporations). In particular, it calculates the net unhedged foreign currency liabilities as a share of total assets. The larger this number is in a given country, the higher is the systemic risk in its banking sector.

This paper makes three distinct contributions to the literature:

1. Since data from the CHF Lending Monitor is reliable and consistent across countries, and is more detailed than what has been publicly available till now, my systemic risk measures are more accurate than the ones in Ranciere, Tornell and Vamvakidis (2010).
2. I can separately identify the aggregate systemic risk due to all foreign currency loans and the particular systemic risk resulting from CHF loans in Europe.
3. The quarterly data of the CHF Lending Monitor allows me to observe the evolution of the currency mismatch on a quarterly basis from 2009:Q1 till 2010:Q4. For a subset of countries the measure can be calculated from as early as 2002:Q1 on.

My currency mismatch measures show that the systemic risk due to foreign currency loans is high in the majority of the non-euro area countries: net unhedged foreign currency

liabilities of the banking sectors correspond to more than 20% of their total assets. However, CHF mismatch indices are much lower: net unhedged CHF liabilities are always less than 5% of their total assets. Therefore I conclude that CHF loans are not the main driver of a systemic risk in Europe.

Individual components of the foreign currency mismatch indices show that banks are trying to hedge against the foreign currency induced credit risk by holding more foreign currency assets than their foreign currency liabilities in a persistent manner. However, the mere size of the foreign currency loans to unhedged households exceeds this buffer in most countries resulting in a positive foreign currency mismatch index.

Furthermore, I find that the currency mismatch measures are quite persistent and not volatile during the time period they are available. This confirms the findings of previous research that both households and firms take long-term loans in foreign currency and do not "carry-trade" based on short-term changes of the macroeconomic environment (see, for example, Beer, Ongena, and Peter (2010) and Brown, Ongena, and Yeşin (2011)).

## 2 Method

I follow the approach suggested in Ranciere, Tornell and Vamvakidis (2010) to calculate currency mismatch indices for the European countries' banking sectors. This new approach is different from the previous ones used in the literature, since it takes into account the indirect exchange rate risk that banks undertake when they lend to unhedged borrowers. In other words, the new currency mismatch indices consider the "exchange-rate-induced

credit risk”.

In the literature, currency mismatch in a banking sector is usually measured as the net foreign currency liabilities (i.e. the difference between foreign currency liabilities and foreign currency assets) as a share of total assets of the banking sector. However, banks usually match their foreign currency assets and foreign currency liabilities so that their difference would be almost (or sometimes even identically) zero. Furthermore, the simple measure treats all foreign currency assets equally without considering the risks associated with foreign currency loans given to unhedged borrowers. Therefore, Ranciere, Tornell and Vamvakidis (2010) propose to calculate the net unhedged foreign currency liabilities as a share of total assets, by not including the ”risky” foreign currency assets in the foreign currency assets, i.e. foreign currency loans given to the domestic non-bank sector are not included in foreign currency assets.

Thus in a given country, the foreign currency mismatch index in the banking sector equals to net foreign currency denominated liabilities plus unhedged foreign currency assets divided by total assets.

Therefore, foreign currency mismatch index =

$$\frac{\text{FX liabilities} - [\text{FX assets} - \text{FX loans to resident households and non-fin. corporations}]}{\text{Total Assets}}$$

As detailed info on CHF-denominated loans is available for the CHF Lending Monitor, I can calculate the systemic risk arising from CHF loans only, by applying the same method.

Thus, the CHF mismatch index =

$$\frac{\text{CHF liabilities} - [\text{CHF assets} - \text{CHF loans to resident households and non-fin. corporations}]}{\text{Total Assets}}$$

Similarly, other FX mismatch index =

$$\frac{\text{Other FX liabilities} - [\text{Other FX assets} - \text{Other FX loans to res. households and non-fin. corp.}]}{\text{Total Assets}}$$

Note that, foreign currency mismatch index = CHF mismatch index + Other FX mismatch index.

Note also that the mismatch indices are upper bounds for the systemic risk, because they assume that none of the domestic households or non-financial corporations cannot service their debt.

### 3 Findings

Table 1 illustrates the foreign currency mismatch index across countries in Europe as of 2010:Q4. It also shows whether the systemic risk is arising from CHF loans or from other foreign currency loans<sup>1</sup>.

First, note that the foreign currency mismatch index varies significantly across European countries, from 0.2% in the UK to 46.2% in Latvia<sup>2</sup>. It is generally higher in the non-euro area than in the euro area. For example, in all of the non-euro area countries except the Czech Republic and the UK, the FX mismatch index is between 12% and 50%. In other words, net unhedged foreign currency liabilities of the banking sectors constitute between 12% and 50% of their total assets. Consequently, these countries display high

---

<sup>1</sup>The currency mismatch indices cannot be calculated for Denmark as the data on the banking sector's liabilities is missing.

<sup>2</sup>My systemic risk measures are all upper bounds, as I assume that all of the domestic households and domestic non-financial corporations are unhedged against the exchange rate risk.

systemic risk in their banking sectors. On the other hand, the FX mismatch index is fairly low in the euro area countries. Net unhedged foreign currency liabilities constitute always less than 5% of total banking sector assets.

Interestingly, the CHF mismatch index is fairly low in all of the European countries. Thus CHF loans given to households and non-financial corporations are not the main driver behind the high systemic risk in the non-euro area countries. Consequently, loans denominated in other foreign currencies contribute by far more to systemic risk in Eastern Europe.

Figure 3 shows the individual components of the FX mismatch index across European countries. These components are net foreign currency liabilities, foreign currency loans to domestic households, and foreign currency loans to domestic firms (all as a share in total assets). The figure reveals that several banking sectors are possibly trying to hedge against the exchange rate risk by having significantly more foreign currency assets than foreign currency liabilities. However, the volume of foreign currency loans to domestic households and non-financial corporations are very large relative to their total assets. Therefore several of the non-euro area countries have large currency mismatch indices. The high systemic risk in the non-euro area countries is due to two factors:

- The banking sectors in those countries have sizable foreign currency assets (and liabilities) relative to their total assets;
- A very large fraction of the foreign currency assets are in the form of foreign currency loans given to resident households and resident non-financial corporations.

Similarly Table 2 lists individual components of the CHF mismatch index in 2010:Q4 across Europe. The CHF mismatch index, hence the systemic risk resulting from CHF loans, is relatively low in all of the countries. However, in a few countries, this is masking the fact that the banks are holding significantly more CHF assets than CHF liabilities (particularly in Hungary, Croatia, and Austria). These net CHF assets balance the sizeable CHF loans to domestic borrowers in those countries. Consequently the resulting CHF mismatch index is still low.

Finally, Figures 4 and 5 display the time evolution of systemic risk in Europe. First, note that both the foreign currency mismatch index as well as the CHF mismatch index are fairly persistent over time for most countries and do not show big fluctuations. In Figure 4, the FX mismatch index shows an upward trend in Bulgaria, Romania, and Poland, though it remains quite flat during 2010. In Hungary, it first increases till 2009, and then starts declining till 2010:Q4. In the remaining non-euro area countries, it is fairly stable during the time period observed. Figure 5 similarly shows low volatility of the FX mismatch index in the euro area.

Figures 6 and 7 depict the time evolution of the CHF mismatch index across Europe. Again persistency and low volatility of the systemic risk is observed. A few countries show a slight increase in the CHF mismatch index over time, however, the CHF mismatch index is continually low relative to the FX mismatch index.

## 4 Conclusion and some policy implications

In this paper, I quantify the systemic risk in European countries due to foreign currency loans by calculating a new currency mismatch index. For this purpose I use data from the CHF Lending Monitor and follow the method suggested by Ranciere, Tornell and Vamvakidis (2010). These exact measures of systemic risk may help policymakers to gauge the system-wide risks associated with foreign currency loans more accurately.

I show that in majority of the non-euro area countries, the systemic risk in the banking sector is very high: net unhedged foreign currency liabilities of the banking sectors correspond to more than 20% of their total assets as of 2010:Q4. However, net unhedged CHF liabilities are less than 5% of their total assets. Thus other foreign currency loans (probably denominated to a large extent in euros) contribute to systemic risk far more than the CHF loans in Eastern Europe. Therefore switching the CHF-loans into euro loans in Eastern Europe, as it was recently suggested by the Hungarian Financial Supervisory Authority , would not eliminate the systemic risk in these countries.

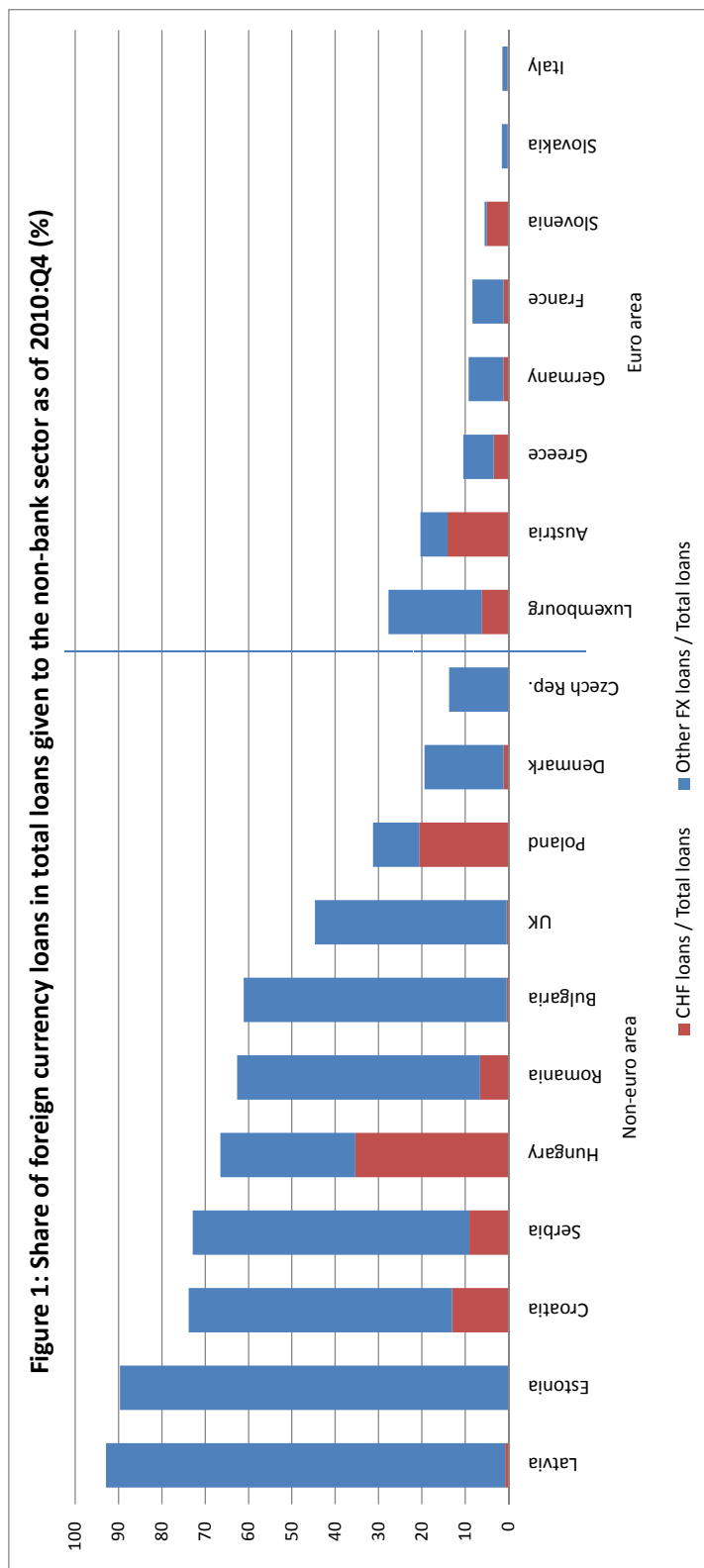
Furthermore, foreign currency mismatch indices show persistence and low volatility during the period they are available. Thus, short-term policies cannot have a strong impact in reducing systemic risk in Europe immediately. Encouragement of local currency borrowing can be a long-run solution. Last but not least, the role of the ECB as the "lender of last resort" needs to be discussed within Europe. The implicit guarantee that the ECB is giving to current and future EU countries can prove to be very costly if the Eastern European currencies depreciate against the euro suddenly.

## 5 References

Beer, Christian, Steven Ongena, and Marcel Peter (2010), "Borrowing in foreign currency: Austrian households as carry traders", *Journal of Banking and Finance*, Vol. 34 Issue 9, pp. 2198-2211.

Brown, Martin, Steven Ongena, and Pinar Yeşin (2011), "Foreign currency borrowing by small firms in the transition economies", *Journal of Financial Intermediation*, Vol. 20 Issue 3, pp. 285-302.

Ranciere, Romain, Aaron Tornell and Athanasios Vamvakidis (2010), "Currency mismatch, systemic risk and growth in emerging Europe", *Economic Policy*, October 2010, Vol. 25 Issue 64, pp. 597-658



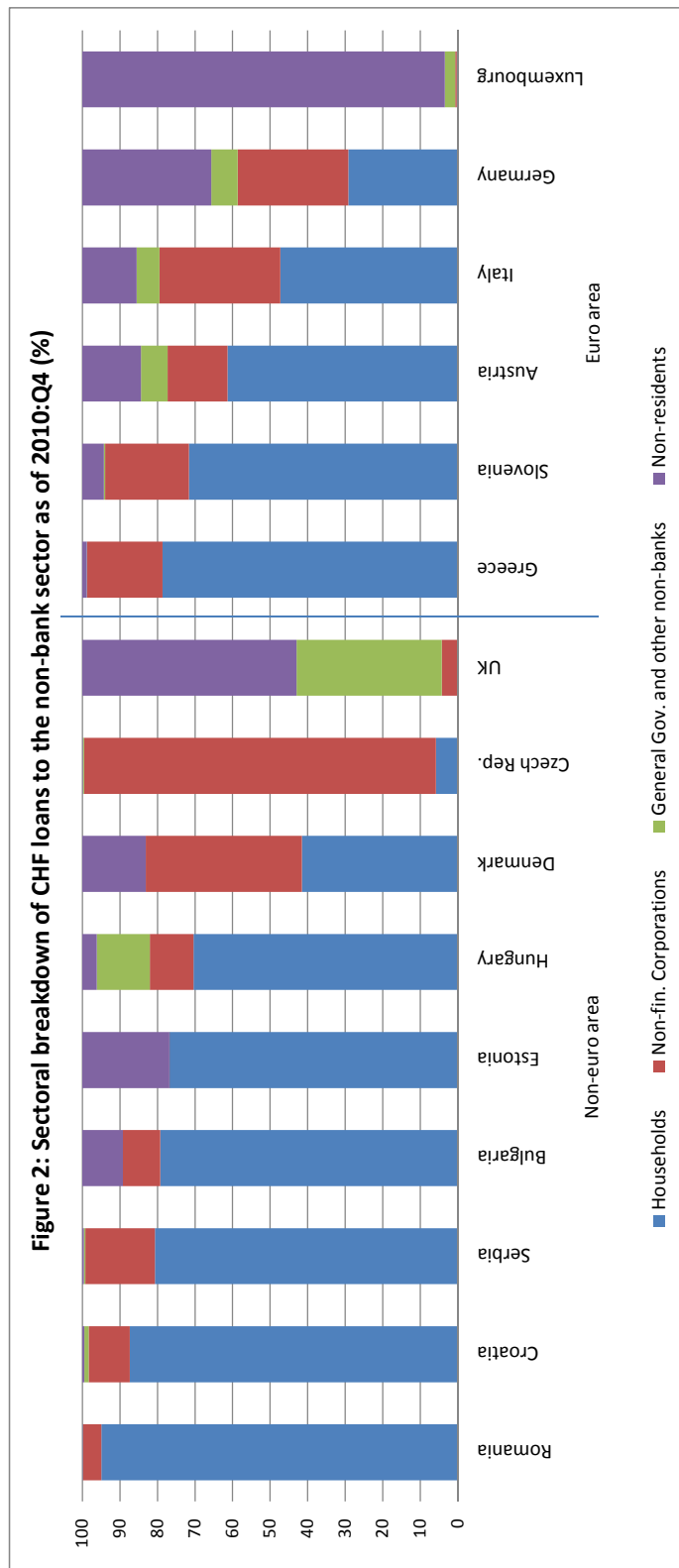


Table 1: Systemic risk measures in Europe as of 2010:Q4

		FX mismatch index	CHF mismatch index	Other FX mismatch index
	Latvia	46.2	n.a.	n.a.
	Estonia	41.4	0.0	41.4
	Croatia	37.2	4.2	33.0
	Bulgaria	31.5	0.0	31.5
Non-	Serbia	32.4	3.4	29.0
euro area	Romania	27.6	2.0	25.7
	Hungary	21.3	3.8	17.5
	Poland	13.2	n.a.	n.a.
	CzechRep	2.4	-0.2	2.6
	UK	0.2	-0.3	0.5
	Slovenia	3.4	3.3	0.1
	Greece	2.3	-0.8	3.1
	Austria	2.2	1.1	1.2
Euro	France	1.9	n.a.	n.a.
area	Luxembourg	1.3	-0.6	1.9
	Italy	0.8	0.0	0.8
	Slovakia	0.7	n.a.	n.a.
	Germany	0.5	0.0	0.5

*Notes:* 1. n.a. means not available; 2. A higher mismatch index means a higher systemic risk; 3.  $\text{FX mismatch index} = \text{CHF mismatch index} + \text{Other FX mismatch index}$ .

Figure 3: Components of the FX mismatch index in 2010:Q4 (%)

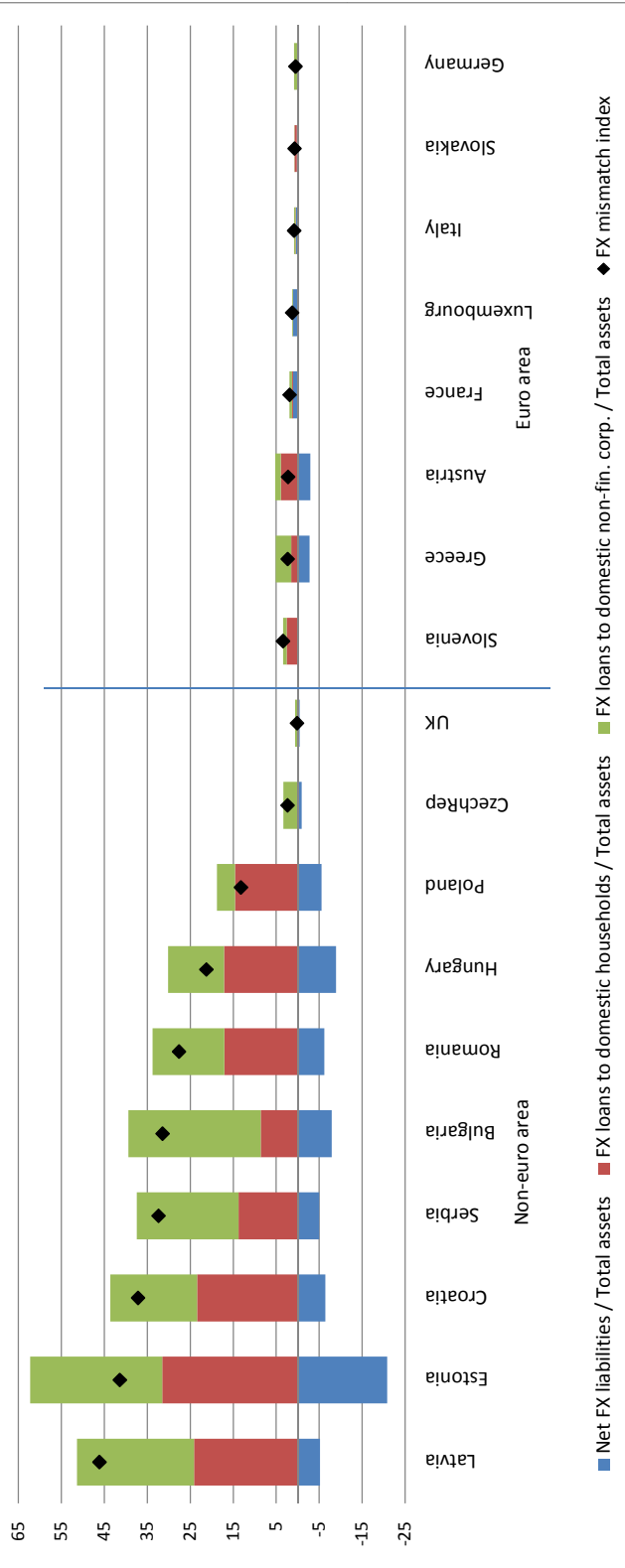


Table 2: Components of the CHF mismatch index in 2010:Q4

		% of Total Assets			
		Net CHF liabilities	CHF loans to domestic households	CHF loans to domestic non-fin. corp.	CHF mismatch index
Non-euro area	Croatia	-4.41	7.67	0.96	4.22
	Hungary	-13.84	15.11	2.50	3.76
	Serbia	-1.79	4.22	0.97	3.39
	Romania	-1.80	3.57	0.18	1.96
	Estonia	0.01	0.00	0.00	0.01
	Bulgaria	-0.23	0.22	0.03	0.02
	UK	-0.31	0.00	0.01	-0.31
	CzechRep	-0.26	0.00	0.04	-0.22
Euro area	Slovenia	0.00	2.55	0.80	3.35
	Austria	-3.59	3.71	0.96	1.08
	Italy	-0.06	0.06	0.04	0.04
	Germany	-0.28	0.13	0.13	-0.01
	Luxembourg	-0.60	0.00	0.01	-0.59
	Greece	-2.63	1.47	0.38	-0.78

