

## The TT Index as an Indicator of Macroeconomic Vulnerability of EU New Member States

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### Abstract

*This paper reviews some of the factors that potentially contribute to macroprudential weakness, and thus concerns about macroeconomic and financial system health in the new EU member states of Central and Eastern Europe. In general, the consequences of the global 2008 – 2009 crisis were more severe in some of the new EU countries, and it is useful therefore to look at the experiences in the different countries to try and understand the reasons for the different outcomes and look to see what lessons may be learned. One of the factors having an impact on recovery from the crisis is in currency relationships, with Estonia, Latvia, Slovenia and Slovakia being members of the Eurozone, and some other countries in fixed exchange rate relationships. In this paper we present the construction of a new indicator (named the TT index) evaluating macroeconomic vulnerability of the new EU countries, which is based on seven macroprudential indicators and calculated for the years 2008 and 2013.*

**Keywords:** Euro, European Union, macroprudential indicators, TT index

**JEL Classification:** F15, F31, F36, G21

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### 1. Introduction

The global financial crisis that spread from the sub-prime difficulties in the United States has had some severe negative consequences, but it has also had some welcome outcomes. Not the least of these has been the opportunity for

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academics, policy-makers and practitioners to reacquaint themselves with negative financial and economic events (for more details on consequences of the global crisis see, for instance, Mandel (2009), Šikula (2009), Czesaný (2011) or Reinhart and Rogoff (2011)). Although there had been some smaller economic downturns during the period since the end of World War II, the financial crisis of 2007 – 2009 has generally been acknowledged as the most severe since the great depression of the 1930s.

This study reports a comparison and contrasting of the effects of the crisis on a small group of countries which display some similarities in their economic and financial structures, despite major differences in their geographies. The countries that we include in the study are the 10 countries of Central and Eastern Europe (CEE) that joined the European Union in the 2004 – 2012 period: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. By investigating and discussing these we generate some insights into the consequences of the special features of the crisis in different environments. We learn something of the risks and benefits associated with different economic and financial structures. This has the potential to inform policy-makers in those and other countries of some of the consequences of economic shocks in a range of different contexts, and thus to guide future policy-making. They may be able to learn something of how they can limit the flow-on effects of financial and economic difficulties in the future.

Massive cross-border holdings in CEE banks pose significant challenges to financial regulation and a large number of unresolved issues remain such as fragmentation of financial markets or national regulatory and supervisory powers (Fielding et al., 2010). The issues that underpin this paper, in terms of financial interrelationships being a breeding ground for crises, are not new. Once we started to have globalised financial markets, events in one country could find numerous ways to impact on events in other countries, through a multiplicity of transmission channels. A key element in the globalisation of financial markets has been in the foreign ownership of banks, prior research on which has focused on a number of different strands. One set of studies has looked at the reasons why banks expand overseas, from home country and host country perspectives. Tripe and Matthews (2003) summarised this by describing six core theories, and noted that, even in looking just at the four major Australian banks, no single theoretical explanation appeared to dominate.

To and Tripe (2002) failed to find a single tidy explanation for foreign banks' involvements in the New Zealand market, beyond suggesting that there seemed to be a group of longer established banks with different relationships to their host country market from that which applied to more recent arrivals. Further insights

into this were reported by Tripe, McIntyre and Wood (2009), who found a distinct difference in recognition as foreign between the longer established foreign banks and the more recent arrivals.

Yet another factor is banks' exposure to international financial markets, in that we have seen how the losses incurred by banks in foreign markets can weaken their capital positions for lending into other markets that were otherwise unaffected. Popov and Udell (2010) outline a process whereby falling house values in the USA weakened the balance sheets of Austrian, Belgian and Italian banks which had invested in securities based on those mortgages. This forced those banks to tighten credit standards in their subsidiaries in Slovakia. Another side of this is that the higher credit ratings of foreign banks (which are generally shared by their subsidiaries in other countries) give them greater capacity to draw in funds from other sources to boost funds available for lending. Foreign subsidiaries are thus able to increase their lending to levels beyond what would be available through purely domestic bank funding. This may be seen as contributing positively to credit availability, although it is sometimes perceived as having allowed excessive credit expansion.

Trade flows made a contribution to the spread of the crisis, as exporters faced reduced sales and thus incomes. Countries with high levels of exports thus faced significant downturns in income, and this was a major factor in the spread of the global financial crisis into countries in South East Asia. These effects would be expected to differ according to the currency regime – countries with fixed exchange rates would be expected to be impacted more severely than countries with floating exchange rates, as under floating rates some of the shock of reduced export sales should be absorbed through the exchange rate.

The paper continues as follows. In Section 2 we look in more detail at the relevant economic data for the countries involved in our study, which provides a background to the new macro-vulnerability index that we discuss in Section 3, the empirical part of our paper. Finally, Section 4 concludes the paper and draw relevant lessons.

## **2. Local Economic Conditions of CEE**

In this part we discuss and compare local macroeconomic conditions of CEE countries in the 2006 – 2013 period. We have divided CEE countries (or new EU-10 countries) into two groups according to their currency regimes: (i) new member states (“NMS Floaters”) – New member states (NMS) using floating exchange rates (Czech Republic, Poland, Hungary and Romania) and (ii) new member states (“NMS Fixers”) – New member states (NMS) using the Euro

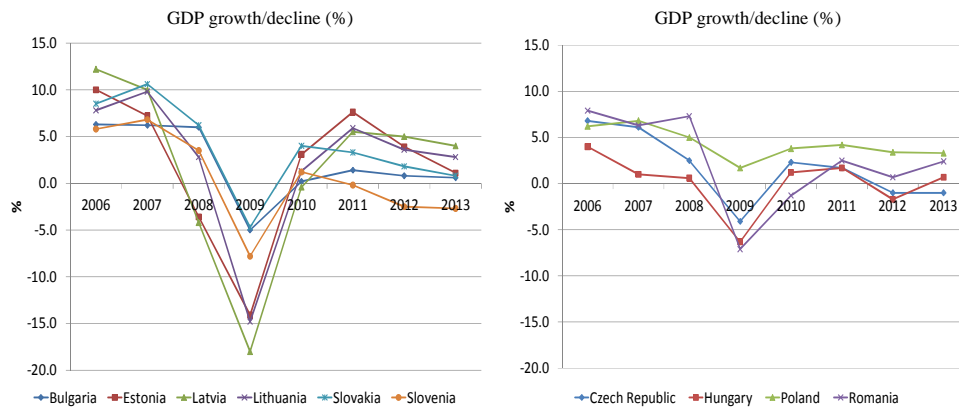
(Slovenia and Slovakia) crawling peg (Latvia) or currency boards (Bulgaria, Estonia, and Lithuania). Note that countries joining the Euro have generally been required to adhere to fixed exchange rate regimes (relative to the Euro) to establish their eligibility.

## 2.1. Economic Performance

There are a number of similarities between the economic conditions applying in the so-called new EU member states in Central and Eastern Europe. These include, in many cases, foreign ownership of banks, rapid expansion of credit, and significant current account imbalances which have been funded by inflows of funds to the banking system. However, different CEE countries reported different pre-crisis macroeconomic fundamentals what affected economic and financial performance of these countries during the global crisis. In the following part we discuss main macroeconomic and financial markets' indicators for CEE: GDP decline in 2009, high foreign ownership of banks, rapid credit growth, current account imbalances, loan-deposits ratios, and an increasing government debt-to-GDP ratio.

Figure 1

### Economic Performance of CEE Countries in the 2006 – 2013 Period



Note: Note that the two panels in this graph (and many of those following) show countries with a fixed exchange rate regime in the left panel, and those with a floating exchange rate regime in the right panel.

Source: Authors based on FITCH (2010; 2014).

## 2.2. Foreign Ownership of Banks

In early 2000s privatization of banks in CEE was finished and all main CEE banks came into foreign ownership. As a result, many European banking groups such as UniCredit, Raiffeisen, Erste, KBC or Société Générale entered this market

and enjoyed high dividends from their subsidiaries in the precrisis period. However, this parent-subsidiary relationship showed to be a double-edge sword during the crisis, when some CEE banks suffered losses and their parent banks had to fund them (e.g. Raiffeisen Bank in Hungary). On the other hand, some CEE banks with strong deposit base helped their Western parent banks with funding during the crisis (e.g. Erste Group, an Austrian bank, was funded by its Czech subsidiary Česká spořitelna).

FITCH (2010; 2014) report a high degree of foreign ownership of CEE banks for both Groups A and B; while Estonia, Slovakia and the Czech Republic posted the highest shares reaching almost 100%, Slovenia reported the lowest share around 40%. See Bonin (2010) for a more extensive review of the foreign ownership of banks in these economies. In terms of the theoretical issues canvassed in the previous section of this paper, it should be noted that foreign entry has largely been undertaken by acquisition of existing operations, rather than by greenfields establishment of new ones. We do not in the end use this factor directly in our assessment of the macroprudential risks to which our countries are exposed. For one thing, the differences between the countries in our study are not great (with the partial exception of Slovenia), which means that it is not a distinguishing factor for the data set. The other major point is that we do not have a clear prior view as to the impact of foreign bank ownership on a country's exposure to macroprudential risks (compare to Heryán and Stavárek, 2012).

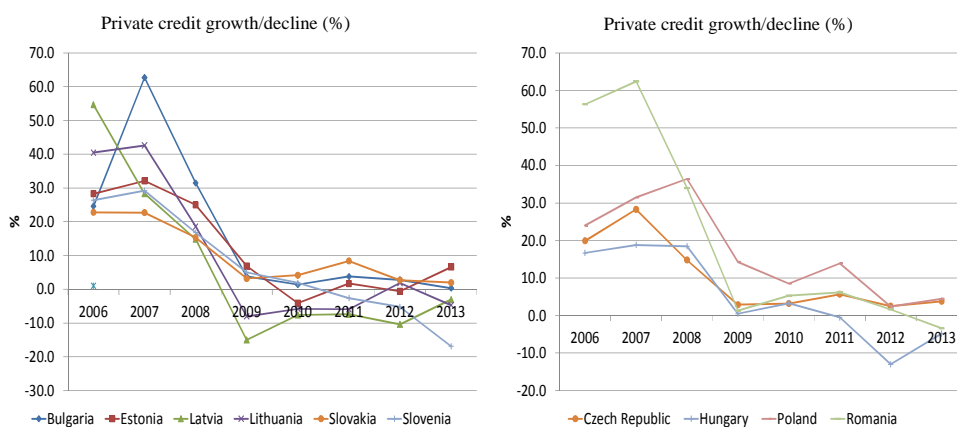
### **2.3. Private Credit Development**

Rapid credit growth ranks to one of causes of a crisis typically followed by an asset-price bubble (Teplý, 2010). CEE countries saw a sharp credit growth in the 2006 – 2008 period (Figure 2), which was caused by several factors. First, financial intermediation in CEE is still well below EU levels and expected convergence in this respect (in terms of bank assets/GDP ratios CEE countries reach approx. 100% vs. 200% in the EU). Secondly, CEE countries experienced rapid GDP growth in the observed, which further fuelled the demand for credit (Stavárek and Vodová, 2010).

Finally, foreign-owned banks supported these countries by relatively cheap funding usually in foreign currency. Unhedged foreign-currency borrowing by households remained a key risk for both households and companies in case of currency depreciation, what materialized during the crisis. For example, in 2008 the proportion of foreign currency loans to total household loans amounted to 90% in Estonia, 86% in Lithuania, 60% in Latvia or 57% in Hungary, where Hungarian's forint depreciation against Euro caused an approximately 30% jump

in EUR-denominated mortgage instalments for some Hungarian households between August 2008 and December 2009. Not surprisingly, CEE countries saw a rapid decline of private credit dynamics in the year of 2009, when the global crisis negatively affected global economy's performance. Figure 2 indicates that private credit growth plummeted in 2009 and even two countries (Lithuania and Latvia) reported year-on-year declines in this year.

**Figure 2**  
**Credit Expansion Development in CEE in the 2006 – 2013 Period**



Source: Authors based on FITCH (2010; 2014).

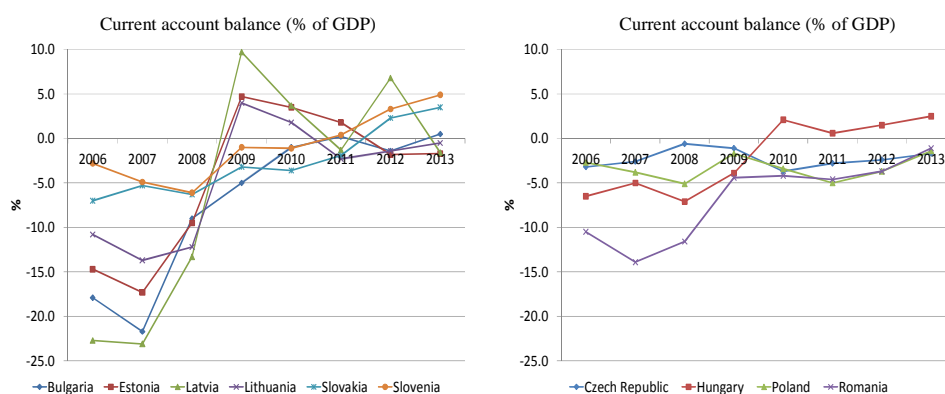
#### 2.4. Current Account Balances

A current account deficit is another measure of an economy's overheating. As CEE countries were growing rapidly, their balance of payments current account showed huge deficits.<sup>1</sup>

Our research shows that NMS Fixers posted higher current account deficits than NMS Floaters in the precrisis period. For instance, while Baltic states' (Estonia, Lithuania and Latvia) deficits exceeded 15% of GDP, the Czech Republic and Poland's current account deficits oscillated up to 5% of GDP (FITCH, 2010). On the other hand, in 2013 two NMS fixers (Slovakia and Slovenia) reported higher current account surpluses compared to all NMS floaters (Figure 3).

<sup>1</sup> See Klaus (2000) for discussions on causes of the exchange rate crisis in the Czech Republic in 1997, Brada, Mandel and Tomsik (2008) analysing intertemporal approach to the balance of payments in transition countries or Janda, Michalkova and Skuhrovec (2013) discussing the effect of credit export subsidies of foreign trade of the Czech Republic.

Figure 3  
Current Account Imbalances in CEE in the 2008 – 2013 Period

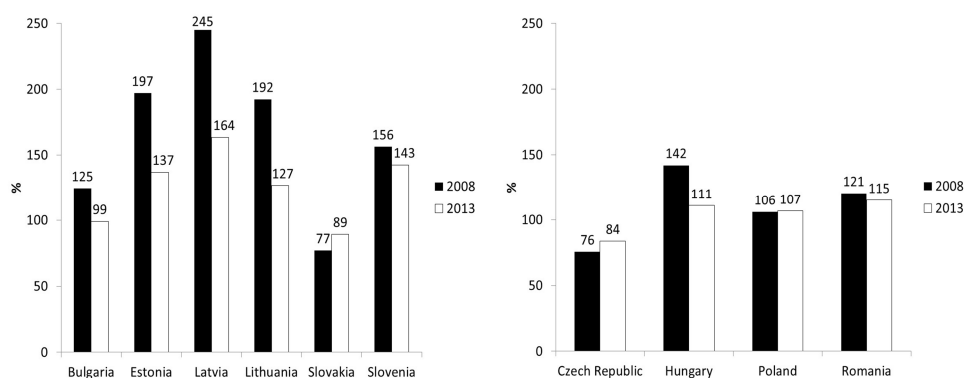


Source: Authors based on FITCH (2010; 2014).

## 2.5. Loan-to-deposit Ratios

However, besides macroeconomic imbalances, the banking sectors' characteristics had important impacts on the economic performance of CEE countries. The first variable, a loan-to-deposit ratio (LTD) indicates liquidity position of a banking sector (the lower the LTD ratio, the higher liquidity risk of the sector). If the LTD is greater than 1, loans provided by banks exceed deposits gathered from customers implying the need of financing through interbank markets, which proved to be important during the crisis. If trust among market players is weak, liquidity dries very quickly on the interbank market, putting pressure on balance sheets of banks with low LTD ratios.

Figure 4  
Loan-to-deposit Ratios in CEE in the Years of 2008 and 2013



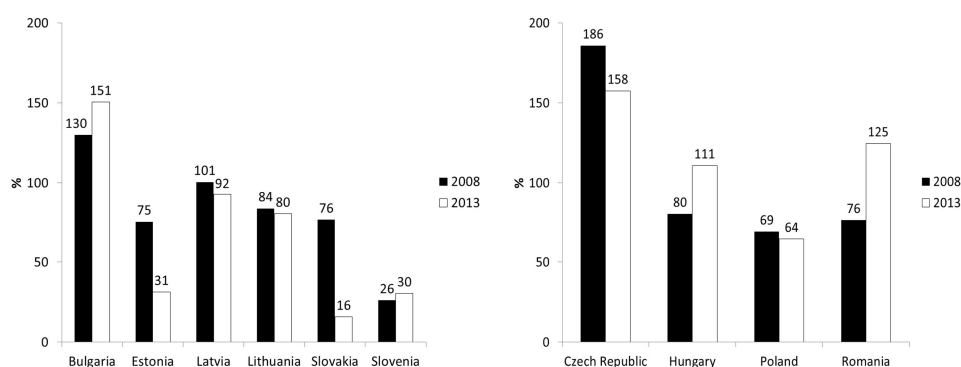
Source: Authors based on FITCH (2010; 2014).

Figure 4 displaying the LTD ratios around CEE countries shows that on average NMS Fixers report higher LTD ratios than NMS Floaters. On one hand, Baltic states' ratios exceeded 190% in 2008; on the other hand, the Czech and Slovak banking sectors, more lightly impacted by the turmoil, reported LTD ratios under 80%. Most of the researched countries reported a decline in LTD ratios between the years in 2008 and 2013 with exceptions of Bulgaria, Czech Republic, Slovakia: their LTD level remained still relatively low compared to the others, however.

## 2.6. Liquidity Risk Ratios

Since liquidity risk materialized during the financial upheaval, we have included a second variable describing this type of risk: a macroeconomic liquidity risk ratio that seeks to assess the risk of an external liquidity crisis<sup>2</sup> by expressing the level of a country's liquid external assets as a percentage of its liquid external liabilities defined by FITCH (2010; 2014), which is consistent with standard text-book approaches to country risk assessment (Saunders and Cornett, 2011). A higher liquidity ratio implies a better liquidity position for a country; while the Czech Republic reported the highest ratio (185.9%) among the investigated countries, other countries such as Estonia, Poland and Slovenia posted the lowest values of this indicator (Figure 5).

Figure 5  
Liquidity Risk Ratios in CEE in 2008 and 2013



Source: Authors based on FITCH (2010; 2014).

<sup>2</sup> For more details on liquidity risk in CEE banks see, for example, Bláhová (2012), Bruna and Durcakova (2012) or Vodová (2013a; 2013b), discussions of risk management practices in CEE we refer to Baran and Witzany (2014), Dvořák (2010), Hlaváček, Horváth and Hainz (2014), Křišťoufek (2010), Skořepa (2013), Stádník (2013; 2014) or Vácha, Baruník and Vošvrda (2009).



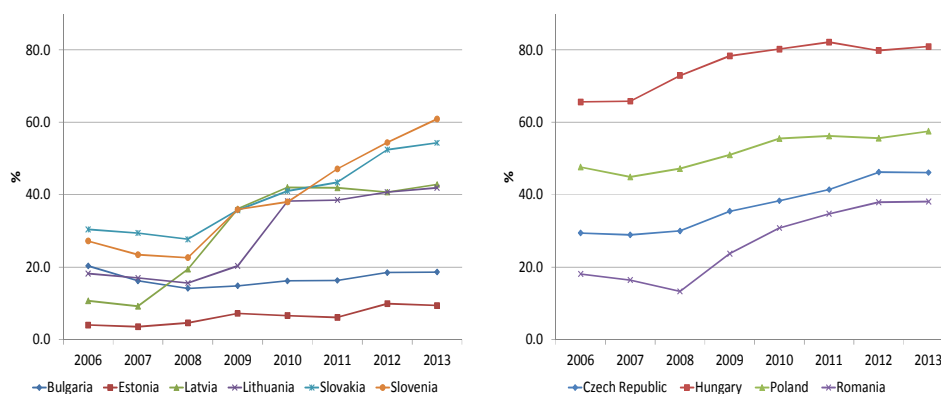
## 2.7. Government Debt

The global crisis resulted in weaker banking sectors and deterioration of public finance around the world as documented by many researchers including Reinhart and Rogoff (2011).<sup>3</sup>

Although a central government debt-to-GDP ratio of CEE countries sits well below the Maastricht treaty's level of 60% (except for Hungary and Slovenia as of the end of 2013), the dynamics of increasing government debt of these countries is alarming (Figure 6). This fact highlights the importance of public finance reforms in both NMS Fixers and NMS Floaters. However, these reforms are hard to implement in the European Union, where an illusion of infinite economic growth failed, as documented by stagnation or recession witnessed in the Eurozone in middle 2014. We believe that structural reforms will not happen in the EU in coming years due to election-minded politicians with their short-term orientation and therefore lost decades of the EU are expected as happened in Japan since 1990s. Moreover, we agree with Šútorová and Teplý (2014) stating that 'zombie' banks<sup>4</sup> will hamper economic recovery of the EU in coming years.

Figure 6

### Central Government Debt/GDP Ratios of CEE Countries in the 2006 – 2013 Period



Source: Authors based on FITCH (2010; 2014).

<sup>3</sup> For general discussion on the recent global crisis and public finance in CEE see Tepperova and Klazar (2012), Tepperova, Vancrova and Vitek (2012) or Loužek (2013).

<sup>4</sup> We follow Šútorová and Teplý (2014) and define a zombie bank as a financial institution with (i) a price-to-book value ratio < 1, (ii) a negative economic worth, (iii) mispriced assets and (iv) support by government's bail-outs and guarantees (e.g. Citibank, Commerzbank, Credit Agricole, Crédit Immobilier de France, Royal Bank of Scotland, UniCredit, German Landesbanken, or Spanish cajas).

### 3. The TT Index as a New Macro Vulnerability Index

For assessing macroeconomic situations of CEE countries we have created of a new macro vulnerability index (TT Index<sup>5</sup>) that evaluates each investigated country based on a total score (TT index) comprising seven variables. Firstly, based on previous research and data availability we have selected these seven macroeconomic variables: Liquidity ratio, Credit growth, Current account balance, Loan-deposit ratio, Government debt-to-GDP ratio, FX loans I (% of total household loans) and FX loans II (% of total corporate loans). Secondly, we set ranges (adjusted to a normal distribution of indicators' values) for each variable and assigned scores (1, 2 or 3) for each country. A higher value of a variable indicates lower risk for the country's macroeconomic situation and the same holds for the TT index. For example, Bulgaria's score for Liquidity ratio is 3, because Bulgaria reported a high Liquidity ratio as of the end of 2008 (130%) meaning above-average value among CEE countries. Finally, we simply summed up the scores for each country and set the TT index (Table 1). Detail descriptions for each variable and country are described in Appendix.

Table 1

#### Calculations of the TT Index for CEE Countries in 2008

Country	V01	V02	V03	V04	V05	V06	V07	Total
	Liquidity ratio	Credit growth	CA balance	LTD	Gov.debt	FX loans I	FX loans II	
Bulgaria	3	1	1	2	3	2	2	12
Estonia	2	2	1	1	3	1	1	9
Latvia	3	3	1	1	2	1	1	10
Lithuania	2	2	1	1	2	2	1	9
Slovakia	2	2	2	3	2	3	2	16
Slovenia	1	2	2	2	2	3	3	15
<b>Average TT index for Fixers</b>								<b>11.8</b>
<b>Standard deviation for Fixers</b>								<b>3.1</b>
Czech Republic	3	3	3	3	1	3	2	17
Hungary	2	2	2	2	1	1	2	11
Poland	1	1	3	2	1	2	2	10
Romania	2	1	1	2	3	2	2	11
<b>Average TT index for Floaters</b>								<b>12.3</b>
<b>Standard deviation for Floaters</b>								<b>3.2</b>

Source: Authors.

#### 3.1. TT Index for 2008

The highest TT index in 2008 was recorded for the Czech Republic and Slovak Republic, while the lowest values were reported for Estonia, Lithuania and Latvia – the three smallest countries in the study, and which would be expected

<sup>5</sup> The TT index is named after the authors of this study. When constructing this index, we were inspired by Jakubik and Teplý (2011) and Teplý and Tripe (2012).

to suffer from limited development of their financial markets. Surprisingly, Estonia got the lowest score although it was to join the Eurozone in January 2011, which should imply relative fiscal and macroeconomic stability. However, the Maastricht criteria government deficit, government debt, inflation rate, long-term interest rates and Exchange rate mechanism (ERM) II membership differ from those applied at the TT index that includes more financial markets' indicators. On the other hand, the Euromoney credit risk rating of Estonia fell sharply in the late 2009 and early 2010, what confirms our result that this country's performance was not based on strong macroeconomic fundamentals. We should highlight Estonia's high loan-to-deposit ratio, low liquidity ratio and a high share of FX loans in both corporate sector and households.

### 3.2. TT Index for 2013

The highest TT index in 2013 were recorded in Bulgaria and Romania, what might seem surprising. However, when analyzing overall results we find that these countries improved their TT indices significantly compared to the year 2008. On the contrary, both Slovenia and Slovakia reported a 3-notch decrease in the TT index as their macroeconomic fundamentals deteriorated more than compared to the other countries. Estonia reported the lowest value of TT index in 2013 because it reported weaker fundamentals than their peers in 2008 with one exception: a government debt/GDP ratio. Regarding the fact that Estonia, together with the Czech Republic, reported the highest FITCH rating (A+) as of the end of 2013, we can conclude that rating agencies consider the government debt/GDP ratio very important for country's rating.

Table 2

#### Calculations of the TT Index for CEE Countries in 2013

Country	V01	V02	V03	V04	V05	V06	V07	Total
	Liquidity ratio	Credit growth	CA balance	LTD	Gov.debt	FX loans I	FX loans II	
Bulgaria	3	2	2	2	3	2	2	16
Estonia	1	1	1	1	3	1	1	6
Latvia	2	2	1	1	2	1	1	8
Lithuania	2	3	2	1	2	2	1	12
Slovakia	1	2	3	2	1	3	2	13
Slovenia	1	3	3	1	1	2	3	12
<b>Average TT index for Fixers</b>								<b>11.2</b>
<b>Standard deviation for Fixers</b>								<b>3.6</b>
Czech Republic	3	1	1	3	2	3	3	14
Hungary	2	3	3	2	1	1	2	13
Poland	2	1	2	2	1	2	2	10
Romania	3	3	2	2	2	2	2	16
<b>Average TT index for Floaters</b>								<b>13.3</b>
<b>Standard deviation for Floaters</b>								<b>2.5</b>

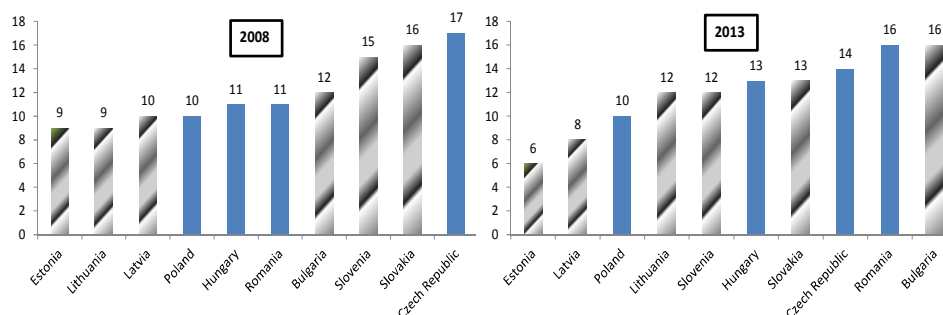
Source: Authors.

### 3.3. Comparison of the TT Index between 2008 and 2013

When comparing CEE countries in terms of their exchange rate regimes (e.g. Fixers and Floaters), in 2008 the Fixers posted the slightly higher average TT index (12.3) compared to the Floaters (11.8), while in 2013 this difference increased (13.3 vs 11.2). As the results vary across both Fixers and Floaters, we cannot say which regime is better, however (see Figure 7). The reason for the lack of distinction here is that there are both well and poorly performing countries in both groups. Countries which are part of the Eurozone have generally had to achieve good economic performance as a condition of membership, whereas some other countries with fixed rates struggle in a turbulent economic climate. On the other hand, there are countries such as the Czech Republic which show good economic performance, but which place less focus on membership of the Eurozone. A conclusion that we might look to draw from this is that currency arrangements are not of themselves important for macroprudential stability: what matters is how an economy is managed overall. However, ratings agencies rank the level of government debt as very important.

Figure 7

#### TT Index for CEE Countries in 2008 and 2013



Source: Authors.

Key areas where there would appear to be differences between countries with fixed and floating exchange rate regimes are in respect of the current account balance, loan to deposit ratio and government debt. In the case of the current account balance, the worse performance of the fixed exchange rate countries should be no surprise, as their exchange rates cannot be adjusted in response to imbalances. Higher loan to deposit ratios, again, should not be a surprise as external sourcing of funds does not carry the risk of exchange rate depreciation (and this is arguably facilitated by foreign bank ownership). Figure 1 implies that the fixed exchange rate countries showed worse economic performance during

the crisis period. By contrast, in the case of government debt, the existence of a fixed exchange rate arrangement may limit a government's ability to borrow, while fixed exchange rate countries will also need more in the way of reserves to cover external payments (the liquidity ratio).

## Conclusion

This paper has sought to review some of the factors that potentially contribute to macroprudential weakness, and thus concerns about macroeconomic and financial system health in a selection of ten CEE countries. We have not taken account of every potentially relevant factor (such as, for example, foreign ownership of banks, as discussed above), but we have nonetheless identified a range of factors which are important for assessing macroprudential factors to which countries' banking systems are exposed. As central banks around the world give increased attention to such issues, we believe that there is value in looking at practical ways by which such issues can be explored. We also note that we have constructed our index using two years' data only: it would be interesting to explore the ways in which values of the TT index might change through time. Over time, with more observations, a set of more robust scoring parameters might be established, which could allow for a more robust set of values for the index. However, even with what we have done, we have created something of a watch-list of countries at risk.

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## Appendix

### Definitions of Variables Included in the TT Index

Variable	Definition
1. Liquidity ratio	Country's liquid external assets as % of its liquid external liabilities
2. Credit growth	Private credit growth in %
3. Current account balance	Current account balance in %
4. Loan-deposit ratio	Loan-deposit ratio in %
5. Government debt-to-GDP ratio	Government debt-to-GDP ratio in %
6. FX loans I (% of total household loans)	FX loans in % of total household loans
7. FX loans II (% of total corporate loans)	FX loans in % of total corporate loans

Source: Authors based on FITCH (2010; 2014).