

# **Capital Account Liberalization and Currency Crisis – The Case of Central Eastern European Countries**

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## **Abstract**

The dissertation investigates if Central and Eastern European countries with unregulated capital flows are more vulnerable to currency crises. In order to answer this question properly the paper considers two lines of analysis: single-country and multi-country. Single –country studies look into three cases: Russia, Poland and Latvia. The multi-country analysis is the simple adaptation of Glick, Guo and Hutchison’s probit panel model (2004). The results suggest that countries with liberalized capital accounts experience a lower likelihood of currency crises. Moreover, the information from case studies pointed that the speed and sequence of the CAL process needs to be adequate for the country development.

## **Keywords**

currency crises, capital account liberalization, exchange rate

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## INTRODUCTION

The topic of capital account liberalization (henceforth CAL) and currency crisis episodes is an important issue for today's emerging market economies in the current era of multinational financial integration, the technology progress and development of international organizations such as the IMF, EU and OECD. Nevertheless, the CAL process is not a new issue; a similar situation occurred in the era of globalization from 1870-1914 when the capital flows were free of any restrictions.<sup>1</sup> However, at that time money could not be transferred with the press of a button from one part of world to another in one second. Today, the debate about the relationship between CAL and the currency crisis phenomena has become a heated one. This is due to the fact that in the last two decades, the increase of the intensity of the CAL process has been accompanied by an increase of currency and banking crises phenomenon, particularly in developing countries.<sup>2</sup> Many countries imposed or were tempted to impose controls on international capital movement in fear of the economic disruption that may accompany capital flows (e.g. Malaysia, Chile)<sup>3</sup>. These capital controls have different forms, and their efficacy in promoting or deterring currency crisis episodes or economic growth is questionable and much debated.<sup>4</sup> Furthermore, at present, the macroeconomic empirical analysis and theoretical implications have not found conclusive evidence demonstrating that CAL increases the risk of a currency crisis. These ambiguous empirical results have moved the researchers' attention towards investigating the different ways of measuring CAL and currency crisis events, as well as more complicated econometric techniques.<sup>5</sup>

In this context, Central and Eastern European (henceforth CEE) countries<sup>6</sup> seem to be very interesting case studies for analyzing the connection between CAL and currency crisis events. Since Berlin Wall fell most of the CEE countries have transformed their economy from totally closed to an almost fully integrated economy with a global market (e.g.

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<sup>1</sup> See among others Bordo (2007), Henry (2006), Summer (2000) and Stiglitz and Charlton (2004).

<sup>2</sup> Griffith-Jones, Gottschalk and Cirara (2000) found that three countries (Korea, Mexico and the Czech Rep.) from the six emerging countries that joined the OECD and liberalized their capital flows in the 1990s, had a large and costly crisis shortly after they joined.

<sup>3</sup> See Kawai and Takagi (2003), Kapla and Rodrik (2001), Charlton and Stiglitz (2004), Cowan et al (2005).

<sup>4</sup> See Le Fort and Lehman (2003), Glick, Reuven and Hutchison (2000), Eiteman, Stonehill and Moffett (2006).

<sup>5</sup> See Jonhston and Ryan (1994), Quirk (1994), Kaminsky and Reinhart (1999), Kauffman (2000), Martin and Rey (2002), Williamon (2002), Tudela (2004), Rodrik (1998), Edwards (2001), Klein and Olivei (2000), Arteta, Eichengree and Wyplosz (2001), Gruszczynski (2001), Demirguc-Kunt and Detriagiache (1998), Eihengreen and Rose (1999), Calvo and Reinhart (2000), Licchenta (2006).

<sup>6</sup> Russia and Ukraine were included to this analysis due to these countries are very interesting in the context of this subject. Both countries had currency crisis and similar communist history to other CEE's countries.

participation in international organizations, liberalization of capital and trade regulations).<sup>7</sup> In addition, most of these countries have had constant speculative attacks on their currency over the last ten years<sup>8</sup>, which has often forced them to seek helps in IMF or World Bank programs.<sup>9</sup> Sometimes this cooperation with international organizations has had a positive effect of CAL intensity (e.g. the Baltic countries or Czech Republic). On the other hand, the transition from communism to a market economy has been more complicated than simply an economic one. There has also been the transformation of social structures and political changes which are connected with additional costs for the economy such as additional early retirement or unemployment benefits<sup>10</sup>. In this situation, CEE countries experienced macroeconomic problems such as fiscal deficit, macroeconomic instability and high inflation. Therefore, all CEE countries' experiences implied that the analysis might be very interesting. However, the simultaneous political-economic-social changes might provide an unambiguous answer to the questions about the CAL's negative impact on the likelihood of a currency crisis. Maybe this is the reason why the impact of CAL on currency crisis episodes for CEE countries has not been documented yet. There are only a very few papers that seek to account for the impact of the CAL process on the structure of capital flows into Central Eastern Countries and EU/EMU accession problems, or which try to explain the reasons for the currency crisis episode in single countries (e.g. the Czech Republic crisis, the Bulgarian crisis).<sup>11</sup>

All the points which are mentioned above suggest that there is room for another analysis which will assess the negative impact of capital liberalization on the risk of currency crisis in CEE countries over the last ten years. In order to explain that free movement of capital reduces a country's vulnerability to currency crisis, three aspects need to be considered. Firstly, how theoretical studies can explain the currency crisis and whether there is any theoretical background which supports the hypothesis that CAL has an impact on currency crisis episodes. Secondly, it is necessary to consider whether there is any empirical evidence from single-country studies that might maintain the negative correlation between

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<sup>7</sup> Since 2004, 8 CEE countries have accessed to EU and most of them were members of the IMF.

<sup>8</sup> According to my own calculations for 12 countries from this region, there were between 77-99 speculative attacks episodes over the period 1995-2005 and 7-16 were successful and transferred to be currency crisis. (see Chapter 3.1).

<sup>9</sup> IMF. The IMF's Approach to Capital Account Liberalization", *Evaluation Report*, 2005 pp. 31.

<sup>10</sup> In communist countries, the problem of unemployment did not exist. After the transformation, this problem shown so there was a need to introduce social benefit system for the unemployed.

<sup>11</sup> See Morales (2000), Calomiris (1999), Dąbrowski (2001), Arvai (2005), Kopits (1999), Buitier and Taci (2001), IMF (2005), Griffith-Jones, Gottschalk and Cirera (2000), Lankes and Stern (1998), Lane and Milesi-Ferretti (2006), Altar, Albu, Dumitru and Necula (2005) and Krkoska (2001).

CAL and currency crisis episodes. Lastly, the question can be asked: Can cross-country analysis explain the relation between the increase in the likelihood of CAL and the decrease of the risk of a currency crisis?

This research attempts to answer these three questions by focusing on subtle predictions regarding CEE countries' CAL policy and by employing measures tailored to capture the aspect of CAL relevant for currency crisis episodes. Furthermore, my study aims at providing contributions to this area by looking at CAL and currency crisis issues which are addressed separately into five substantial chapters in this paper.

Chapter II has three main parts: The first part focuses on CAL aspects such as: efficiency of capital control, sequence of CAL reforms and CAL measures. The second part describes the theoretical basis of the currency crisis, providing definitions and different generations of models. Lastly, a summary of the Chapter and a suggestion for the possible link between CAL and currency crisis will be presented. Chapter III reviews the empirical literature and includes the analysis of a single country as well as a cross-country analysis. In Chapter III, I describe three case studies: the Russian, Latvian and Polish cases whose different experiences illustrate how CAL has affected the probability of a currency crisis. Chapter IV discusses the adaptation of Glick, Guo and Hutchison's probit panel model (2004) for CEE countries which allows me to answer the question of whether the crisis could have been affected by the CAL process or not. In this model the group of 12 countries from the former Soviet Bloc was analyzed.<sup>12</sup> Chapter V summarises the argument and draws some conclusions.

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<sup>12</sup> Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Russian Federation, the Slovak Republic, Slovenia, the Ukraine.

## CHAPTER I

### **The Theoretical link between Capital Account liberalization and Currency Crisis Episodes**

In this chapter I will present two main pillars of my research: important aspects of CAL and theoretical explanations for the Currency Crisis. A summary of my theoretical observations about the relationship between CAL and the Currency Crisis will be presented in third section of this chapter.

#### **1.1. Capital Account Liberalization**

This section mainly focuses on the way in which CAL can be important in analysing the reasons of Currency Crisis episodes. Firstly, I will discuss the way in which capital flows are allocated to different categories and how these categories can be imprecise. In particular, the analysis of categories' imperfection is important because many capital account regulations are based on capital flows classification. Next, I will investigate the reasons for capital control and the effects of capital control on the real economy with special consideration of capital control efficiency. In the third part, I concentrate on the sequence and precondition of the CAL process which can have a positive effect on the capital control efficiency and also on the exchange rate stability. Lastly, CAL measures will be described, taking into account its defects.

##### **1.1.1. Capital flows**

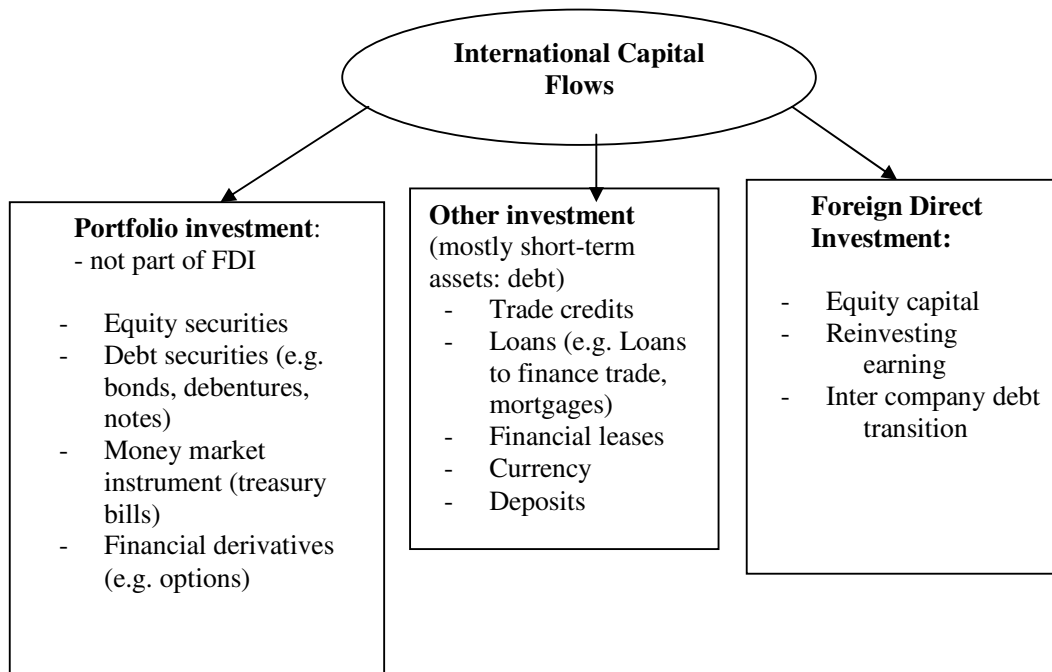
Capital flows can be distinguished in terms of their original maturity. The IMF developed a three-way division to separate international capital flows into Foreign Direct Investment (FDI) (long-term investments)<sup>13</sup>, Foreign Portfolio Investment (FPI) (short-term

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<sup>13</sup> The IMF proposed the following definitions of FDI. A foreign investor owns at least 10 % of the ordinary shares or has a right to 10% percent of the votes in the General Assembly of shareholders in an incorporated enterprise or the equivalent an unincorporated enterprise. The FDI reflects the aim of obtaining a lasting interest by a resident entity of one economy (direct investor) in enterprises that are resident in another economy (direct investment enterprises). The lasting interest implies the existence of a long-term relationship between the direct investor and the enterprise and a significant degree of influence on the management of the enterprise (Duce (2003: 5). The emphasis is on whether the purchase is made with a view to controlling the firm or not controlling investors' interests (effective voice in the management). But there is opened question how the 10% voice in the General Assembly can be effective. In this context the 10% criterion is somewhat arbitrary (Lipsey (1999: 5), Gökkent (1997:10)).

investments)<sup>14</sup> and other investments (see Fig. 1.). There are short term and long term assets and liabilities based on whether a contractual maturity is less than or equal to one year or more than a year. However, in the case of the development of the financial instrument, in particular options and swaps, the original maturity is now of relatively little importance.<sup>15</sup>

Fig. 1. International capital flows classification according to the investment instrument used (OECD, IMF)



Sources: My own analysis; IMF. *Balance of Payments Manual*, Washington, DC, 1993.

It is an often heard statement that FDI flows tend to be more stable compared to FPI (Stiglitz (2000), Liccheta (2006)).<sup>16</sup> The new theoretical model of Albuquerque (2003), Itay and Razin (2005) supported this view that FPI flows create macroeconomic volatility as the reason of higher default risk of FPI than FDI. In empirical analysis, Lipsey (1999), and Itay and Razin (2005) shown that direct investment flows have been the least volatile source of

<sup>14</sup> The FPI is strictly connected with a portfolio diversification process and obtaining high-fast capital gains. FPI is considered as transactions when a non-resident holds less than 10 percent of the shares of an enterprise plus all investment in debt securities (e.g. bonds, debentures, notes, money market or debt instruments, financial derivatives or secondary instruments).

<sup>15</sup> A good example can be a bond maturity in twenty years is long term, but during its lift, it may change hands numerous times or the herding practise of corporations Gökent (1997: 10), Cowan and De Gregorio (2005:12), Pawlik (2003: 4).

<sup>16</sup> As a result of the smaller cost of pulling out for lenders, the short-term debt whereas liquidating foreign direct investment may involve selling plant and machinery, and selling stocks or bonds during a crisis usually involves a loss for the sellers. (Dadush, Dasgupta and Ratha 2000).

international investment for majority of countries. However, Lipsey (1999) found an exception to this. The United States has flipped back and forth from being the dominant net supplier of FDI to being a dominant net recipient of FDI and back to being a dominant net supplier of FDI again. Itay and Razin (2005), and Wyplosz (2001) established that the differences in volatility between FPI and FDI flows are much smaller for developed economies than for developing economies. Moreover, portfolio investments are frequently maligned for causing a crisis (e.g. the Mexico Peso) due to their short-term investment horizon creating financial market volatility (Neely (1996), Rodrik and Velasco (1999)). However, an empirical study by Durhan (2003) found that FPI does not correlate positively with macroeconomic volatility, but the result indicates the negative indirect effect of “other foreign investment” through macroeconomic volatility. Other authors (Singh (2002), Zywiecka (2002), Kregel (1996)) suggest that FDI can also be responsible for macroeconomic instability and have a negative impact on a country’s balance of payments. In particular, FDI creates a time profits of foreign exchange outflows (e.g. dividend payment or profits repatriation) or FDI was made in production of export goods.<sup>17</sup> In summary, it is very complicated to provide an unambiguous answer to the question ‘What kind of capital is better for a country and causes less distributions in macroeconomic-currency stability?. Moreover, there are problems in distinguishing between short or long run capital flows (FDI or FPI).

### **1.1.2. Capital controls**

In this part I will explore the possible reasons why capital control can exist in the modern world. I will concentrate on the efficiency of these controls in two main dimensions. First, I will ask whether it is true that capital control has an impact on real economic variables such as interest rate, capital flows etc. Secondly, I will discuss how market participants avoid capital regulation.

Starting with the reason for the existence of capital controls; the increase of capital flows across borders and the origin of the global capital market carry the risk of negative turbulences (e.g. investors animal spirits, boom-bust cycles, procyclical natura of capital and capital flight). To navigate this risky global environment, some countries impose certain kinds of control on capital<sup>18</sup>, arguing that these controls help limit volatile short-term capital flows

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<sup>17</sup> Zywiecka (2002: 20), Devereux (2006: 28).

<sup>18</sup> Capital controls is a government policy of restricting local residents from acquiring foreign assets (capital outflow) and/or restricting foreigners from acquiring local assets (capital inflow). This domestic policy instrument can be divided into two categories: administrative restriction (direct control) and market

(sudden capital reversal), avoid balance of payments crises, exchange rate volatility and the spread of economic shocks.

In addition, this domestic policy instrument provides greater independence of interest rate policy and has altered the maturity of capital flows (Saxena and Wong (1999), Dooley (1996), Summers (2000)). The pioneers of this line of thought were Tobin (1978) and Dornbusch (1986). Tobin proposes imposing uniform tax on all foreign exchange transaction to discourage very short-term capital flows. Dornbusch (1986) suggests the adoption of measures such as a dual exchange rate system. In contrast, capital controls themselves may have a destabilizing effect on exchange rates or the economic situation. Firstly, the implementation of capital control restriction may lead to herding behaviours or financial panic. These irrational investors' behaviour can cause a net capital outflow and increased financial instability. Secondly, new capital restriction can be regarded as a signal of inconsistently designed government policies that render a country more vulnerable to currency crises (Glick, Reuven and Hutchison (2000)). Lastly, capital control regulation gave the power to the bureaucrats. It can lead to economic misallocation, corruption and rent seeking activities and then to economic instability (Eichengreen (2001)).

All the effects described above lead us to ask an open question about the effectiveness of capital control. The effectiveness depends on different factors concerning the countries themselves as well as the issue of time. These factors can change exogenously or as the results of domestic policy. The set of factors includes the "international in scope" factors, a domestic "structural" nature (i.e. slowly changing), macroeconomic factors, and factors related to the design of the restrictions themselves. The "international in scope" factors includes the state of technology and the international legal environment. The second set of factors, which operate at a domestic structural level, are efficiency of the bureaucracy, "structural" factors e.g. financial reform, trade integration and increase of FDI. A third set of factors is the size of the domestic incentives motivating inflows or outflows. Finally the effectiveness of restrictions is very likely to depend on the design of the restrictions themselves (Montiel (2003)). These factors determine whether laws controlling capital flows are on the book than whether the laws are enforcer, or they are enforced, whether they

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restriction (indirect controls). Administrative regulations are mainly legal regulations. Examples of these include: legal permission of a risky financial transaction, limits imposed on the amount of a firm's stock a foreigner can own, limits imposed on a citizen's ability to invest outside the country, the amount of foreign capital residents may hold, banking obligations for the controlling and monitoring of capital flows. The main purpose of market restrictions is to discourage an investor from making a risky financial transaction. The market restriction increases the cost of this transaction e.g. uniform tax, require reserve level, capital gain tax Gruszczynski (2002).

effectively stem the flows of capital. In this case the efficiency of capital control can be considered from two perspectives. Firstly, if capital control has any effective effects on domestic policy and its impact are according to policy makers intentions (e.g. limit volatile short-term capital flows or interest rate, changing the composition of capital flows). The second case analysed how foreign or domestic residence can circumvent capital control regulations.

Unfortunately, in the first case, the unambiguous answer was found neither for the empirical cross-country analysis nor single country studies (e.g. the Chile case<sup>19</sup>) (see Table 1).

However, the Malaysian case (1998-2001) is an interesting one. This case suggested that the controls after the devaluation of the Thai baht in July 1997 (Thailand) were effective in achieving the immediate goal of discouraging capital outflows and reducing the investor's speculation pressure. This capital control policy allowed Malaysia to recover from the Asian financial crisis compared to the IMF programs' countries faster and with smaller declines in employment and real wages.<sup>20</sup>

In the second case, the channels through which foreign or domestic resident can circumvent capital control regulations are similar to the circumvention of corporation taxations and profit transfer, especially for multinational corporations. According to Eiteman, Stonehill, and Moffett (2006), Montiel (2003) the main way of avoiding capital controls are identified: transfer pricing<sup>21</sup>, overinvoicing of import, underinvoicing of export, creating unrelated exports, use of payment leads and lags to effectively lend and borrow abroad<sup>22</sup>, changing of trade credits condition, unbundling of Capital Service Payments<sup>23</sup>, Fronting Loans<sup>24</sup> and Special Dispensation (creation of centre profit of multinational corporations).

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<sup>19</sup> De Gregorio et al. (2000), Gallego et al. (1999), (2003), Galbis (1996), Cowan et al. (2005), Gallego et al. (1999), Kawai and Takagi (2003), Lopez-Mejia (1999), Edison, Klein, Ricci and Slok (2002).

<sup>20</sup> See Edison, Klein, Ricci and Slok (2002), Kawai and Takagi (2003), Charton and Stiglitz (2004).

<sup>21</sup> This is the financial transactions between the subsidiary and the parent company for purchasing raw materials, services and intellectual property from the parent.

<sup>22</sup> The parent may serve to transfer profits temporarily between the subsidiary and the parent. For example, if the subsidiary buys supplies from the parent and pays for them in advance, this serves as a loan from the subsidiary to the parent. If the subsidiary sells supplies to the parent and the payments are delayed (lagged) then this also serves as a loan from the subsidiary to the parent.

<sup>23</sup> The return on a foreign investment is composed of compensation for a variety of services from the parent company; i.e.: management fees, payment for technical expertise, royalties and license fees, payment for proprietary knowledge and intellectual property.

<sup>24</sup> The loans from the parent company may also carry an interest charge above the cost of debt capital that serves to transfer profits to the parent. The subsidiary could also make loans to the parent, perhaps at below-cost interest rates; this would be an effective way of transferring funds from the subsidiary to the parent. If a country's regulations on the transfer of capital prohibit loans from a subsidiary to a parent company, but allow the transfer of funds to financial intermediaries, then a fronting loan may be used to achieve a transfer of capital from the subsidiary to the parent. The subsidiary deposits funds in a bank which serves as collateral

Table 1. The efficiency of capital control

Empirical studies	Stability of interest rate	Volatility of exchange rate	Volume of capital flows	Composition of capital flows
Mathieson and Rojas-Suarez (1993) (developing countries)	•	•	•	~
Johnston and Ryan (1994)	•	•	↑	↑
Montiel and Reinhart (1999) (15 developed and developing countries )	•	•	↑	↑
Lopez-Mejia (1999) (Chile, Colombia, Malaysia)	•	•	•	↑
Edison and Warnoc (2003) (developing countries)	•	•	~	
Campion and Neumann (2004) (Latin American countries)	•	•	•	↑↑

Note:↑↑↑- strong up-way impact (rise of interest rate, less volatility of exchange rate, decreases of capital flows, less “hot capital”)↑↑- medium positive impact↑- small positive impact ↓- negative impact (decrease of interest rate) ~ no impact , •-the study did not analyse the effect of capital control on this variable

Source: My own analyses based on Mathieson and Rojas-Suarez (1993), Johnston and Ryan (1994), Montiel and Reinhart (1999), Lopez-Mejia (1999), Edison and Warnoc (2003), Campion and Neumann (2004).

Some empirical literature has tried to present the problem of avoiding capital control regulations. Mathieson and Rojas-Suarez (1993) suggest that capital controls had lost effectiveness in the 1980s with the liberalization of exchange and trade controls. They identified channels of evasion such as under- and over-invoicing, transfer pricing policies, and leads and lags. Desai, Foley and Hines (2004) analysed the impact of capital control of FDI investment by using American affiliate–level data makes for the period 1982-1997. According to their results, American multinational firms circumvent capital controls by adjusting their reported intra-firm trade, affiliate profitability and dividend repatriations. The evidence indicates that the same affiliates have a 4.7 percent lower reported profit rates than do comparable affiliates in countries without capital controls.

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for a loan to the parent company. The interest on the parent company's loan is offset, at least in part, by the interest received on the subsidiary's deposit.

### **1.1.3. The preconditions and sequencing of Capital Account Liberalization**

As shown above, capital controls have a tendency to become more ineffective over time, creating their own costs and distortions (Summers, (2000)). These effects encourage individual countries to continue the process of CAL. Since the late 1960s, several developed countries have pursued gradual CAL and in the 1990s many developing countries took this path but more rapidly and often adopting a deeper approach, the so-called “big bang” (Schneider (2000), Griffith, Gottschalk and Cirera (2000)). The gradual approach is mainly connected with the orthodox, laissez-faire concept which required reforms in the real economy and financial system before opening the capital account (Singh (2002)). Since the Latin American and Western European financial crashes in the 1990s, a gradualist approach has won over. More economics heads move into this approach. However, some researchers have advocated rapid CAL, given its positive impact on capital inflow and domestic financial development (Johnston and Ryan (1994)). Specifically, after the Asian crisis in 1997 there was a big break in economic thinking about rapid methods of CAL (Singh (2002), Stiglitz (2004)). Two important questions were raised about what sequencing of capital regulation should have been taken (order and speed of capital account restriction removal) and what pre-liberalization conditions should be met before opening the capital account.

#### ***Sequencing of capital regulation removal***

The sequence of CAL can have different order or pattern. Some researchers believe that the capital account should be liberalized following the liberalization of the current account and the domestic financial system. Others have suggested that there should be simultaneous liberalization of the current and capital account (McKinnon (1993), Saxena and Wong (1999)). In practical view, the IMF and OECD liberalized the capital flows by using a type of two-step procedures (the IMF’s Articles of Agreement and OECD Code Liberalization). The first step included liberalization of direct investment, long-term capital movements and trade transactions. The second considered the liberalization of short-term financial transactions and inter-bank market (Griffith, Gottschalk and Cirera (2000), IMF (2005)).

#### ***Pre-liberalization reforms***

Several studies have a sceptical view of the importance of the sequencing of capital regulation removal and underline the role of adequate institutional safeguards. They point out

that institutional safeguards must be in place before an economy can benefit fully from free access to international capital markets (Mathieson and Rojas-Suarez (1993), Kaminsky and Schumukler (2003), Kawai and Takagi (2003)). The adequate institutional safeguards were based on capital account pre-conditions. It is necessary for countries to meet these preconditions before capital account liberalization is possible:

- a sound macroeconomic policy framework: macroeconomic policy and fiscal consolidation are consistent with the choice of the exchange rate regime (Saxena and Wong (1999), Schneider (2000)),
- an independent monetary policy based on indirect policy tools and flexibility in exchange rate management. This involves multiple exchange rate regimes into floating unified rate systems (Schneider (2000), Singh (2002)). However, governments must ensure that inflation, the current account balance and foreign exchange reserves are maintained at acceptable levels before the movement towards capital account convertibility (Schneider (2000)),
- a strong domestic financial and banking system: strong supervision and prudential regulations covering capital adequacy, good lending standards and asset valuation, effective loan recovery mechanism, transparency, disclosure and accountability standards, and provisions ensuring that insolvent institutions which are dealt with promptly financial collapse. (Fisher (1997), Prasad, Kenneth, Wei and Kose (2003)). In addition it is important to offer some incentives for sound corporate finance practices in order to avoid high leverage and excessive reliance on foreign borrowing (Kawai and Takagi (2003)),
- an accurate and comprehensive data disclosure, including information on central bank reserves and forward operations (Saxena and Wong (1999)).

In summary, both conceptions of CAL: preconditions or sequencing of liberalization) could be adopted simultaneously, as Johnston and Ötoker-Robe's (1999) modernized approach to managing the risks of cross-border capita flows suggests.

#### **1.1.4. CAL Measures**

Given the different means of international capital movements and diversity in the intensity and scope of capital controls (administered regulations or market restriction), it is difficult to obtain consistent way of measuring capital account restrictions across a wide range

of countries (Edwards (2000)). In addition, as suggested in last section, there are problems of significant discrepancies between the legal (de jure measures) and the actual degree of capital controls (de facto measure) (Eichengreen (2001)). However, in my analysis, I will essentially follow the Edison et al. (2002) distinctions of capital account measures: rules-based measures and quantitative measures.<sup>25</sup>

### ***Rules-based measures***

The rules-based measures are constructed from published regulations (national and international capital controls rules). The IMF and OECD published a list of the rules and regulations governing resident and non-resident capital-account transactions in each country. These rules-based measures can be divided to two categories: IMF measures and other on/off measures.

### **IMF measures**

IMF measures might be classified into three categories: E2 line measures, Share measures and intensity measures.

### **E2 line**

The IMF has published its Annual Report on Exchange Arrangements and Exchange Restrictions report (AREAER ) since 1950. This report provides a description of foreign exchange arrangements, exchange and trade restrictions and relevant prudential measures of individual IMF member countries. During this period the report has developed and the following changes in structure and content regulatory framework for current and capital account transactions. Until 1967 the publication provided exclusively qualitative descriptions of capital account restrictions. Since 1967, the report has been modified and now includes a table summarizing the exchange arrangements adopted by member countries, but without any detail on how the narrative accounts are covered to summarise the data (Eichengreen (2001)). The summary table is entitled “Restrictions on payments for capital transactions”. A single

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<sup>25</sup> For instance, Eichengreen (2001) distinguished three main approaches to the calculation of capital flows: measures based on statute of IMF and OECD, actual and assets prices. The first group measures of Eichengreen’s approach can be connected to the rules-based measures of Edison et al’s., and others two groups of measures of Eichengreen can be considered as quantitative measures. Other researchers (Prasad, Rogoff and Wei (2003) focus more on measures of financial openness and degree of financial integration. However, they say that CAL (considered as the liberalization of legal restrictions of capital) is an important precursor to financial integration.

line (E2) contains 10 categories: time and distinctions between restriction on inflows and restrictions on outflows.<sup>26</sup> In the second half of the 1990s, the IMF began providing more detailed breakdowns of policy measures. The report disaggregated controls on export proceeds into “surrender requirements for export proceeds” (requiring exporters to surrender to the authorities any foreign exchange earned from exporting) and “repatriation requirements for export proceeds” (requiring them to surrender even payments made to overseas accounts). Line E2 contains 17 categories which are divided into three main sections: control on payments for invisible transactions and current transfer, proceeds from exports and/or invisible transactions, capital transaction and provision specific (IMF(2005))<sup>27</sup>.

In this line, E2 allowed the delivery of a binary judgement and constructed an on/off indicator of the existence of rules/restrictions (the range is “0” meaning never restricted, to “1”, always restricted). Not all categories have to be used to say that a country is open to capital flows. For instance, Glick, Guo and Hutchison (2004) state that capital account is restricted if controls were in place in 5 or more of the E2 categories of capital account restriction and “financial credits” was one of the categories restricted. Desia, Foley and Hines (2004), and Shart (2000), formulated a CAL index for multinational corporations capital transfer. They used only two of these categories: restrictions on capital repatriation and restrictions on profits remittance. Capital account restrictions obtained from these data are coded as a dummy variable equal to one if either of the restrictions appeared.

### **Share measures**

Shares measure represent the proportion of year the capital account is judge as free of capital restriction, according to IMF standards ( line E2 ).<sup>28</sup>For instance, if a country had an open capital account for 4 of the 10 years from 1995 to 2005, the Share is equal to 0.4 (Hendry, (2006)).

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<sup>26</sup> Eichengreen (2001) “Capital Account Liberalization: What do Cross-Country Studies Tell us?” *World Bank Economic Review* pp.343-344

<sup>27</sup> Control on payments for invisible transactions and current transfer, proceeds from exports and/or invisible transactions (repatriation requirements, surrender requirements), capital transaction, control on capital market securities, money market instruments, collective investment securities, derivatives and other instruments, commercial credits, financial credits, guarantees, securities, and financial backup facilities, liquidation of direct investment, real estate transactions, real estate transactions, personal capital movements, provision specific to commercial banks and other credit institutions and Institutional investors.

<sup>28</sup> Some investigators used only a few categories which were provided by the IMF’s reports (Eichengreen (2001)).

Additionally there are some measures that use both the E2 line and Share measures (Chinn and Ito (2002), Cowan and Gregorio (2005))<sup>29</sup>.

### **Intensity measures-Quinn measures (1997)**

Quinn's (1997) measures capture the intensity of the enforcement of controls on both regulations: the capital account and the current account. Both regulations were based the *AREAER* reports. Capital account variable contains payment and receipts (0-4 scale). The current account includes payment for imports, payment for invisibles, receipts for export and receipt for invisibles (0-8 scale). In addition, Quinn added international legal agreement such as membership of the OECD, European Union, and IMF. This variable contains information about a national's ability to restrict exchange and capital flows. For each of these seven categories, Quinn chose the intensity of controls on a two-point scale. On this scale, a score of 0 indicates payments are forbidden, 0.5 indicates that there are quantitative or other regulatory restrictions, 1 indicates that transactions are subject to heavy taxes, 1.5 indicates that there are less severe taxes, and 2 indicates that transactions are free of restrictions or taxes (Eichengreen (2001), Arteta, Eichengreen and Wyplosz (2001)). The sum of whole index was between 0-14.

### **Other On/Off Measures**

Other On/Off Measures might be divided into three categories: OECD Code of Liberalization of Capital Movements, Stock market liberalization indicators and the Montiel-Reinhart Intensity Measure (1999)

### **OECD Code of Liberalization of Capital Movements**

The OECD developed a code based on the 11 categories (using a 0/1 index) which linked CAL restrictions with a range of types of international transactions. These categories are: FDI, liquidation of direct investment, admission of securities to the capital market, buying and selling of securities, buying of collective investment securities, operations in real estate, financial credits and loans, and personal capital movements proportion (Eichengreen, (2001)).

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<sup>29</sup> Chinn and Ito's (2002) index is based on four dummy variables: multiple exchange rates, restriction on currency account transition, restriction on capital account transactions and requirement of the surrender of export receipts. In addition there is a calculation for share variable of capital account transaction for changing in five years after of capital liberalization.

Since 1961 the OECD measure has changed over time by incorporating new financial instruments and transactions.<sup>30</sup>

### **The Montiel-Reinhart Intensity Measure (1999)**

The measure of intensity of controls on international transactions used annual report of the country's central bank (15 countries).<sup>31</sup> They mainly focus on three types of principal flows: portfolio flows, short-term flows and FDI, plus capital account balance. The index score is between "0" to "2" where "0"- "no restrictions or taxes were imposed on capital inflows and no restrictions on the domestic indebtedness of domestic financial institutions were in place that appeared to be in excess of commonly used prudential measure", "1"- overzealous prudential regulations -such as strict limits on the foreign exchange exposure of banks and " 2"- "the existence of measures, such as prohibitions, deposits requirements, or financial transaction taxes, designed to limit capital flows" (Montiel and Reinhart (1999), Edison et al. (2002)).

### **Stock market liberalization indicators**

Stock market liberalization is one small part of general policy reform termed CAL which focuses only on stock market transactions (sale or purchase of equities). The on/off measures of stock market liberalization are considered in two ways. The first way is mainly connected with government declaration and policy decrees of the liberalization of stock market transaction. However in many cases, there is no obvious point when government declaration or policy decree was made. As a result of this lack of clarity, many researches have used the proxy for this government declaration. For instance, Hendry (2000, 2003) uses the dates reflecting official policy decrees as the first date in which a country fund was available to foreigners. The second way of indirectly capturing domestic securities

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<sup>30</sup> In 1964 the code was expanded of covering from a limited one originally long-term direct investment and personal capital movements and included operations in real estate, credits linked to international commercial transactions and services, financial credits and loans and physical movements of capital. In 1973 the OECD added operations in collective investment securities and in 1984 the code broadened the definition of FDI by including the right of establishment for non-resident investors. Lastly, the OECD added short-term money market operations and new and innovative forms of financial institutions such as swaps, futures and options (IMF (2005), Griffith-Jones, Gottschalk and Cirera (2000)).

<sup>31</sup> Argentina, Brazil, Chile, Colombia, Costa Rica, the Czech Republic, Egypt, Indonesia, Kenya, Malaysia, Mexico, the Philippines, Sri Lanka, Thailand, Uganda.

implementation dates is to monitor IFC indexes<sup>32</sup> (Henry (2000, 2003, 2006), Bekaert (1995), Bekaert, Harvey and Lundblad (2001), Aherane et al. (2000), Edison and Warnock (2001)).

### ***Quantitative measures***

The usual on/off measures of capital CAL do not capture the intensity of controls or financial integration. Because of that, some studies have used some quantitative measures. The quantitative measures can be divided into three main groups: national saving paired with national investment rates, interest rate differentials and assets prices integration and international capital flows (Edison et al. (2002), Eichengreen (2001)).

#### **National saving paired with national investment rates**

The first analysis of patterns in the behaviour of saving and investment was carried out by Feldstein and Horiok (1980). In this paper they argued that higher correlation between saving and investment suggests stronger capital control. This perspective was strongly criticised by Obstfeld (1986) and Edwards (2001).

#### **Interest rate differentials and assets prices integration**

The interest rate differentials approaches and asset price integration techniques can be divided to the following groups:

- onshore-offshore interest differentials and deviation from covered interest parity to measure capital mobility Holmes and Wu (1997), Edwards (2001), Gruszczynski (2001), Edison et al. (2002),
- black market foreign exchange premium as the proxy for measure capital mobility Saxena and Wong (1999), Chinn and Ito (2002), Arteta, Eichengreen and Wyplosz (2001),
- international integration of securities markets (Bekaert (1995), Levine and Zervos (1998), Edwards (2001)). These studies assumed that a stronger integration of market would be expected from the liberalization of statutory restrictions of foreign ownership of domestic securities. The correlation of stock market return across countries or

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<sup>32</sup> Both indexes are calculated on a monthly basis by the International Finance Corporation. The completed description of the methodology behind the construction of the IFC indices is presented in Standard & Poor (2006). (see Appendix 1.1-Fig. 1.).

convergence of private rates of return is used as a measure of international integration of markets (Harberger (1978, 1980)). Bekaert (1995) regressed national return in excess of the US interest rate to derivative expected returns. The regression was with respect to expected and unexpected parts such as lagged local and US interest return, local and US dividend yields and the transformation of US interest rate. This estimation of expected returns was used to compute the correlation of expected returns in the United States. This correlation represented measures of market integration. On the other hand, Levine and Zervos (1995) computed measures of integration by using the international capital asset pricing model CAPM and the international arbitrage pricing model APT. Both asset pricing models indicate if the expected return on each asset is linearly related to a benchmark portfolio, the markets are integrated.

### **International Capital Flows**

Some researchers have proposed the actual capital inflows and outflows as a percentage of a country's GDP (Kraay (1998), Swank (1998), Prasad, Rogoff, Wei and Kose (2003)); or annual measure of portfolio and direct investments assets and liabilities as a percentage of GDP as the financial openness (Chanda (2001), O'Donnell(2000), IMF (2001)). They suggested that these variables give a wider picture of capital control insensitivity measures than the on/off measures provide. However, the problem is that actual capital flows will be affected by other ranges of policies rather than restrictions on capital flows (Eichengreen (2001)).

### **1.2. Currency Crisis-Theory**

At the beginning of this section I show that there are three different currency crisis definitions. I will then discuss the various theoretical models that attempt to describe the mechanism of a currency crisis or predict the moment of a successful currency attack on the exchange rate. The next part starts by looking at the first generation models, and then proceeds to the models of multiple equilibriums, contagion effects and herding behaviours (second-generation models). The analysis moves into the models of twin crises and problems of balance sheet firms (third generation models) and conclude with sudden-stop models. This overlook over the empirical definitions of crisis and theoretical models allows recognizing two important issues for my further research. Firstly, I will identify an appropriate empirical

variable of a currency crisis for my empirical model (see Chapter 3) and secondly, I will identify the mechanism of a currency crisis and then address the question of how CAL might impact on these different mechanisms.

### 1.2.1. Definition of a Currency Crisis

Most empirical studies which analyse the currency crisis event calculate the probability of a currency crisis by using the probit or logit model. In this case the dependent variable is a discrete measure of crisis, which might be expressed in different ways. However, there is no one exact, perfect definition of a currency crisis index. There are two main problems in defining the currency crisis episodes. These problems can be expressed in the form of questions: firstly, ‘What variables should a currency crisis index include? And secondly, ‘How large should be change in the index that we delineate it as the crisis phenomena?’

The traditional way of thinking about a currency crisis is that a currency crisis exists only when there is an abrupt change in the nominal exchange rate (Edwards 1989, Edwards and Montiel 1998, Frankel and Rose 1996). For instance, Frankel and Rose (1996) defined a currency crisis as a nominal depreciation of the currency with respect to the American dollar of at least 25%, which is also at least a 10% increase in the rate of depreciation. This cut-off point is clearly arbitrary. In addition, this definition excludes unsuccessful speculative attacks, as the standard measure does not make allowances for when a speculative attack has occurred.

Other empirical studies widen this definition by adding the additional variables such as interest rate or reserves changes. These studies also present a different way of calculating the cut-off point of defining the currency crisis phenomena. The researchers in these studies primarily based the threshold taking into consideration the mean and the standard deviation of a currency crisis index. In their model, the dependent variable is described the currency crisis phenomena is expressed essentially by index so-called the Market Pressure index (MPI) or index of “exchange rate pressure” or the “speculative pressure index” (Eichengreen, Rose and Wyplosz (1995, 1996); Kaminsky, Lizondo and Reinhart (1998); Sachs, Tornell and Velasco (1996); Cerra and Saxena (1998); Kaminsky and Reinhart (1996, 1999); Glick, Guo and Hutchison (2004); Eichengreen and Rose (2001); Ahluwalia (2000), Kaminsky (2003)). The standard technique of describing the market index pressure is :

$$MPI_{i,t} = \frac{(\% \Delta e_{i,t})}{\sigma_{\Delta e_{i,t}}} + \frac{(\Delta i_{i,t})}{\sigma_{\Delta i_{i,t}}} - \frac{(\% \Delta r_{i,t})}{\sigma_{\Delta r_{i,t}}}$$

where “e” is the bilateral exchange rate of country “i” with US or Germany, “i” is the interest rate in country “i” and r is the non-gold international reserves that the central bank has. The changes in exchange rate, interest rate and reserves are weighted by their respective standards deviation. The simple understanding of this index is that if there is any attack on domestic currency, either the exchange rate and interest rate will rise or the central bank will reduce the level of foreign reserves to protect the exchange regime.<sup>33</sup> For example, Eichengreen, Rose and Wyplosz (1995, 1996) used this index, where the first two changes of exchange rate and interest rate represent the speculative pressure and the last one can show the phenomena of fending off the attacks. In addition, Eichengreen, Rose and Wyplosz (1996) define the cut-off point of defining the currency crisis phenomena as

$$MPI_x > \mu_{MPI_x} + 1.5 * \sigma_{MPI_x}$$

where  $\mu$  is the mean of the MPI in country x, and  $\sigma$  is the standard deviation of MPI. Nevertheless, Eichengreen, Rose and Wyplosz’s (1996) index was criticized at least on three grounds (Esquivel and Larrain (1998), Flood and Marion (1998)). Firstly, there is no clear instruction on the weights that should be attached to each variable. Secondly, a number of time aggregation problems exist and thirdly the index is defined in such a way that it tends to select situations that are largely unpredictable from a “bad fundamentals” perspective.

Finally, the main purpose is to define the actual currency crisis so there is a need to focus on “successful” speculative attacks. In response to this, Esquivel and Larrain (1998) offer different methods of estimating a currency crisis. They take into account two criteria: first, the devaluation rate should be large enough relative to what is considered standard in a country; second, the nominal devaluation has to be meaningful, in the sense that it should affect the purchasing power of the domestic currency. Thus, nominal depreciations that simply keep up with inflation differentials are not considered currency crises even if they are fairly large. Consequently, the definition of a currency crisis excludes many of the large nominal depreciations that tend to occur during high-inflation periods. This condition implies that a currency crisis occurs when a nominal devaluation is associated with a large and sudden change in the real exchange rate<sup>34</sup>. On the other hand, Eichengreen and Rose (2001) implied

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<sup>33</sup> Saxena and Wong (1999) “Currency Crises and Capital Control : A selective Survey” *The World Bank Working Paper* pp. 16-18.

<sup>34</sup> Esquivel and Larrain (1998: 10), “Explaining currency crises”, Harvard pp.10.

that a currency crises can not be identified with changes in the exchange rate regime. They observe that not all decisions to devalue or impose a flat exchange rate are preceded by speculative attacks. More importantly, a central bank may remain aloof from the intervention on the foreign exchange market. This approach by the central bank might discourage speculation against the currency by raising interest rates or forcing the government to adopt other austerity policies. In this case, Eichengreen and Rose (2001) decided to construct empirical measures of speculative attacks. This measure included a weighted average of changes in exchange rates, interest rates, and reserves, where all variables are measured relative to those of a centre country – Germany. Speculative attacks or currency crises are then defined as periods when this speculative pressure index reaches extreme values.<sup>35</sup>

In their empirical research the various economists used the modifications of this MPI index (Kaminsky, Lizondo and Reinhard (1998); Kaminsky and Reinhard (1996, 1999); Kaminsky (2003); Ahluwalia (2000) and Glick, Guo and Hutchison (2004)). Most of the papers define a currency crisis as a situation in which an attack on the currency leads to a sharp depreciation of the currency, a large decline in international reserves, or a combination of the two. For instance, Kaminsky, Lizondo and Reinhard (1998), Kaminsky and Reinhard (1996, 1999), developed an index of “exchange rate pressure” which is a weighted average of monthly percentage changes in the exchange rate<sup>36</sup> and monthly percentage changes in gross international reserves (measured in U.S. dollars). The weights are chosen in order that the two components of this index have the same variance. The higher value in the index reflects stronger selling pressure on the domestic currency. This definition includes both successful and unsuccessful attacks on the currency. This definition is comprehensive enough to take into consideration not only speculative attacks on a currency under a fixed exchange rate but also attacks under other exchange rate regimes. However, according to this definition the currency crisis is described when

$$MPI_x > \mu_{MPI_x} + 3 * \sigma_{MPI_x}$$

where  $\mu$  is the mean of the MPI in country  $x$ , and  $\sigma$  is the standard deviation of MPI. As in Frankel and Rose’s definition, this index needs some correction in the case of high inflation, since it does not reflect some currency crises. The reason for this is that the average and

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<sup>35</sup> Eichengreen and Rose (2001) “The empirics analysis of currency and banking crises” NBER Working Paper pp.2.

<sup>36</sup> The exchange rate is defined as units of domestic currency per U.S. dollar or per Deutschmark, depending which one is the most relevant.

variance of the exchange rate are disturbed by high inflation. Nevertheless, Kaminsky (2003) tried to overcome the problem of high inflation by making some modifications to the index. The sample was divided according to whether inflation in the previous six months was higher than 150 percent and then constructed an index for each sub-sample. Kaminsky (2003) defines crisis episodes as the 12 month and the 18 month window prior to a crisis. This specification of definition allows avoiding classifying the same crisis twice. In opposition, Kaminsky and Reinhart (1999) imposed the 24-months window.

In contrast to Kaminsky or Reinhart's papers, Ahluwalia (2000) defined the crisis in a similar way to Eichengreen, Rose and Wyplosz (1996). The Ahluwalia's index (2000) is a weighted average since its two components, the percentage change in the exchange rate and the negative of the percentage change in reserves, have different volatilities. This is accomplished by weighting each component by the inverse of its variance, and dividing by the sum of the inverses of the variances of the two components.<sup>37</sup> A different approach is adopted by Glick, Guo and Hutchison (2004), who identified currency crises by following the conventions laid down by Kaminsky and Reinhart (1999). As before, Glick, Guo and Hutchison's weight was attached to the exchange rate; here the reservation components of the currency pressure index are inversely related to the variance of changes of each component over the sample for each country<sup>38</sup>. However, their currency pressure measure of crises does not include episodes of defence involving sharp rises in interest rates; they also used the real exchange rate. It is important to note that their index differs from Kaminsky and Reinhart's (1999) approach in two main ways. Firstly, they deal with episodes of hyperinflation by separating the nominal exchange rate depreciation observations for each country according to whether or not inflation in the previous 6 months was greater than 150 percent. Moreover, they calculated for each subsample, separate standard deviation and mean estimates with which to define exchange rate crisis episodes. Secondly, the large changes in exchange pressure index is defined as

$$^{37} MPI_{i,t} = \left[ \frac{1/\sigma_{\Delta e_{i,t}}}{1/(\sigma_{\Delta e_{i,t}} + \sigma_{\Delta r_{i,t}})} \right] \Delta e_{i,t} - \left[ \frac{1/\sigma_{\Delta r_{i,t}}}{1/(\sigma_{\Delta e_{i,t}} + \sigma_{\Delta r_{i,t}})} \right] \Delta r_{i,t} \text{ where } \Delta e_{i,t} \text{ is the percentage change in}$$

the exchange rate,  $\Delta r_{i,t}$  is the percentage change in reserves over the relevant interval,  $\sigma_{\Delta e_{i,t}}$ ,  $\sigma_{\Delta r_{i,t}}$  are the variance of the percentage changes in the exchange rate and international reserves respectively.

<sup>38</sup> Real exchange rate changes are defined in terms of the trade-weighted sum of bilateral real exchange rates (constructed in terms of CPI indices, line 64 of the *IFS*) against the U.S. dollar, the German mark, and the Japanese yen, where the trade-weights are based on the average of bilateral trade with the United States, the European Union and Japan in 1980 and 1990 (from the IMF's *Direction of Trade*). Ideally, reserve changes should be scaled by the level of the monetary base or some other money aggregate, but such data is not generally available on a monthly basis for most countries.

$$MPI_x > \mu_{MPI_x} + 2 * \sigma_{MPI_x}$$

where  $\mu$  is the mean of the MPI in country  $x$ , and  $\sigma$  is the standard deviation of MPI.

Additionally, they described the specific standard deviation, provided that it also exceeds 5 percent.<sup>39</sup>

To a large extent, therefore, the definition of a currency crisis is agreed upon between economists. However, it is necessary to add that a currency crisis has a negative effect on an economy, the level of GDP, unemployment and other aspects of a financial system in most instances. In this field there is a vast literature, which attempts to define the crisis by using different methods other than exchange rate indexes (market pressure indexes). For instance, Cerra and Saxena (1998) imposed Markov Switching Models (MSMs) to make the probability of a crisis continuous and endogenous. Radelet and Sachs (1998) focused on a financial crisis and defined them as a sharp shift from capital inflow to capital outflow between year  $t-1$  and year  $t$ .

### 1.2.2. Theoretical Currency Crisis models

In this section, I will examine different kinds of theoretical models that endeavour to describe the mechanism of currency. At the beginning, I start by exploring the first generation of Krugman's (1979) and Salant and Henderson's (1978) models where inconsistency between domestic economic conditions (wrong macroeconomic fundamentals and exchange rate commitment causes a currency crash. I then go on to look at the second generation models. These models analyse the psychological game between investors and government which might root to multiple equilibriums. In this line of models, there are self-fulfilling currency crisis models (Obstfeld (1986)) and pure speculative models such as contagion effects models (Gerlach and Smets 2000, Eichengreen, Rose and Wyplosz (1997) and Masson (1998)) or herding behaviour models (Binkchamadani and Shami (2000), Calvo (1998), Mendoza (2000)). At the end of this section, I move on to examine the third generation model and Sudden stop models. The third generation model is based on the microeconomics fundamentals and explores three main areas: financial market inefficiency (James and Stoker (1994), Mishkin (1996)), the fragility of the banking system (Chang and Velasco (1998),

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<sup>39</sup> Glick, Guo and Hutchison (2004) "Currency Crises, Capital Account Liberalization, and Selection Bias" Working Paper of the Federal Reserve Bank of San Francisco, pp. 6-7.

McKinnon and Huw (1996), Kaminsky and Reinhart (1999) a company's balance sheet and the effects of monetary policy in the currency crisis (Krugman (1999), Aghion, Bacchetta and Banerjee (2001)). The last group of models, the so-called Sudden Stop models (Mendoza (2001), Hutchison and Noy (2004)) were developed by basing on the herding behaviour models (Calvo (1998)) and concentrate on the fact that sudden capital reveals are in unpredicted moments. The analysis of the reason for the occurrence of a currency crisis can allow us to point the indicators responsible for currency crisis and simultaneous influenced by the CAL process.

### *The first generation models*

The first generation models are based on the balance-of-payments, stresses that crises are caused by, and weak economic fundamentals such as excessive fiscal and monetary expansion. The money is created only through government deficit; conversely, government deficit will be financed by printing money.<sup>40</sup> If, in any period, expansion of domestic credit is too large to be absorbed by the demand for real balances, equilibrium in the money market is achieved through adjustment of the exchange rate by offsetting movement in central bank foreign exchange reserve stock so as to hold the exchange rate regime. It causes the depletion of foreign exchange reserve, when the process is continued, so that the outcome is fundamental disequilibrium rather than purely transitory events. Since foreign exchange reserves systematically decline, market agents may doubt the ability of the central bank to control the fixed exchange rates system.<sup>41</sup> Eventually, reserves fall to a critical threshold at which the rational agents may initiate speculative attacks on the foreign exchange reserve of the central bank, eliminating the authorities' remaining foreign assets and causing the collapse of the exchange rate<sup>42</sup> (see Fig. 2).

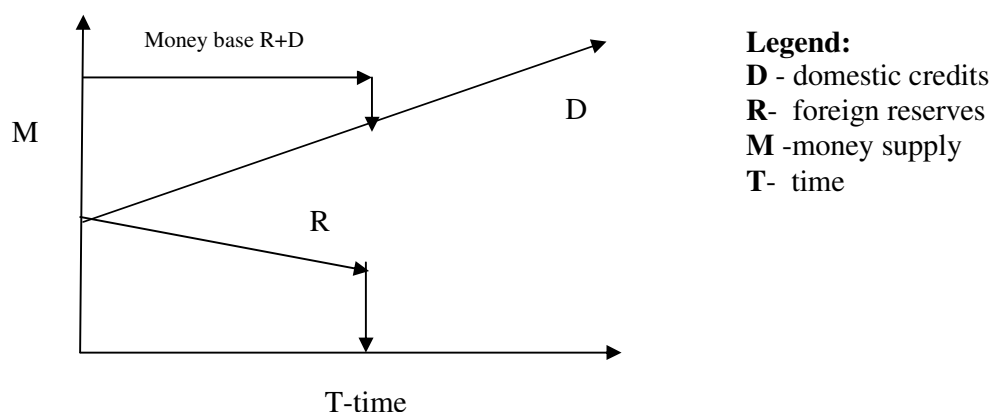
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<sup>40</sup> Goldberg (1994) "Predicting exchange rate crises Mexico revisited", *Journal of International Economics*, 36, pp. 414.

<sup>41</sup> Krugman (1979) "A model of balance of payment crises", *Journal of money, credit and banking*, Vol. 11, No. 3, pp. 315.

<sup>42</sup> It is clear that speculative attack on the government's reserves can be viewed as the process by which investors change the composition of their portfolios, reducing their domestic currency holding and increasing that of foreign currency. A currency crisis is a natural outcome of maximizing behaviour by investors.

Fig. 2. Domestic credit (D) and foreign reserves in first generation models



Source: Flood Robert, Garber Peter and Cramer (1996) "Collapsing Exchange-Rate Regimes: Another linear examples", *Journal of International Economics*, Vol. 41, pp. 227.

Seminal studies in the field carried out by Krugman (1979) and Salant and Henderson (1978), have led to numerous other researchers addressing this issue. Several authors have extended and simplified Krugman's paper, namely Dornbusch (1987), Flood and Garber (1986), Flood, Garber and Kramer (1996).<sup>43</sup>

### ***The second generation model***

After the European currency crisis experience in 1992-1993, it was impossible to fully understand the reason for the crisis in the terms of the first generation model. Most countries did not have any problems with the divergence between fiscal policy and exchange rate policy. In this context, some authorities state that changes in the exchange rate regime can be caused by reasons other than a depletion of official international reserves. In that case a crisis can happen without a significant change in macroeconomics fundamentals. Instead, economists have pointed out that the adverse consequences of policies such as higher interest rates or other key economic parameters (for example, unemployment levels or GDP etc.) have forced governments to maintain exchange rate parity. Simultaneously, it gave room to the development of the market agents' formation of expectation about exchange rate policy and then might lead to bad equilibrium such as self-fulfilling currency crisis. The first pioneer of the model of the self-fulfilling currency crisis even before the European crisis in 1992-1993,

<sup>43</sup> On the whole, these economists describe the same process - that an exchange rate crisis can take the form of either a discrete devaluation of a controlled exchange rate or a switch to a floating rate accompanied by a sharp speculative attack on central bank holding of foreign exchange reserves.

was Obstfeld (1986).<sup>44</sup> The expansion of this model can be found in other studies including Obstfeld (1994, 1996), Ozkan and Sutherland (1995), Reisen (1998) and Krugman (1996). Most of these authors pay less attention to the role of fundamentals in creating balance-of-payments crises; they also point to the importance of other economic variables that may help predicting those crises. Since most of the solutions the models provide do not apply to the steady state, they became the basis for a body of literature on speculative bubbles, sunspot equilibrium and consider nonlinear behaviour rules by one or more agents. This led to multiple solutions and then to self-fulfilling solution. The models of self-fulfilling currency have two main assumptions: firstly, the government is the active agent of the market and wants to maximize an objective function. Secondly, economic policies are not predetermined but respond instead to changes in the economy. Economic agents take this relationship into account in forming their expectations about the policy. The policy represents a kind of trade-off between the benefits of and the costs of maintaining a credible exchange rate peg. For instance, the degree of commitment of the central bank to defend the peg is dependent on the level of reserve. The weaker the commitment of the central bank the higher the probability that the speculative attack will be successful. Additionally, there is the psychological game which takes place between the market agents and authorities. The market agents create expectations about the future policy and then start the actions that affect some of the variables (e.g. interest rate, unemployment, loss of trade competition).<sup>45</sup> This variety of factors may affect the authority's objective function that could be used as the indicator of a currency crisis. In these circumstances, the possibility of a multiple equilibrium can be created and the economy may move from one equilibrium to another without a change in the fundamentals.<sup>46</sup>

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<sup>44</sup> Obstfeld model suggested that speculative attack is the opposite of the canonical model and represents an entirely rational market response to persistently conflicting internal and external macroeconomic targets. There exist circumstances in which balance-of-payments crises may indeed be purely self-fulfilling. Clearly, such crises are apparently unnecessary and lead to the collapse of an exchange rate that would otherwise have been viable. The crisis does not reflect irrational private behaviour, but an indeterminacy of equilibrium that may arise when agents expect a speculative attack to cause a sharp change in government macroeconomic policies. Even though a crisis is not inevitable, agents believe that the central bank will respond to crises by embarking on a program of heightened inflation. The belief that the authorities will ratify crises makes it unprofitable for any individual speculator to hold domestic currency while a run is taking place.

<sup>45</sup> There are three main reasons which indicate a speculative attack: the perceived benefit of maintaining the exchange rate regime; the benefits of abandoning the peg and feedback from expectations of abandonment of the peg to the costs of defending it. The last two reasons for speculative attacks were especially analysed in the works of Obstfeld (1994, 1996) and Reisen (1998). According to these articles, markets expect devaluation, makes the endogenous variables as domestic interest increase, thus creating an incentive to devalue.

<sup>46</sup> There exist two equilibrium: the first one features no attack, no change in fundamentals and indefinite maintenance of the peg; the second one features a speculative attack followed by a change in fundamentals which validates, *ex post*, the exchange-rate change which speculators expect will take place. (Eichengreen, Rose and Wyplosz (1997: 13)) Two main lines can be seen in this kind of model. The first emphasises the reinforcing effects of the action of economic agents in determining the movement from one equilibrium

The other line of second generation models suggests that crises may occur as a consequence of pure speculation against the currency, as agents follow herding behaviour (Calvo and Mendoza (2000) and Binkhchnadami and Sharma (2000)) and/or foreign exchange markets are subject to contagion effects (Gerlach and Smets (1995), Eichengreen, Rose and Wyplosz (1997), Masson (1998) and Ahluwalia (2000)).<sup>47</sup> In Obstfeld's and Reisen's models, neither of them predicted crises by changes in the economic fundamentals through the market agent's expectations. The crisis is the consequence of a pure speculative attack on a currency.

With regard to herding, this can be presented into two different ways. Firstly, when all agents have different pieces of information, it can be rational for individuals to base behaviours on the behaviours of others because of the cost of information. This is especially the case when there are many small investors in the economy. They cannot rely on their own individual information due to the high costs involved so they will base their behaviour on the behaviours of other market players, mostly those who have good reputations. In this situation, market investors will take decisions based on limited information and will therefore be more sensitive to rumours. This causes an ineffective distribution of the financial market decisions and moves the market to a crisis outcome (Calvo and Mendoza (2000)). Secondly, the incentive structures within which portfolio managers operate may make it not very costly to be wrong along with everyone else, with incentives to stand out against the crowd being insufficient. This is mostly the case when the advantages of investment (the case of the manager's salary in investment firms) depend on their competitors behaving similarly (Binkhchnadami and Sharma (2000)). In other words the salary of the manager will not decrease so much if the other investors on the market make the same mistake.

There is a possibility of contagion effects where two variants are present. The first variant is the spill-over effect (trade linkages).<sup>48</sup> The crisis in one market may affect macroeconomic fundamentals in another country, market via the loss of competitiveness of

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position to another. The second line underlines the role of expectation by considering the strategic complementarities of the action of economic agents in determining the final outcome (Esquivel and Larrain (1998: 4-5).

<sup>47</sup> Sometimes the contagion and hedging effect should not be added to the second-generation models and by many economics authorities put them to the special category such as financial market in efficiencies. However, despite this, I decided to use in my theoretical presentation the same way as Kaminsky, Lizondo and Reinhard (1997) and Esquivel and Larrain (1998). After developed the third generation models that mostly depends on the microeconomics fundamentals it can suggest that contagion and hedging effects should be considered as the second generation models due to the fact that they present the some kind game between the investors and government as well.

<sup>48</sup> Masson (1998) "Contagion: Monsoonal effects, spillovers and Jumps between Multiple Equilibria", *IMF Working Paper*, pp. 5.

the courtiers associated with devaluation of currency. This situation can result if the said countries are main trading partners. Generally, a successful attack on the exchange rate in one country leads to its real depreciation, which improves the competitiveness of the country's merchandise exports. This produces a trade deficit in the second country and a gradual decline in the international reserves of its central bank. This causes the other country to become more vulnerable to an attack and a currency crisis (Gerlach and Smets (2000), Eichengreen, Rose and Wyplosz (1997)).

The second variant is monsoonal effects (Eichengreen, Rose and Wyplosz (1997) and Masson (1998)). This effect is linked with multiple-equilibrium and suggests that a crisis in one country may raise the probability of a crisis in another country because the currency crisis in one country is like a signal which encourages a self-fulfilling speculative attack. Certainly a crisis in one country may conceivably trigger a crisis elsewhere for reasons unexplained by the macroeconomic fundamentals, perhaps because it leads to shifts in market sentiment or changes in the interpretation given to existing information. However, there can be another variance connected with the political nature of the devaluation decision when a policy is interested in enlarging political integration with its neighbours (e.g. the European crisis 1992-1993). In this context, devaluation in one of the neighbouring countries may increase speculation against the domestic currency.

### *Third generation model*

At the end of the 1990s, in particular, the after the structural financial crisis in Asia, a third generation model of currency crisis started developing very quickly. For the reason that the Asian countries brought incontrovertible experience that if something does not work in the micro fundamentals of an economy that could cause a currency crisis.<sup>49</sup>

The third generation models concentrated on three main microeconomic aspects related to currency crisis such as the fragility of the banking system (McKinnon and Huw Pill (1996), Chang and Velasco (1998 a,b,c) and Kaminsky-Reinhart (1999), financial market inefficiency (moral hazard or the problem of asymmetrical information) (Stoker (1994), Mishkin (1996) and Krugman (1998)), companies' balance sheets and the effects of monetary policy

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<sup>49</sup> In most crisis economies, governments have enjoyed surpluses and increasing foreign exchange reserves as well as low unemployment and booming exports. On the other hand there have been government failures, such as the fact that the financial sectors in these countries were not well-regulated. It also appeared that while growth had slowed, some signs of excess capacity had appeared in 1996 (Krugman (1998, 1999 a, b), Furman and Stiglitz (1998), Chang and Velasco (1998 c), Velasco (2001)).

during/before the currency crisis episodes (Krugman (1999 a, b), Aghion, Bacchetta and Banerjee (2000, 2001)).

The first issue addressed in the development of third generation models was the fragility of the banking system and financial market inefficiency. The classical views of the first generation model suggest that currency crises arise as a result of inconsistencies between inflationary fiscal policy and the exchange rate peg. This causes the depletion of international reserves and finally the collapse of the exchange rate regime.<sup>50</sup> As the models show, the authorities cannot directly finance the fiscal deficit by printing money but it is clear that the problem of financing expansive fiscal policy by printing does not disappear especially in most developing countries. However, modern variants of the first generation model, the so-called twin banking-currency crisis model, explain how this problem can change in a currency crisis, again, via the banking system. This framework stresses the fact that currency crises are often part of broader financial crises, where the two elements interact with one another, giving life to what have been called the “twin crises” (McKinnon and Huw Pill (1996), Chang and Velasco (1998 a, b, c), Stoker (1994), Mishkin (1996) Kaminsky-Reinhart (1999)).<sup>51</sup>

Stoker (1994) and Mishkin’s (1996) models concentrated more on the financial aspects of asymmetric information and moral hazard than twin model effect. However, more recently, a thoroughly worked-out attempt to model the financial fragility aspect of a currency crisis was carried out by Chang and Velasco (1998 a, b, c). This study addresses the issue of the financial intermediaries and commercial banks collecting funds from depositors and then allocating investment in order to maximize their profits and that of the depositors also. The banking system, in so doing, will improve social welfare. Additionally, the exchange rate regime and authorities’ credit policy increase this effect so that the whole economic mechanism is intended to maximize social welfare. In an open economy, the banks play another active role in generating large capital inflows to the economy through, for instance, the banking system where domestic and foreign investors borrow money from abroad at a low interest rate and then invest in the domestic market where yields are higher. At the same time,

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<sup>50</sup> Krugman (1979), Dornbusch (1987), Flood, Garber and Kramer (1996), Flood and Garber (1986).

<sup>51</sup> The twin banking-currency crisis model relies on Diamond and Dybvig’s dilemma (1983), where we find two possible outcomes of the market agents: one in which agents have confidence in the solvency of financial intermediaries, and one in which lack of confidence leads to a run. Both equilibria involve self-fulfilling expectations because banks fail if, and only if, there is a run. Furthermore they concentrate on the asymmetrical information problems (adverse selection and moral hazard ) in the financial market when with later are poorly supervised and monetary authorities act as lenders of the last resort . The asymmetrical information problem results in financial markets being unable to efficiently channel funds to those who have the most productive investment opportunities and therefore causing the banking system (Mishkin and Frederic (1996: 17).

though, there is one caveat, which is the risk of a sudden reversal of capital flows and of a bank run. In other words, international illiquidity<sup>52</sup> of the domestic financial system plus financial liberalization is at the centre of the problem. To the same extent, we do not have to implicitly assume that holders of the bank's liabilities, domestic depositors and foreign creditors, all remain confident in the bank. This means that depositors will attempt to withdraw their deposits in the short run, and that foreign creditors will not roll over their initial credit in the short run so that the bank will not be able to honour all of its commitments. There certainly seems to be a lack of confidence that leads to a banking crisis raises that can be caused by a shift in expectations. For example, if agents expect devaluation, early withdrawals will be beneficial. This can generate financial panic in domestic and foreign investors and at the same time foreign creditors will demand repayment from the domestic banks. If the domestic banks do not have enough domestic deposits in liquid form that is in the world asset it raises render of self-fulfilling bank run possibility. Long-term investments of the domestic bank will yield little if they have to be liquidated prematurely. In a closed economy, the central bank can protect against market panic by acting as a lender of the resort. With a fixed exchange rate and open economy the central bank can play the same role because a run against the intermediaries generates pressure on the peg and then increases demand for foreign exchange reserves. As long as the central bank holds the exchange rate, the regime will stabilise the banking system. Everything depends on the size of the central bank's reserves. On the other hand, to help domestic banks, the central bank can pursue a different expansionary policy and keep interest rates from rising. But, in this case, private agents will use the additional domestic currency to deplete the central bank's reserves. Therefore with limited international reserves, eventually, the central bank will abandon the peg. This shows how a financial crisis can transfer to a balance of payments crisis.

A further implication of the Chang and Velasco (1998) model suggests that financial liberalisation allows the domestic bank to obtain cheaper borrowed capital, and promotes a lending and investing boom in the domestic economy that causes a consumption boom, increase in current account deficit and increased financed the borrowing abroad. As the current account deficit continues to widen, financial markets will need more foreign capital to feed the trade deficit (boom-bust cycles) (McKinnon and Huw (1996), Kaminsky and

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<sup>52</sup> The key issue is a mismatch of assets and liabilities: a country's financial system is internationally illiquid if its potential short term obligations in foreign currency exceed the amount of foreign currency it can have access to on short notice (Change Velasco (1998 c).

Reinhart (1999)<sup>53</sup>. The lending boom converges levels gradually in inflation. There is marked cumulative real exchange rate appreciation.<sup>54</sup> Cumulative real exchange rate appreciation will generate the expectation of exchange rate depreciation on the market. According to Chang and Velasco's model (1998), the capital inflows become outflows and cause the collapse of the banking system which then leads to a currency crisis.

The problems of balance sheet firms have been dealt with in practical discussions, while the issue has been neglected in the currency crisis literature. However, more recent models (Krugman (1999 a, b) and Aghion, Bacchetta and Banerjee (1999, 2001)) increasingly address this topic and have found a link between all three micro economic aspects: the fragility of the banking system, asymmetrical information (moral hazard) and company balance sheets. Krugman's (1999 a) model presents an elegant simplification of the model of Aghion, Bacchetta and Banerjee (1999, 2001). Aghion, Bacchetta and Banerjee's (1999) model addresses the issue in a similar manner to Krugman's (1999a) model. These models state that a currency crisis can happen both under fixed and flexible exchange rate pegs, as the primary source of a crisis is the deteriorating balance sheet of private firms. This is because these balance sheets play a key role in the crisis itself. These models suggest that entrepreneurs can borrow in domestic currency from domestic consumers or in foreign currency from foreign lenders. Indeed, in these models it is mix short-term debt, denominated in domestic currency and long-term debt denominated in foreign currency. The amount that domestic entrepreneurs can borrow from foreigners or domestic banks to finance investment depends on their wealth; the entrepreneurs' wealth is therefore the fundamental variable that determines investment and output (Bernanke and Gertler (1989)). However, the wealth of each individual entrepreneur depends on the level of such borrowing in the economy as a whole; because the volume of capital inflow affects the terms of trade and hence the valuation of foreign currency- denominated debt (for example, inflows cause real appreciation of the exchange rate and decrease the value of foreign debt).

Any real shock in the economy such as productivity, or, such as fiscal or expectation shocks, can cause a decrease in capital inflows that will have adverse effects on the balance sheets of domestic entrepreneurs (Aghion, Bacchetta and Banerjee (2001)). Though the arbitrage in the foreign exchange market which implies that the currency must depreciate in the current period. If people start to believe that the currency will depreciate, it may indeed

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<sup>53</sup> Kaminsky and Reinhart (1999) "The twin crises: the cause of banking and balance-of-payments problems", *The American Economics Review*, 89, (3), pp.475.

<sup>54</sup> This conclusion is taken from Dornbush's overshooting model (Dornbush (1987)).

depreciate (Blanchard (1979)), but an explosion in the domestic currency value of dollar debt has a disastrous effect on firms. The increase in foreign currency repayments and fall in their profits then reduce their ability to borrow and then investment and output in a credit-constrained economy. A further reduction of capital inflow reduces the demand for the domestic currency and leads to depreciation. Generally speaking, the financial crisis cycles started to close circle, nevertheless, it is one of the possibilities multiple equilibrium in these models.<sup>55</sup>

Moreover, fragility in the banking and financial sector will make the whole system more susceptible to collapse by reducing the amount of credit available to firms (Stiglitz and Furman (1998), Radelet and Sachs (1998), Velasco (2001))<sup>56</sup>.

### ***Sudden –Stop Model***

Calvo (1998) was a pioneer in defining the empirical regularities of the so-called sudden stop phenomenon. These sudden stop episodes hit emerging markets in the 1990s (Asian crisis 1997-1998, Russian Crisis 1998, Mexican crisis 1994). The sudden stop phenomenon is essentially defined as an abrupt reduction of the capital inflows to a country and up to time of abrupt reduction that have been receiving large volumes of foreign capital Calvo (1998). This definition of Sudden Stop event was widened by Mendoza (2001), Mendoza and Smith (2002) and Hutchison and Noy (2004). These authors consider the effect of large downward adjustments in domestic production after a sharp reversal in capital inflows and collapses in asset prices and in the relative prices of non-tradable goods relative to tradable ones.

There are no perfect measures of the sudden stop effect. The traditional sudden stop indexes are based on changes of international reserve and net capital flows (current account balance changes) Calvo, Izquierdo and Mejia (2004).<sup>57</sup> The sudden stop event is defined as

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<sup>55</sup> This story of currency crises pointed out two well-known and significant facts. Firstly, a country goes into a crisis where firms hold a lot of foreign currency as denominated debt (the measure of aggregate foreign currency exposure is the ratio of claims to liabilities with respect to BIS banks). It is striking that all the countries which had a ratio higher than 1.5 experienced a serious crisis in the 1990s. The second fact is that there are substantial and persistent deviations from the purchasing power parity that require large changes in the relative price of tradeable and non-tradeable commodities. (Krugman (1999a), Aghion, Bacchetta and Banerjee (1999)).

<sup>56</sup> The expansionary monetary policy is assumed not to be inflationary since prices are stickling in short run. Velasco (2001) “The impossible due Globalization and Monetary independence in Emerging Markets”, Mimeo, Harvard University, pp. 12.

<sup>57</sup> Calvo et al. (2004) first built the sudden capital reversal measure  $\Delta C_t$  where  $\Delta C_t = C_t - C_{t-12}$  and then  $C_t$  is defined to be a 12-month moving sum of lagged values of capital flows proxy  $P_t$ . The capital flows proxy is computed by subtracting monthly changes in international reserves from the quarterly current account

episodes when gross inflows drop off considerably and remain modest for a full year. In contrast, Rothenberg and Warnock (2006) and Mendoza (2006) regarded the sudden stop index as net capital flows in preference to gross capital flows. In addition, Rothenberg and Warnock (2006) indicated the episodes of sudden as very strong inflows of capital for the following two years. This definition allows us to distinguish the sudden stop episodes from the episode of sudden flight.<sup>58</sup>

The sudden stop phenomenon involves a reversal in capital inflows associated with a currency and balance of payments crisis (Calvo (1998), Rodrik and Velasco (1999), Calvo, Izquierdo and Talvi (2002), Kaminsky (2003), Hutchison and Noy (2004)). There are three mechanisms through which a sudden stop in international capital flows may bring about a currency and balance of payments crisis. The first two channels were built on the financial friction of the “great depressions” model. The first channel is based on the Keynesian hypothesis of price or wage stickiness and its connection with an external financing premium (Bernanke, Gertler and Gilchrist (1999)). The second channel is the so-called Fisherian analysis of debt-deflations driven by collateral constraints.<sup>59</sup> This analysis was introduced by Kiyotaki and Moore (1997) and then developed by integrating forms of imperfect credit markets, by Mendoza (2001). Essentially, these two approaches investigated the effect of a fall in credits, attributable to the sudden stop in capital inflows, combined with an external financing premium, a “financial accelerator”, reducing aggregate demand and causing a fall in output.<sup>60</sup> Conversely, Mendoza’s approach to Bernanke, Gertler and Gilchrist’s and Moore’s (1997) Sudden Stop models is quite different. This analysis focuses on an excess volatility phenomenon and explains the abrupt economic collapses of Sudden Stops as a typical phenomenon nested within the co-movements of regular business cycles. The model also

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balance. The sudden stop episode is indicated when in the first month  $t$  that  $\Delta C_t$  falls one standard deviation below its mean. The episode ends if  $\Delta C_t$  again exceeds one standard deviation below its mean. The additional assumption is that within the episode, there must be at least one time  $t$  when  $\Delta C_t$  falls at least two standard deviations below its mean.

<sup>58</sup> In accordance with Rothenberg and Warnock (2006), nearly the half of the currency crisis episodes that were recognized as sudden stops by previous definition of Sudden Stop episodes. In the traditional model sudden flight is defined when local investors are given information to enable them to foresee a negative shock to the local market. These investors then shift money to global markets. In this case the net inflows will decline, but the decline is prompted not by global investors. True sudden stops might occur if global investors sell emerging market assets when they receive a negative signal that could well originate from the actions of other global investors. Both types of episodes are associated with a sharp decrease in net capital inflows, however, so Rothenberg, Warnock decided to use the gross flows.

<sup>59</sup> Hutchison and Noy (2004) “Sudden Stops and the Mexican Wave: Currency Crises, Capital Flow Reversals and Output Loss in Emerging Markets” Working Paper 0413, University of California, Santa Cruz, pp. 11.

<sup>60</sup> Mendoza (2001) Credit, prices, and crashes: Business cycles with a sudden stop. *NBER Working paper* No. 8338, 2001, pp.12.

emphasizes the interaction of uncertainty, risk aversion and incomplete contingent-claims markets in forming the transmission mechanism linking financial frictions to the real economy. This analysis is in line with the models developed by Aiyagari (1993) and Aiyagari and Gertler (1999), where precautionary saving and state-contingent risk premium play a key role in driving business cycle dynamics.<sup>61</sup> In addition, Mendoza (2001) introduced “policy uncertainty” and “involuntary contagion” as explanatory variables in Sudden Stops model. Finally, the third mechanism is the analysis of existence of the multiple equilibria most of which were developed as part of the second and third generation model (Calvo (1998), Rodrik and Velasco (1999) and Aghion, Bacchetta and Banerjee (2001)). However, in this case, as Rodrik and Velasco (1999) suggest, excessive short debt can leave borrowing countries vulnerable to sudden shifts in lenders’ or investors’ expectations, which can in turn become self-fulfilling of a currency crisis. However, the reason for the shift in the economy to a bad equilibrium might be the sudden capital reversal.

### **1.3. The Link between the regulation of capital control and currency crisis events**

In this section I will summarise the information collected in the two previous sections and link this information with the general neoclassical economic theory in order to get a clear picture about a possible connection between CAL and Currency Crisis episodes.

Neoclassical theory is based on the concept of allocative efficiency. In that case CAL should improve the efficiency of capital investment by removing the distortions (e.g. monopolization of market). CAL works in the same way as the liberalization of the domestic market (Fischer (1997), Summer (2000)). In addition, the supporters of neoclassical theory and the CAL concept argue that capital flows are similar to the trade between time periods (temporal borrowing and lending) and to the trade between countries. They term these capital flows as “intertemporal trade” and argue that trade liberalization is beneficial for the economy across jurisdictions under argument for competitive markets (Fischer (1997), Summer (2000)). In the case of allocative efficiency, the CAL process will improve the diversification of the investor’s portfolio (by reducing the portfolio risks or increasing the purchase of lower risk equity), increase the efficiency of saving allocation and then smooth the consumptions in

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<sup>61</sup> Mendoza (2001) Credit, prices, and crashes: Business cycles with a sudden stop. *NBER Working paper* No. 8338, 2001 pp. 13.

response to shocks and increase economic growth<sup>62</sup> (Fischer, (1997), Liccheta (2006), Gourinchas, Jeanne (2002), Prada, et al. (2003)). All these improvements will have a positive influence on macroeconomic stabilization and financial markets strength (Fig 3).

Certainly, CAL optimists recognize that the CAL process can be linked to the risks of market overreaction. Nevertheless, they argued that if capital movements are mostly appropriate then the currency crises do not blow up with any reason rather started as the rational reaction to policy mistakes or external shocks (Fisher, (2003: 4)). Therefore, market overreactions are caused by the lack of precondition reforms or wrong sequences of CAL reforms. The economists mainly consider the currency crisis described by the first generation models (Krugmand (1979), Salant and Henderson (1978)) or the simple version of “twin models” (McKinnon and Huw (1996), Chang and Velasco (1998 a,b,c)) where bad macroeconomic fundamentals or weak banking supervision allowed the economy to crash in an almost predictable way. However, the currency crisis described as second generation models (Obsfelt (1986, 1994, 1997)) recognized to special factors (e.g. unemployment levels, interest rate levels, GDP) can be considered here as well. The self-fulfilling expectations of investors were caused mainly by some economic problems (e.g. high unemployment levels). On the other hand, this assumption about precondition reforms CAL becomes an incentive for good policies or reforms (e.g. independence of monetary policy or property rights). This effect also reduced the probability of a currency crisis. (Gourinchas and Jeanne (2002), Eichengreen (2001), Klein and Olivei (2001)) (see Fig. 3).

However, the other side of the debate about CAL and currency crises was of the opinion that it is not a direct causal link between CAL and the incidence of a crisis, but there is evidence to believe that liberalization increases the probability of a crisis (Stiglitz (2000), Charlton and Stiglitz (2004), Williamson and Mahar (1998), Singh (2002), Dollar and Kraay (2001)). They arrived at this conclusion from the wrong neoclassical paradigms: those financial and capital markets are essentially the same as the goods-services markets. The theory ignores important aspects that undermine the main neoclassical assumptions (such as

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<sup>62</sup> In more detail, the link between economic growth and CAL might be regarded from two important perspectives: investments increase and savings increase. The effect of CAL might cause the direct implications or indirect implications of investment/saving conditions improvements. However, both effects work in the same direction to decrease the cost of capital and increase the efficiency of diversification of the investment portfolio. The direct effect is generally linked with price of capital such as interest rates, price of market stocks and cost of inter-company loans. (Henry (2003), Stulz (1999)). When a country liberalizes their regulation of capital control their interest rate should have flattened to the international interest rate; at the same time the additional inflows of foreign capital to the stock market should cause an increase in market stock prices. In the context of multinational corporations, the transfer of investment capital between different subsidiaries will be less expensive after CAL resulting in more capital stock being available for future investments (Desai, Foley and Hines (2003)).

full information, rational agents' behaviour, distortions etc.).<sup>63</sup> They found reasons why CAL can lead to economic instability macroeconomic instability and banking booms and then to a currency crisis (the lack of neoclassical theory) (see Fig. 3). These reasons might be divided into main two categories. The first group of reasons consist of animal spirits<sup>64</sup>, the procyclical nature and volatility in capital flows, self-fulfilling expectations, the systemic risk though contagion from one economy to other, momentum trading<sup>65</sup> and the sensitivity of international markets to changes in information (financial panic). (Stiglitz (2000), Singh (2002)). This group is mainly linked to the indicators of sudden stop models (Mendoza (2001), Hutchison and Noy (2004)) and second generations models which are based on the assumption of pure speculation against the currency such as herding behaviour models (Calvo and Mendoza (2000) and Binkchamadani and Shami (2000)) and contagion effects models (Gerlach and Smets (2000), Eichengreen, Rose and Wyplosz (1997) and Masson (1998)). After that, the second category of reasons for instability can be regarded in the perspective of third generations models and banking/financial fragility- the main authors in this field being James and Stoker (1994), Mishkin (1996), Chang and Velasco (1998 a,b,c), Kaminsky and Reinhart (1999) or Companies' balance sheet models (Krugman (1999 a,b), Aghion, Bacchetta and Banerjee (2000, 2001). In this categories of reason are financial panic, boom-bust cycles<sup>66</sup>, increased the competition among banks following liberalization and the short-termism of leading players and momentum trading. However, financial panic and momentum trading are important in analysing both second and third generation models of a currency crisis (Stiglitz (2000), Charlton and Stiglitz (2004), Chari and Henry (2002) (see Fig. 3).

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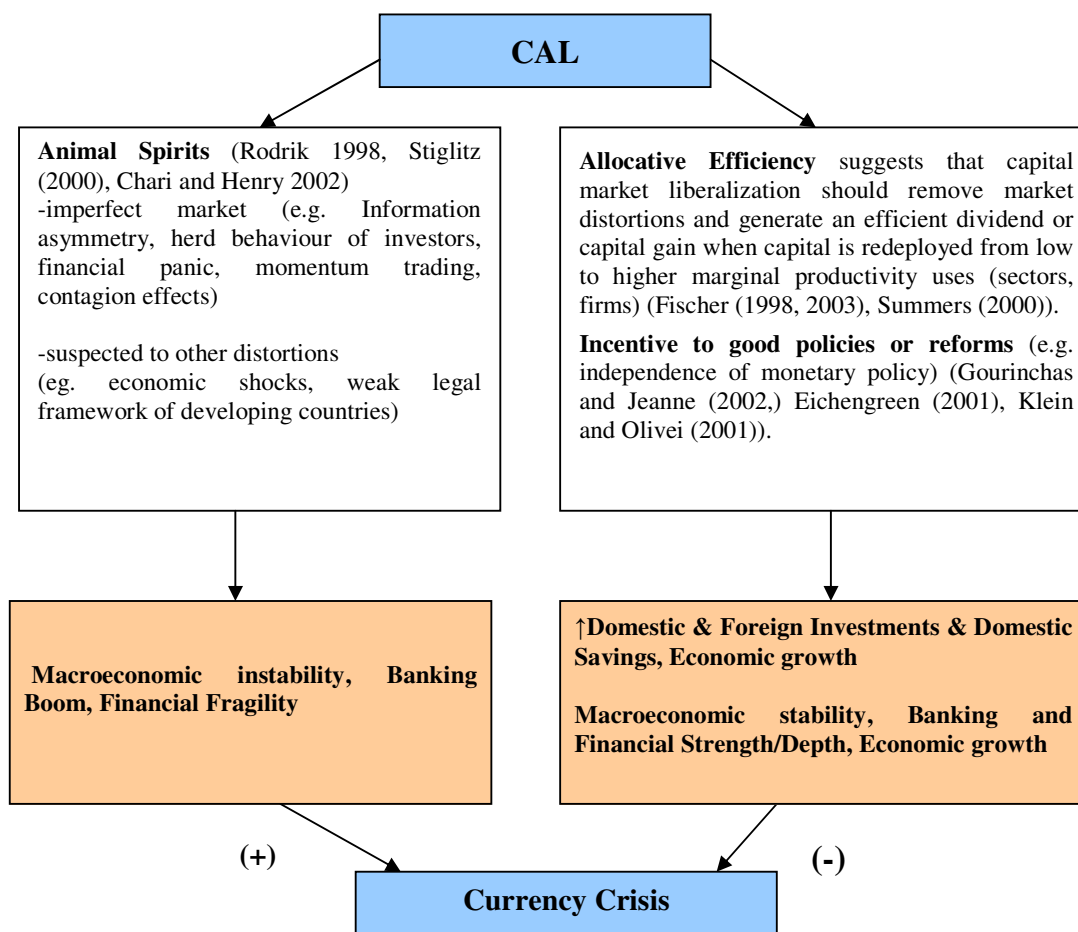
<sup>63</sup> Beginning with the assumptions that large numbers of them are of questionable validity in, specifically, developing countries, Rashit (2001) has pointed that the benefits of open capital markets predicted in the neoclassical theory rests on three key assumptions: capital and labour resources are fully employed everywhere, capital flows themselves do not adversely affect macroeconomic stability and international capital movements are determined by long-term returns on investment in different countries. Few of these assumptions, however, are likely to hold in developing countries. And the other aspects are the distortions. For instance the restrictions on capital flows are certainly distortional but this may be optimal in the presence of the other distortions (Stiglitz and Charlton (2004)). Such distortions are pervasive in developing countries. Industrial policies are often implemented to protect and promote domestic industries; where the economic institutions are often weak and are limited in their ability to enforce competition law, property rights, and international macroeconomics instability often connected with informational asymmetries or in the context of economics shocks. In addition, the model of perfect functioning markets is even less relevant when one considers that liberalization often takes place in perspective of contemporaneous economic shocks (Stiglitz and Charlton (2004)).

<sup>64</sup> The animal spirits argued that capital flows have little to real economic activity; in this context CAL has no effect on investments, output or any other real variable and mainly consider the impact of information on the behaviours of investor.

<sup>65</sup> This strategy prescribed the buying of assets whose prices have been increased and selling assets whose prices have been falling, (Prasad, Rogoff, Wei and Kose (2003)).

<sup>66</sup> Boom-bust cycles following capital inflows imply an initial surge in investment and asset bubbles, followed by capital outflows and recession.

Fig. 3. CAL and Currency Crisis from a theoretical perspective



Source: My own analysis based on Chari and Nenry (2002), Stiglitz (2000), Rodrik (1998), Eichengreen (2001), Guorinchas and Jeanne (2002), Klein and Olivei (2001), Charlton and Stiglitz (2004), Singh (2002)).

All these phenomena connected relation between CAL and currency crisis episodes are intensive during the process of liberalization the capital flows. Nowadays a few practical sides of these phenomena are presented. First example is that the liberalization of capital flows increases the number of investors and availability of new foreign assets which might raise the problem animal spirit effects (e.g. adverse selection, risk of asymmetric information, moral hazard, financial panic) (Mishkin (1996)). Foreign investors might have less knowledge about domestic markets than domestic ones. At the same time, domestic investors can have problems with information about new foreign assets. However, access to information about a new situation will entail additional costs for both kinds of investor, which can drive them into patterns of irrational behaviors (Banerjee (1992), Calvo and Mendoza (2000), Binkhchnadami

and Sharma (2000). Additionally, the CAL process exposes the country to short-term debt/short-term capital (e.g. East Asian countries before 1998) which make a country more vulnerable to sudden changes in market sentiment and financial panic (Rodrik and Velasco (1999), Gruszczynski (2002), Uri Dadush, Dasgusta and Rata (2003)). In terms of CAL and the banking system, for example, CAL might increase the fragility of the banking system. The managers of foreign-owned banks may suffer from the poorer knowledge of the behaviour of borrowers. Consequently, foreign-owned banks may face more problems resulting from information asymmetries than domestic-owned banks (Mc Kinnon and Huw (1999)) In addition, the increase of capital flows can exacerbate the efficiency of financial supervision by monetary authorities and can lead to a banking crisis by increasing the amount of bad credit in a foreign currency for firms or individual-domestic financial dolarization (Chang Velasco (1998a,b), Kaminsky and Reinhart (1999), Demirguc-Kunt and Detragiache (1998)).

Moreover, these opponents to the CAL process also suggest that the link between the liberalization of the financial system and economic and financial crises is closer in developing countries than in developed countries (Arteta, Eichengreen and Wyplosz (2001), Singh (2002)). There are several reasons which help explain this situation. Firstly, developing countries are more suspected to economic distortions such as economic shocks or weak legal framework. Secondly, most developing countries have a small economy so that CAL process influenced negatively on efficiency of the monetary policy.<sup>67</sup> This means that developing countries have fewer tools to protect against the speculation attacks. Lastly, it is sometimes very difficult to implement any preconditions reforms in developing countries ( see Fig. 3.).

On the whole, it is difficult to obtain an unambiguous answer about the sign in the relation between CAL and Currency Crisis Episodes. As has been discussed, there are two main ways in which this link can be considered. Moreover, as discussed in first part of this chapter, capital control might be efficient (e.g. the Malaysian case) but in the long-term market, players always find a way to avoid this restrictions. Furthermore, there are always problems what kind of capital control regulation should be imposed on different categories of capital flows. As we have seen, both categories of capital (FDI and FPI) bring volatility of balance of payments (Singh (2002)). On the other hand, it is sometimes relatively easy to

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<sup>67</sup>This conclusion is based mainly on the Mundell-Fleming model. This model argued that there is inconsistency between the policy of simultaneous currency pegging and CAL for a small open economy. Any attempt by the central bank to raise the domestic interest rate above the world rate (plus a risk premium) will invite foreign capital inflows, while any attempt to lower the domestic rate below the world rate will lead to capital outflows. On the other hand, if there is a change in the world interest rate, the domestic rate has to change accordingly (Saxena and Wong (1999)).

transfer FDI to FPI by foreign investors (e.g. foreign companies can take the credit in domestic bank and in the case of domestic problems, they transfer it to head office.

## CHAPTER II

### Overview of empirical literature

The discussion about the costs and benefits of capital account liberalization has been a topic of some heated debate for a long time. In recent years, however, after some incidents such as the Mexico crisis (1994-1995), the Asian crisis (1997-1998) and the Argentinean crisis (2001), the topic has become very important in the context of future international and national policy, especially in the case of currency crisis events. As we have already seen in Chapter One, the theoretical literature on these topics is separately quite well-developed; however, it is difficult to find theoretical explanations of the relation between these CAL and Currency Crisis effects. However, in real life we can describe episodes when both the Capital Account Liberalization process and a currency crisis effects exist together.<sup>68</sup> Nevertheless, there is an extensive empirical literature measuring the effects on capital account liberalization on particular variables such as interest differentials, inflation or output.<sup>69</sup> On the other hand, there are a large number of empirical studies that provide information on varied experience with currency crises and examined determinants of currency crises (based on existing theory –see Chapter 1.2.2). There are few papers regarding the impact of capital account liberalization on exchange rate stability (currency crisis events). Among all these studies, two lines of analysis can be distinguished: single-country and multi-country.

In this chapter I will briefly describe the single-country and mutli-country studies which generally analysed the link between currency crisis episodes and CAL incidences. In addition, I will write more details about leading indicators methodology in order to present how researchers try to calculate the probability of currency crisis by using different factors. Furthermore, in the section about the single-country studies, I will describe three case studies such as Russia, Latvia and Poland. These countries were chosen for CEE countries-analysing group of 12 countries.<sup>70</sup>

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<sup>68</sup> The Mexico crisis (1994-1995), the Asian crisis (1997-1998) and the Argentinean crisis (2001), the Russian crisis (1998), the Brazilian crisis (1999).

<sup>69</sup> Cowan et al (2005), Gallego et al (2003), Mathieson and Rojas-Suarez (1993), Lopez-Mejia (1999), Edison and Warnoc (2003), Campio and Neumann (2004).

<sup>70</sup> Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russian Federation, Slovak Republic, Slovenia, the Ukraine. Although Russia is not CEE country I decided to add this country to my research. Due to this country is strong linked with CEE's countries and secondly it is interesting example of currency crisis in this region of Europe.

## 2.1. Empirical literature - single country studies

The single-country analyses, which investigated the relation of exchange rates and capital control (or capital account liberalization), are limited to a few selected countries: the Malaysian and Thai cases - Edison, Reinhart (2001 a, b), the Mexico case and East Asian countries - Edwards (1999), the Chile case - Gallego, Hernandez(2002), Gallego et al (2003), Gregorio, Edwards, Valdes (2000), the Korean case - S. Kim, S. H. Kim, Wang (2002), Demetriades, Luintel (2001), the Asian case and the Argentina crisis (2001-2001) – Bustelo (2004). The researchers used different methods of analysis such as VAR models, probit models etc., however, and the majority of them exploited non-statistical methods.<sup>71</sup>

In my research I will primarily concentrate on three country case study for CEE countries (Russia, Poland and Latvia) to present the link between the CAL and currency crises. There were two main criteria of country selection. First, I decided to choose one country had a currency crisis (Russia in 1998) and country did not have the experience of currency crashes. Russia was taken due to this crisis provoked a contagion effect across the countries of the former USSR (e.g. Ukraine, Moldova) and less-developing countries (e.g. Brazil).<sup>72</sup> Second, I took countries with the similar level of CAL progress which accepted IMF Article VIII (Russia in 1996, Poland in 1995 and Latvia in 1994). In that case all three countries liberalized the basic capital control restrictions.<sup>73</sup> Moreover, I decided to analyze two non-currency crisis countries instead of one country. I want to present countries with the different approach to CAL process. Latvia removed almost all restrictions on FDI, credit, and portfolio flows by 1995 (Latvia is a rapid liberalizer). Poland adopted a gradual schedule of CAL. For instance, eventually, in October 2002, all remaining short-term restrictions were eliminated (Poland is a cautious liberalizer).<sup>74</sup> Furthermore, both non-currency crisis countries had different experience of financial crashes. Poland is an example of lack of banking crisis events even during the increased the number of the speculation attacks during the Asian, Czech Republic, Mexican and Russian crises (see Appendix 2.1 Figure 3,4). At the same time, Latvia noticed the banking crisis in 1996. In addition, this different experience of Poland and Latvia allows analyzing the impact of sequence of CAL on macroeconomic-

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<sup>71</sup> Gruszczynski, “Kryzysy Walutowe a Liberalizacja obrotów kapitałowych”, Wydawnictwo Naukowe PWN 2002 pp. 113.

<sup>72</sup> Dąbrowski (2001) “The Episodes of Currency Crises in the European Transition Economies ” CASE report no 40 pp. 5-6, 24-51,54-58, 65-70.

<sup>73</sup> CAL might be measured by considering different data (see Chapter 1.3, Chapter 3.3.1).

<sup>74</sup> Arvai (2005) “Capital Account Liberalization, Capital Flow Patterns, and Policy Responses in the EU’s New Member States” IMF Working Paper pp.10-11.

financial stability and the possibility of currency crisis episodes. It is widely thought that capital account liberalization might lead to a banking crisis and then through over-lending and financial crash transfer to a currency crisis (see Chapter 1.2 and 1.3).<sup>75</sup>

Last but not least, the analysis of case studies will mainly concentrate on the second half of the 1990s. During this period there was spate of currency crises around the world (Asian crisis 1997, Mexican crisis 1994-95, Brazilian crisis 1999 etc.). Especially, I will focus on Russian currency crisis (1997-1998), Latvian banking crisis (1995-1996) and the intensity of speculation attacks against Polish currency after Asian crisis (1997-1998).

### ***Case Studies-Russia, Latvia and Poland***

The collapse of the communistic system in CEE's countries (such as Poland) and the Soviet Union promised a peaceful and affluent Russia. Moreover, it was believed that former communistic countries would rapidly become integrated into the global marketplace and Soviet Union would never again be a threat to the world peace. However, the transition from communism to a market economy, which began in the early 1990s, was more complex than merely an economic experiment; it also involved the transformation of society and of social and political structures. As a consequence, the former communistic country's transformations challenged the IMF and World Bank policies and planning. In order to avoid a return to the communist system, these institutions advocated shock therapy. All three countries Latvia, Poland and Russia imposed this therapy. This therapy had three main pillars: liberalisation, stabilisation and privatisation.<sup>76</sup> The liberalisation program was intended to allow integration with a market economy so most prices were freed overnight and the liberalization of capital flows. At the beginning of the 1990s capital account liberalization was generally viewed as beneficial.<sup>77</sup> The IMF encouraged capital account liberalization, but the process was mostly driven by country authorities' agents in both cases (see Appendix 2.1 Table 9.). In the first half of the 1990s, there was no clear guidance about the operational aspects of this process such as the pace and sequencing of the removal of restrictions.<sup>78</sup>

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<sup>75</sup> Hendry (2006), Singh (2005), Eichengreen (2000), Demetriades, Luintel (2001).

<sup>76</sup> Schleifer A. and Triesman D. (2000), "Without a Map: Political Tactics and Economic Reform in Russia ", Cambridge: MIT Press, pp 100-132.

<sup>77</sup> It was before the Mexican crisis (1994-1995), the Argentina crisis (2001-2002), the Asian crisis (1997-1998) and the Russian crisis (1998).

<sup>78</sup> See IMF (2005), Hendry (2006), Singh (2005), Eichengreen (2000), Demetriades, Luintel (2001).

## The Russian currency crisis

This section provides a brief review of the Russian economic and political situation in the late 1990s (see Appendix 2.2. Table 1.).

After the collapse of the economy in October 1994, the authorities seriously started implying the three-pillars-program.<sup>79</sup> They begun of a new program of mass privatisation and a successful disinflation program partly based on anchoring the rouble to the dollar through a crawling peg arrangement, the corridor. In July 1995, this disinflation program was implemented by tightening monetary policy and by giving autonomy to the Central Bank of Russia.<sup>80</sup> In April 1996, Russian officials began negotiations to reschedule the repayment of the foreign debt inherited from the former Soviet Union as members of the Paris and London Clubs of indebted nations and international institutions became obligated to expand their assistance.<sup>81</sup> In June 1996, Russia signed the IMF Article VIII. Clearly, the outlook in 1997 presented good reasons for optimism. Russian politics had managed to establish most of the pre-conditions for a successful transition, but they had failed in some important details due to impossible political conditions. Mass privatisation is usually presented as an unmitigated disaster;<sup>82</sup> however, there were many positive signals. Inflation was no longer a debilitating factor. The inflation rate for 1997 stood at 11%, down from 2500% in 1992. Monetary policy was entirely dedicated to the pursuit of disinflation, aiming at a rate of 5% by the end 1998. The exchange rate had been brought into the corridor in July 1995, and was successfully kept

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<sup>79</sup> Сергей Матвеев, Ирина Синицина (1995), “Банковская система и финансовый рынок России в 1994-1995 гг.”, Центр социально-экономических исследований, 61, pp. 11-15.

<sup>80</sup> Sutale P. (1999), “The financial crisis in Russia”, Bank of Finland, Institute for Economies in Transition, Bofit, pp. 7, W. Małeckı, A. Sławiński R. Piasecki and U. Żuławska (2001), “Kryzysy walutowe”, Wydawnictwo Naukowe PWN, pp. 137-153.

<sup>81</sup> Additionally the World Bank was prepared to provide expanded assistance of \$2 to \$3 billion per year and the International Monetary Fund (IMF) continued to meet with Russian officials and provide aid. In September 1997, Russia was allowed to join the Paris Club of creditor nations after rescheduling the payment of over in old Soviet debt to other governments. And then Russia signed another agreement for debt repayment with the London Club. However, the improvement in international credit rating can be very questionable. For example, the Paris Club’s recognition of Russia as a creditor nation was based upon discutible qualifications. The one-fourth of the assets considered to belong to Russia was in the form of debt owed to the former Soviet Union by countries such as Cuba, Mongolia, and Vietnam. Recognition by the Paris Club was also based on the old, completely arbitrary official Soviet exchange rate of approximately 0.6 rubles to the dollar (the market exchange rate at the time was between 5 and 6 rubles to the dollar). The improved credit ratings Russia received from its Paris Club recognition were not based on an improved balance sheet. Abigail J., Chiodo and Michael T. Owyang, ‘ “A case study of a currency crisis: the Russian Default of 1998”, The Federal Reserve Bank of Louis 2002 pp. 11, J. E. Stiglitz , “Globalisation and its discontents”, Penguin Books, 2002, pp.144-156.

<sup>82</sup> In 1997, 69% of enterprises (including foreign ones) were private, 9% had mixed ownership. True, there was a heavy price to pay: appalling corporate government. Most firms were in the incompetent and corrupt hands of the former “red barons” more apt at seeking subsidies than at retooling non-competitive businesses. N. Ivanova, Ch. Wyplosz , “Who lost Russia in 1998” Graduate Institute of International Studies Working Paper presented at the conference “Money Doctors” in Paris, December 14-15, pp. 17-18.

in a narrow band between 5 and 6 roubles to the dollar.(see Appendix 2.2 Fig. 3.) The trade balance never posed any threat ( see Appendix 2.2 Fig. 4. ). Oil, gas and mineral exports were virtually guaranteed, at least in volume. This allowed Russia to purchase western goods deemed superior in quality. Following liberalisation, imports had risen sharply while non-oil, non-mineral, non-military imports and exports were insignificant. Russian manufacturers were largely unable to complete orders for their own domestic markets, far less for foreign markets.<sup>83</sup>

Progress had been achieved over the period 1992-1997, but much remained to be done on both the structural and macroeconomic levels and, in some aspects, the Russian economy rapidly deteriorated after the 1996 presidential election. There was no doubt that one of the main reasons for Russia's macroeconomic fragility was fiscal problems. The federal budget had been in deficit from the beginning of the transition. Local and regional government were not allowed to run deficits and indeed, managed to maintain a rough balance. By end of 1997, the situation was no better. At about 7% of GDP, the deficit was not unbearable since the domestic public debt was at zero to start with, in 1992.<sup>84</sup> However, the biggest weakness in the Russian economy was low tax collection. Many firms did not pay taxes and the government did not pay for its purchases, which permitted barter transactions, especially at the regional government level.<sup>85</sup> The quantitative decline in tax revenue went hand in hand with a qualitative deterioration, as non-cash tax receipts (in the form of promissory notes – *vekselya*- or other non-monetary payments) reached 26 percent of taxes in 1996 and 20 percent in 1997.<sup>86</sup> Additionally the majority of tax revenue came from taxes that were shared between the regional and federal governments, which fostered competition among the different levels of government over tax revenue distribution. Certainly, this kind of tax sharing can result in conflicting incentives for regional governments and lead them to help firms conceal part of their taxable profit from the federal government in order to reduce the firms' total tax payments. In return, the firm would then make transfers to the accommodating

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<sup>83</sup> Abbigail J.,Chiodo and Michael T.Owyang, "A case study of a currency crisis: the Russian Default of 1998", The Federal Reserve Bank of Louis 2002 p. 11, N. Ivanova, Ch. Wyplosz , "Who lost Russia in 1998?" Graduate Institute of International Studies Working Paper presented at the conference "Money Doctors", Paris, December 14-15, pp. 17-19.

<sup>84</sup> Ivanova N. Wyplosz C. "Who lost Russia in 1998?" Graduate Institute of International Studies Working Paper presented at the conference "Money Doctors", Paris, December 14-15, pp. 16-17.

<sup>85</sup> Stiglitz J.E. , "Globalisation and its discontents", Penguin Books, 2002, pp.152.

<sup>86</sup> Chapman, A. Mulini M. (2001), "Explaining Russia's currency and financial crisis", Kluwer Academic Publishers, 11, pp. 7.

regional government (a kind of barter trade). This can explain why federal revenues dropped more rapidly than regional revenues.<sup>87</sup>

As the authorities were unable to raise adequate government revenue and the IMF prohibited the Central Bank of Russia from borrowing in 1995 (the disinflation program), the government relied on the market to pick up government short-term bills (GKO's) and long-term bonds (OFZ's), and in the process attracting domestic and foreign investors to the government securities market.

The first debt instruments, short-term GKO's, had been issued in small quantities in May 1993, but an efficient GKO market soon developed. At their lowest levels in the final quarter of 1997, the annualised yields of government securities averaged 25-30 percent, far higher than comparable rates abroad.<sup>88</sup> The high real returns of this instrument made it very appealing to Russian and foreign investors, even though the latter were not initially allowed to invest and then had to hold their assets in special S-accounts, which severely limited the repatriation of their earnings. In spite of the lifting of the earlier requirement limiting purchases of government bonds to domestic investors, this was not adequate to finance the Russian fiscal problem.<sup>89</sup> Under these conditions, at the beginning of 1996, the government decided to remove the limitations on the purchase of government securities by non-resident investors, promoting foreign investment, especially short-run capital in flows to Russia. So, by late 1997, roughly 30 percent of the GKO market was accounted for by non-residents, by direct contract or via the banking system. The CBR and Sberbank (the biggest State Saving Bank), which held about 50 percent of GKO's, assisted the government by purchasing new GKO issues at primary auctions. The remaining GKO's were held by the domestic commercial banks which were owned by the oligarchs. The OFZ market did not develop so dynamically because of investor uncertainty.<sup>90</sup> This relation between capital account liberalization and CRB/ Sberbank is indicated the risk of currency crisis in Russia.

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<sup>87</sup> Desai P., (2000) "Why did the ruble collapse in August 1998?", *American Economic Review*, vol. 90, no.2 pp. 49, Shleifer and Treisman (2000), "Without a map: Political tactics and economic reform in Russia", Cambridge, MA: MIT Press, pp. 100-149.

<sup>88</sup> Buchs T.D.(1999), "Financial crisis in the Russian Federation", *Economics of Transition*, vol.7(3), pp. 688; Shleifer and Treisman (2000), "Without a map: Politics tactics and economic reform in Russia", Cambridge, MA: MIT Press pp. 100-149, Abbigail J. Chiodo and Michael T. Owyang, "A case study of a currency crisis: the Russian Default of 1998", The Federal Reserve Bank of Louis 2002 p. 11 P.Desai, (2000) "Why did the ruble collapse in August 1998?", *American Economic Review*, vol. 90, no.2 , pp.48.

<sup>89</sup> Desai P., (2000) "Why did the ruble collapse in August 1998?", *American Economic Review*, vol. 90, no.2 pp.49, Abbigail J.,Chiodo and Michael T.Owyang, "A case study of a currency crisis: the Russian Default of 1998", The Federal Reserve Bank of Louis 2002 pp. 12.

<sup>90</sup> Ivanova N., Wyplosz C. , "Who lost Russia in 1998" Graduate Institute of International Studies Working Paper presented at the conference "Money Doctors", Paris, December 14-15, pp.33.

Secondly, there was an element of fragility in the banking system. Russian bank assets fell below that of liabilities and this weakness was often seen as stemming from the liability side. The most striking feature of Russian bank liabilities was a low and falling share of deposits, the Sberbank being the only exception. From 1995 to 1997, deposits fell by some 11 percent, reaching 49 percent of overall liabilities. Without households deposits going into the Sberbank, which absorbed some 75 percent of this type of deposits, the ratio of deposits to liabilities would have been much lower, at well below 30 percent. Also, the composition of deposits changed; there was contraction in mainly long-term deposits (time and saving deposits, including currency ones). So, the overall fall in deposits harmed Russian banks in as much as it reduced access to a cheap source of liquidity; moreover, as the public turned to more volatile forms of deposit, banks became more exposed to sudden liquidity shortfalls due to loss of confidence.<sup>91</sup> However, in 1996, capital liberalisation allowed Russian banks to borrow more from foreign markets. Most of these transactions were secured by the Russian banks' purchase of GKO on the domestic market and registered as a deterioration in the balance sheets of Russian banks as a rise in their foreign liabilities as a proportion of assets (mostly in domestic government securities that were to become worthless), from 7 percent of their assets in 1994, to 17 percent in 1997.<sup>92</sup> This fragility of banking sectors suggest the existing aspects of "twin" currency crisis model.

But the glimpse of a recovery was seen in 1997, when Russia became the lowest-risk member of the world market according to her international credit rating and with greater domestic stability, which was not to last long however. However, this did not last long the international situation of the foreign market was badly hit by the East Asian crisis in the summer of 1997, and in November 1997, the Russian rouble came under speculative attack (see Appendix 2.1 Fig. 5, 6). The Central Bank of Russia defended the currency by reducing its foreign-exchange reserves. At the same time, non-resident holders of short-term government bills (GKOs) signed forward contracts with the CBR to exchange roubles for foreign currency, which enabled them to hedge exchange rate risk in the interim period (these forward contracts were called NDFs - non-delivery forwards ).<sup>93</sup> Also, a substantial amount of

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<sup>91</sup> Chapman A, Mulini M. (2001), "Explaining Russia's currency and financial crisis", Kluwer Academic Publishers, 11, pp. 11.

<sup>92</sup> Desai P., (2000) " Why did the ruble collapse in August 1998?", *American Economic Review*, vol. 90, no. 2 pp.49.

<sup>93</sup> Małecki W., Sławiński A., Piasecki R., Żuławska U. (2001), "Kryzysy walutowe", Wydawnictwo Naukowe PWN, pp. 137-153.

the liabilities of large Russian commercial banks were off the balance sheets, consisting mostly of forward contracts signed with foreign investors.<sup>94</sup>

After the East Asian crises the oil prices reduced over 40 percent in the first six months of 1998, compared to average prices in 1997. An accompanying fall in nonferrous metal prices meant that Russia's oil industry ceased being profitable as oil prices were lower than extraction costs and transportation, given the exchange rates at the time.<sup>95</sup> So, this external shock hurt the Russian economy, especially the balance of trade and Russia's ability to generate tax revenue.<sup>96</sup>

At the beginning of 1998, the Russian situation began to deteriorate due to increasing uncertainty as investors turned their attention towards the Russian default risk. Even when the government promised to pay back in dollars, it faced high interest rates (yields on dollar-denominated debt issued by the Russian government rose from slightly over 10 percent to almost 50 percent, 45 percentage points higher than interest rate the U.S government had to pay on its Treasury bills at the time) in the market though there was a high probability of default. In this situation, the Russian government wanted to promote a stable investment environment and submitted a new tax code to the Duma, with fewer and more efficient taxes, in February 1998. The new tax code was approved in 1998, yet some crucial parts that were intended to increase federal revenue were ignored. In addition, Russian officials sought IMF funding but agreement could not be reached. This was the case even though the interest rate was lower than it might otherwise have been, because many investors believed that Russia was too politically important to fail. A part of this situation involved the investment banks making loans to Russia, and they whispered about how big the IMF bailout would have to be.<sup>97</sup>

By mid-May 1998, it was clear that the government would not be able to fix the situation on its own and that only an IMF loan might succeed in restoring confidence. On 27 May 1998, the demand for bonds had plummeted so much that yields were less than 50 percent so that the government failed to sell enough bonds at its weekly auction to refinance

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<sup>94</sup> Małecki W., Sławiński A., Piasecki R., Żuławska U. (2001), "Kryzysy walutowe", Wydawnictwo Naukowe PWN, pp137-153, P. Desai, (2000) "Why did the ruble collapse in August 1998?", *American Economic Review*, vol. 90, no.2 pp. 49, Abbigail J., Chiodo and Michael T. Owyang, "A case study of a currency crisis: the Russian Default of 1998", The Federal Reserve Bank of Louis 2002 pp. 12.

<sup>95</sup> Stiglitz J.E., "Globalisation and its discontents", Penguin books, 2002, pp. 145.

<sup>96</sup> Desai P., (2000), "Why did the ruble collapse in August 1998?", *American Economic Review*, vol. 90, no.2, pp. 49-52.

<sup>97</sup> Abbigail J. Chiodo and Michael T. Owyang, "A case study of a currency crisis: the Russian Default of 1998", The Federal Reserve Bank of Louise 2002 pp. 12-14, J. E. Stiglitz "Globalisation and its discontents", Penguin Books, 2002, pp. 146 -147.

the to refinance the payment of the ensuing debt. (see Appendix 2.2 Fig. 2.). The government formed an anti-crisis plan, requested assistance from the West, and began bankruptcy proceedings against three companies with large debts from non-payment of back taxes. The spreading expectation of impending devaluation made the exchange rate for six-month forward contracts rise with respect to the nominal rate by as much as 24 percent in June. From the end of May, the interest rate differentials between outstanding GKO and currency-denominated bonds widened sharply and reached some 85 percentage points in late June. Domestic agents consistently shifted to goods that traditionally represented a shelter in times of troubled foreign currency. From mid-May 1998 on, money flows from the government securities markets to the foreign exchange market caused the rouble to come under attack.<sup>98</sup>

By June of 1998, it was clear Russia would need outside assistance to maintain its exchange rate. Because of this fear of holding roubles, and the lack of confidence in the government's ability to repay its debt, by June 1998, the government had to pay an interest rate of almost 60 percent on its rouble loans (GKOs).<sup>99</sup> (see Appendix 2.2 -Figure 2, Appendix 2.1- Fig. 5,6 ). In the light of this, the CBR increased the lending rate again in June 1998, however, it could not stop the flight of non-residents from government GKOs. At the same time, the CBR lost its reserves to defend the exchange rate peg. In spite of all of the government's efforts, it was common knowledge that loans from foreign investors to Russian corporations and banks were due by the end of September.<sup>100</sup>

By mid-June, it was becoming increasingly clear that the storm would hit (see Appendix 2.2 Fig. 5,6). Speculators could see how much in the way of reserves was left, and as reserves dwindled, betting on devaluation became increasingly a one-way bet. They risked almost nothing betting on the rouble's crash. As expected, the IMF came to the rescue with \$4.8 billion in July 1998, and a GKO swap.<sup>101</sup> The World Bank was also called upon to lend \$ 1.5 bn. for structural reforms because the reformers and their advisers in the IMF feared devaluation, believing that it would set off another round of hyperinflation. However, the effects of this rescue package disappeared during the following two weeks.<sup>102</sup> After losing so much liquidity, the IMF assistance did not provide much relief. The Duma rejected parts of the IMF-endorsed anti-crisis program, which eliminated the additional revenues to budget. On

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<sup>98</sup> Chapman A., Mulini M. (2001), "Explaining Russia's currency and financial crisis", Kluwer Academic Publishers, 11, pp.23, Central Bank of the Russian Federation (1998), *Annual Report*, pp.61.

<sup>99</sup> Stiglitz J.E. , "Globalization and its discontents", Penguin Books, 2002, pp. 146.

<sup>100</sup> Abbigail J. Chiodo and Michael T. Owyang, "A case study of a currency crisis: the Russian Default of 1998", The Federal Reserve Bank of Louis 2002 pp. 13.

<sup>101</sup> Stiglitz J.E. , "Globalisation and its discontents", Penguin Books, 2002, pp. 147.

<sup>102</sup> Stiglitz J.E., "Globalisation and its discontents", Penguin Books, 2002, pp. 146.

August 17, the government floated the exchange rate, devalued the rouble (see Appendix 2.2 Fig. 3.), defaulted on its domestic debt, halted payment on rouble-denominated debt (primarily GKO), and declared a 90-day moratorium on payment by commercial banks to foreign creditors. The terms of the GKO restructuring were announced only one week later. Initially, Russia offered to restructure non-residents' frozen GKO into 17 year dollar-denominated Eurobonds. The IMF tried to insist on an equal approach to resident and non-resident holders of GKO, but the new Russian government decided to offer different restructuring schemes (reverse of capital account liberalization reforms).<sup>103</sup> Additionally, the Russian crisis caused a big turmoil in other countries of the former USSR and other developed countries (e.g. Brazil crisis).<sup>104</sup>

The evidence above suggests that the Russian episode is a typical bad macroeconomic fundamental crisis ("first generation model of currency crisis") - which can be easily predicted, where the capital account liberalization process can accelerate the currency crisis collapse. Krugman's (1999), Wyplosz, Nadezhda Ivanova (2000) and Süppel (2002) supported this explanation of Russian crisis. However, Chapman and Mulino (2001) said that the Russian episode lies between the "first generation model" and the "twin crises" models. In contrast T. D. Buchs (1999) and P. Desai (2000) say that the Russian financial disaster is a typical example of a crisis contagion, although the underlying vulnerability of the economy was a problem in terms of its fiscal deficit or the vulnerability of the banking system was something no investor could ignore. A similar view is shared by J. Stiglitz (2002), but he emphasised that the Russian crisis was a result of an overvalued exchange rate which was in turn the result of IMF stabilisation program and contagion from the East Asian crisis. He maintains, however, that the sharp decline in oil prices on which the Russian government revenue depended heavily was also responsible. The most interesting explanation of Russian crisis is given by E. Gurvich and A. Andryakov (2002). They pointed out the "hostage effect"<sup>105</sup> in the Russian case. In their model they found that the more reserve the government has, the stronger the adverse effect of the crisis is. This effect incorporates the problem of coronation, as do most second-generation models. Last but not least, Abbigail J. Chiodo and

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<sup>103</sup> Ivanova N. and Wyplosz C. (2000), "Who lost Russia in 1998", Graduate Institute of International Studies Working Paper, presented at the conference "Money Doctors", Paris, December 14-16 pp. 35.

<sup>104</sup> Dąbrowski M. (2001) "The Episodes of Currency Crises in the European Transition Economies" CASE Reports no. 40 pp. 30-78.

<sup>105</sup> This effect may appear in situations where a few large players dominate the capital market and the government is lacking liquidity to withstand temporary deterioration of the external environment or a speculative attack: the key point of fighting the crisis hazard with the private sector. But as the government forces investors to bail out government assets, the effect under consideration may be important only in the most severe crisis cases.

Michael T. Owyang (2002) emphasised that different aspects of all models of the currency crisis could be found in the Russian currency crisis but they strongly pointed out that the lack of preconditions of CAL and speculation after Asian crisis was the main reason of this crisis.

### **The Latvian banking crisis (1995) and the Polish experience (1998-1999)**

In contradiction of Russia, both non-currency crisis countries are strongly involved in the process of European integration. In 2004, both countries liberalized their capital flows fully with other members of EU. However, as I have discussed, these countries are related to two different groups in terms of the speed of capital account liberalization: “rapid liberalizers” and “cautious liberalizers”. The Baltic countries and the Czech Republic liberalized their capital accounts relatively quickly, and most transactions were already unrestricted by 1995.<sup>106</sup> In contrast, Poland like Hungary, the Slovak Republic and Slovenia, started so-called “cautious liberalization” and achieved full liberalization in 2001-2004. Both countries displayed some similar patterns – an important feature of the liberalization process that the countries tended to liberalize inflows before outflows.<sup>107</sup> Moreover, both countries had similar problems such as high unemployment rates and government spending (see Appendix 2.3 Fig. 4,7), which could create the self-fulfilling expectation of investors (second generation models-see Chapter 1.2.2, 1.3).

### **The Latvian case**

Latvian independence from the Soviet Union in 1991 started with the dismantling of all the capital controls that existed in the former Soviet Union and reorientation of external trade.<sup>108</sup> Sooner or later, this new policy caused a deterioration of economic performances (e.g. decrease of industrial output and unemployment increase). The Latvian authorities chose the path of total liberalization of capital account liberalization and domestic markets. In November 1991, they enacted the first liberal foreign investment laws in order to establish a legal framework for attracting foreign direct and portfolio investment. Then, in 1992 the National Central Bank was established by introducing the Latvian ruble (Lats) initially as a

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<sup>106</sup> Arvai (2005) “Capital Account Liberalization, Capital Flow Patterns, and Policy Responses in the EU’s New Member States” IMF Working Paper pp.3.

<sup>107</sup> Buitier, Taci (2003) “Capital Account Liberalization and Financial Sector Development in Transition Countries” in Capital Liberalization in Transition Countries: Lessons from the Past and for the Future, ed A. Bakker and B. Chapple (Cheltenham, England, and Northampton, Massachusetts: Edward Elgar) pp. 131.

<sup>108</sup> IMF (2005) “The IMF’s Approach to Capital Account Liberalization”, Evaluation Report pp. 65.

supplement to the Russia ruble<sup>109</sup> and preceded domestic financial liberalization. Latvia also became a member of the IMF. By the end of 1995 Latvia had removed most restrictions on FDI, credit, and portfolio flow but it retained some restrictions on real estate investments and pension fund investments for follow years.<sup>110</sup> However, before EU accession in 2004, Latvia had completed all transitional arrangements for the acquisition of agriculture and forestry land.<sup>111</sup> The IMF did not play a formal role in Latvia's decision about capital account liberalization but it supported the authorities' market-oriented reforms through finance and trade regulation ( see Appendix 2.1 Table 9.). Nevertheless, there was disagreement between the IMF staff and the Latvian authorities on the use of exchange rate policy to deal with capital inflows. When Latvia received large capital inflow, the staff's consistent view was to encourage greater exchange rate flexibility. On the other hand, the national authorities took the view that nominal exchange rate stability is critical to price stability in the small and open Latvian economy and insisted on maintaining the peg to the SDR, which they had introduced in early 1994 (see Appendix 2.3 Fig. 1.).<sup>112</sup> Latvia experienced a major banking crisis in the first half of 1995, which involved the bankruptcy of eleven prominent banks, including Bank Baltja (the largest one).<sup>113</sup> The banking crisis involved the loss of about 40 percent of the banking system's assets and liabilities and the interest rate dropped (see Appendix 2.3 Fig. 3.). This was in fact the culmination of a banking crisis that had been preceded by a dramatic expansion of the banking sector which had occurred in the previous three years.<sup>114</sup> However, the first problems started appearing in 1994 when the licenses of several commercial banks were suspended.<sup>115</sup> This was followed by a situation in which there was a failure to submit the audited reports due from several banks in March 1995. This led to a major crisis in the banking sector. At the same time, Latvia economy were suspected to speculation attacks against the domestic currency (see Appendix 2.1 Fig. 1,2, 7,8). In May 1995, the government announced the taking over of the largest bank which caused the capital flight by the drop of 10 percent of total foreign exchange reserves and downward pressure on the exchange rate. Through decisive intervention in the banking sector and demonstrated commitment to the

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<sup>109</sup> The formal introduction of the national currency was in March 1993.

<sup>110</sup> Hallagan (1997) "Speed and sequencing of market reforms: The case of banking in Latvia" *Contemporary Economic Policy*, Vol. 15, Is. 2, pp. 26.

<sup>111</sup> Arvai (2005) "Capital Account Liberalization, Capital Flow Patterns, and Policy Responses in the EU's New Member States" IMF Working Paper pp.10.

<sup>112</sup> IMF (2005) "The IMF's Approach to Capital Account Liberalization", Evaluation Report pp. 65.

<sup>113</sup> Bank Baltja accounted for 23 percent of all deposits in Lithuania. Hallagan (1997) p. 25.

<sup>114</sup> Sixty-seven banks were granted a license (in 1991, 14 banks; in 1992, 36 banks; in 1993, 16 banks; in 1994, 1 bank).

<sup>115</sup> Bank of Latvia (1997) "Origins of the Banking Crisis ", Annual Report p. 2, Fleming, Talley (1996) "The Latvian Banking Crisis: Lessons learned" Working Bank Policy Research Working Paper no. 1590 p. 12.

fixed exchange rate policy, the economy avoided the transformation of a banking crisis into a currency crisis (see Appendix 2.3 Fig. 1.).<sup>116</sup>

A number of economists were of the opinion that the banking crisis had little connection with capital account liberalization and was generally the result of a weak regulatory system (bank supervision) and corruption (rent-seeking activities of managements).<sup>117</sup> Nevertheless, the liberalization of capital flows allowed for speculation attacks against the currency by the international players and increase the risk of currency collapse in 1996 (see Appendix 2.1 Fig. 1,2).

However, since the crisis banking in 1996, Latvia has not had any currency or banking crisis since 1996. There was strong pressure on exchange rate after severe crisis in the financial system of neighbouring Russia in 1998 and Asia in 1997 (see Appendix 2.1 Fig. 1,2). But Latvia followed the capital account liberalization path.

### **The Polish case**

Poland adopted a gradual schedule of capital account liberalization (member of the IMF in 1995, a member of the OECD in 1996 and of the EU in 2004) which essentially went up in line with gradual macroeconomic development and monetary/exchange rate policies.<sup>118</sup> This strategy of capital account liberalization might be used to demonstrate a preference for long-term flows against short-term flows, and liberalizing inflows before outflows. (Appendix 2.3 Table 1.). In the 1990s in particular, high external debt, trade deficit and very high inflation caused the authorities to proceed very cautiously in removing capital restrictions, mainly in order to decrease the vulnerability to external shocks (e.g. speculative attacks).<sup>119</sup> Some experts suggest that this attitude to liberalization of capital regulation helped the Polish economy to avoid currency and financial crises, event in the face of currency crises in neighboring countries<sup>120</sup> or the international economic crash (e.g. Asian crisis).<sup>121</sup> It is clear

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<sup>116</sup> IMF (2005) "The IMF's Approach to Capital Account Liberalization", Evaluation Report pp. 65.

<sup>117</sup> Fleming, Talley (1996) "The Latvian Banking Crisis: Lessons learned" Working Bank Policy Research Working Paper no. 1590 pp.11-12, Bank of Latvia (1997) "Origins of the Banking Crisis", Annual Report pp. 5.

<sup>118</sup> At the beginning of the transformation, Poland had a fixed exchange rate. In May 1991 Poland introduced the crawling peg regime. In 1994 and 1995 the band of acceptable exchange rate fluctuations was widened. Then in 1998 the National Bank of Poland (NB) began to move into full-blown exchange rate regime reform. In April 2000 the float exchange regime was fully adopted. World Bank (2002). In 2012 Poland should introduce the Euro.

<sup>119</sup> Arvai (2005) "Capital Account Liberalization, Capital Flow Patterns, and Policy Responses in the EU's New Member States" IMF Working Paper pp.8.

<sup>120</sup> Hungary (1994), Czechy (1997), Russia (1998), Ukraine (1998-1999).

that these incidents had an impact on the Polish economy due to the degree of cointegration of the Polish financial market with foreign markets (Linne, (1999), Orłowski, (1999)). For instance, the empirical evidence showed that the Russian and Asian crises had a significant impact on the financial indicators and volatility of the exchange rate ( see Appendix 2.1 Fig. 3,4,7,8, see Appendix 2.3 Fig. 5, 6)(Orłowski, (1999), Ryczynski, (1999) and Morales, (2000)), however, it did not cause the collapse of the Polish currency. Nevertheless, there was an intervention of the National Central Bank on exchange rate market in February 1998 in order to reduce the exchange rate risk.<sup>122</sup>

In a summary of all three case studies, it might be stated that all these experiences show the important role of the sequence of the capital account liberalization process and cointegration with its macroeconomic stability programs and the successful legal frameworks of financial institutions. The Russian and Latvian crises serve as typical models of what happens when the rapid capital account liberalization process can accelerate the crisis. But Poland is the example of good coordination between capital control regulation and macroeconomic policy.<sup>123</sup>

However, the single –country analysis has the limitations that only presents the one-country perspective (empirical bias) and does not consider variation of information across countries. I will now go on to present different cross-country studies which try to predict the currency crisis and link this crisis with CAL process.

## **2.2. Empirical literature - multi-country studies**

The multi-country empirical analyses of capital account liberalization and currency crises might be considered in perspectives. Not many analyses of the direct link between these two effects have been carried out. The existing empirical studies can be separated into two main groups: the currency crisis empirical model, and some two-dimensional studies (CAL-Currency Crises). The first group of currency crisis empirical studies will illustrate the way in which different researchers have tried to estimate and predict the currency crisis phenomenon. However, these researchers do not consider the CAL process as the direct indicators of

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<sup>121</sup> Sadowska-Cieslak (2003) “Capital Account Liberalization in Poland” in *Capital Liberalization in Transition Countries: Lessons from the Past and for the Future*, ed. Bakker and Chapple, (Cheltenham, England and Northampton, Massachusetts: Edward Elgar) pp. 225-243.

<sup>122</sup> Gruszczynski “Kryzysy walutowe a Liberalizacja obrotów walutowych” Wydawnictwo Naukowe PWN 2002 pp.143.

<sup>123</sup> Sadowska-Cieslak (2003) “Capital Account Liberalization in Poland” in *Capital Liberalization in Transition Countries: Lessons from the Past and for the Future*, ed. Bakker and Chapple, (Cheltenham, England and Northampton, Massachusetts: Edward Elgar) pp. 225-243.

currency crisis episodes. The second group of studies will show the technique used to link these two aspects empirically. Mainly these groups of analysis apply the indicators from the currency crisis empirical model. And it is the reason why I decided to describe the first groups of currency crisis empirical models.

The first group of currency crisis empirical model has adopted a variety of econometric techniques (parametric or non-parametric methods). Parametric techniques include probit and VAR models. Non-parametric techniques are mostly confined to the leading–indicator methodology (the early warning system).<sup>124</sup> Most of the multi-country early warning system empirical studies aim to predict the currency crisis non-parametric tests based on the observation of the behaviour of the individual series for the periods prior to the crisis and tranquillity time. These analyses use either a cross-section of countries or a panel-data structure to detect the indicators of the currency crisis. A number of studies along these lines have been carried out, several of them in the 1990’s (Frankel and Rose (1996), Eichengreen, Wyplosz, Rose (1997), Kaminski, Lizondo, Reinhart (1997), Esquivel, Larrain (1998), G. L. Kaminsky, C. M. Reinhart (1999), Ahluwalia (2000), Berg, Borensztein, Pattilo (2000)

In order to shed some light on this line of studies, I will focus on the four approaches of indicators of the currency crisis: the signals approach (Kaminsky, Lizondo, Reihart, 1997), the signal approach in the case of contagion episodes (Ahluwalia, 2000), the modifying signal approach with consideration of the Argentinean Crisis in 2001 (sovereign default models Eaton, Gersovitz, 1981) and lastly the DCSD EWS model (Berg, Borensztein, Pattilo, 2000)<sup>125</sup> ( see Table 2.). In addition I will mention Berg and others’ (2005) description of the private currency crisis prediction models.<sup>126</sup>

The signal approach was expanded by Kaminsky and Reinhart (1996) and Sachs, Tornell and Velasco (1995). There was policy initiatives to monitor indicators of external vulnerability that might be traced to the Mexican peso crisis of December 1994. However, a decisive effort to use a systematic quantitative early warning system to predict the currency crises was formulated by Kaminsky, Lizondo, and Reinhart (1997). The key idea of the signals approach is that the economy behaves differently during crisis and tranquil periods.

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<sup>124</sup> The first papers which tried to developed the indicators of currency crises in this line are: Bilson (1979), Blanco, Garber (1986), Cumby and Van Wijenberg (1989). These papers mainly focus on the investigation of the first generation models (eg. Krugman 1978). The first wide approach was proposed by Edwards (1989) – 10 different variables and then Kaminsky and Reinhart (1996) - 12 variables.

<sup>125</sup> DCSD EWS models – Developing County Studies Division of the IMF -Early Warning System models.

<sup>126</sup> Peltonem’s (2006) paper is also interesting. This study analyzes the predictability of emerging market currency crises by comparing the often-used probit model using a new method, namely a multi-layer perception artificial neural network (ANN) model.

This approach involves monitoring the evolution of a number of economic variables, the so-called “leading indicators” to find out if the variables are behaving in an anomalous way.<sup>127</sup> This strange behaviour of variables might give the “signalling” of a future crisis. In order to be scrupulously precise, when the behaviour of variables indicates a future crisis, the researchers specify a threshold. The threshold values are calculated by taking into account two kinds of risks: one is setting the threshold high and missing the crisis and the second is setting the threshold too low and triggering a false signal.<sup>128</sup> If the value of the variable is beyond this threshold within the following 24 months, it is the warning “signal” of a future crisis.

Ahluwalia’s(2000) indicators based on the crisis signal method Kaminsky, Lizondo, Reinhart(1997). Nevertheless, researchers have measured the contagion effect of the crisis phenomena with the intention of creating an index of exchange rate pressure (crisis measure) which is regressed on seven signal economic variables (Kaminsky, Lizondo, Reinhart 1997) and an additional three contagion indicator variables, which try to measure the effect of discriminating contagion effects (Table 2.). The first index records the number of countries in crisis with at least one signal economic variable in common with the country for which the observation was being taken. The second index considers signals from location and fundamentals. Hence, the index is of dummy variables which takes the value 1 if the country experienced a crisis during a contagious episode, and zero otherwise. The logic of the last indicator is connected with the investor’s perspective. The investors are aware of the weakness in a country based on its currency crisis, so that they look for similarities between that country and other countries, to decide which country might be vulnerable. In this paper, the author looked at three incidences: the Mexican crisis of 1994, the Thailand crisis of 1997

<sup>127</sup> Saxena (1999) “Currency Crises and Capital Controls: A Selective Survey” University of Washington pp.17.

<sup>128</sup> The researchers wanted to build indicators that would only produce two kinds of observations: signal and crisis or non-signal and non-crisis. Hence, the choice of threshold determination involves striking a balance between two types of errors. The first type is that there is signal and there is no crisis (Type I Accepting  $H_o$  when  $H_o$  is false) and the second error is that there is no signal and there is a crisis. (Type II Rejecting  $H_o$  when  $H_o$  is true). In these models, the sizes of the errors are measured by  $\alpha$  and  $\beta$ . If  $\alpha$  is equal 0 (the threshold is too lax), then the indicator will indicate all the crises, but will present false signals. If  $\beta$  is equal to 0 (the threshold is too tight), the indicator will never issue a false signal, but it will indicate all the crises. In this case, the critical region for each variables needs to be selected in order to minimize the noise-to-signal ratio (false-signal-ratio):  $\frac{\beta}{1 - \alpha}$  where  $(1 - \alpha) = \frac{\text{number of months with good signals}}{\text{number of months in the crisis window}}$  and

$\beta = \frac{\text{number of months with bad signals}}{\text{number of months in the crisis window}}$  A good signal is issued the signals inside the crisis 24

months window and bad signal is issued the signals outside the crisis window. Saxena, S. (1999) “Currency Crises and Capital Controls: A Selective Survey” University of Washington pp.18.

and the Russian crisis of 1998, and then tried to find countries that had signals in with these countries.<sup>129</sup>

Compared to earlier papers, Kaminsky (1998, 2003) focuses more on other explanations of the currency crisis phenomena. For instance, Kaminsky (1998) added to the analysis through considering the variables predicting a banking crisis and phenomena of “twin crisis”.

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<sup>129</sup> Ahluwalia (2000) “Discriminating Contagion: An Alternative Explanation of Contagious Currency Crises in Emerging Markets” IMF Working Paper WP/00/14, pp. 9-10.

Table 2. EWS models

Specification of EWS models	Signal approach Kaminsky, Lizondo, Reinhart(1997)-KLAR(1997)	Signal approach –contagion episodes Ahluwalia (2000)	Kaminsky (1998)	Kaminsky (2003)	DCSD EWS model Berg, Borensztein Pattillo (2001)
Horizon	2 years	1 year	2 years	2 years	2 years
Method	Weighted average of indicators. Variables measured as 0/1 indicators according to threshold chosen to minimize noise	Cross-sectional , OLS estimation	Procedure KLR (1997)-weighted average of indicators. Variables measured as 0/1 indicators according to threshold chosen to minimize noise-signal- ratio-signal- ratio-multiple – known as regime signal approach	Ex-ante unknown non-linearity approach: Regression tree analysis (Breiman 1984, Durlauf, Johnson 1995) and regime signal approach (Kaminsky 1998)	Probit regression with variable s measured in country–specific percentile terms
Variables	Real exchange rate, Exports growth Stock prices, Current account M2/ international reserves, Output Excess M1 balances, International reserves, M2 Multiplier, Domestic credit/GDP, Real interest differential, Imports, Bank deposits Lending rate/deposit rate, Terms of trade	The analysis based on the signals approaches measures KLR (1997) such as: Real exchange rate, Exports growth , M2/international reserves, Stock prices, Domestic credit /GDP Short-term debt/ reserves, Current account deficit/GDP. In addition, the analysis includes three contagion indicators: regional contagion index, “wake-up call” index, and similarity of KLR signals	Used results KLR (1997) for currency crisis and new indicators to predict banking crisis by investigating : domestic and external financial liberalization, world real interest rate, foreign debt, capital flights and short-term foreign debt	Fiscal deficit/GDP, excess M1 real balances, Current account, exports, imports, real exchange rate, terms of trade, output, real interest rates, domestic credit/GDP ratio, M2/reserves, deposits, M2 multiplier, stock prices, an index of banking crises, foreign debt/exports, short-term debt/foreign exchange reserves, the world real interest rate and foreign exchange reserves of central banks	Real exchange rate Current account Reserve losses Export growth ST debt/reserves

Source: Ahluwalia (2000), Kaminsky, Lizondo and Reinhart (1997), Kaminsky (1998), Kaminsky (2003), Berg, Borensztein, Pattillo (2000, 2005).

Although this theory does not provide an unambiguous answer to the question of what causes the correlation between banking and currency crises, Kaminsky (1998) decided to use three main proxies: domestic and external financial liberalization, world real interest rate, foreign debt, capital flights and short-term foreign debt (see Table 2). In contrast, Kaminsky (2003) has added new indicators to provide other explanations for the currency crisis such as the sudden stop effect, or sovereign defaults effects- conclusions from the Argentina crisis in 2001. (see Table 3.). All variables were divided according to the theoretical model explanations.

Table 3. Currency Crisis Indicators according to Kaminsky (2003)

<b>Models</b>	<b>Indicators</b>
First Generation	Fiscal Deficit/GDP Excess Real M1 Balances
Second Generation	Exports Imports Real Exchange Rate Terms of Trade Output Domestic Real Interest Rate
Third Generation	Domestic Credit/GDP M2/Reserves M2 Multiplier Deposits Stock Prices Banking Crisis
Sovereign debt	Debt .Exports Short-term Debt/Reserves
Sudden Stops	World Real Interest Rate Foreign Exchange Reserves

Source: Kaminsky G. L. (2003) “Varieties of currency crises” NBER Working Paper Series, pp.26.

Lastly, Eduardo, Borensztein and Pattillo (2005) suggest the interesting comparison between EWS models (KLR model and DCSD model) and the private models which are based on indicators such as bond spreads, agency rating and risk scores analysis (Goldman Sachs’ GS-WATCH, Credit Suisse First Boston’s Emerging Markets Risk Indicator, and the Deutsche Bank Alarm Clock). All private models consider the short-term horizon observation between 1-3 months; the researchers used the similar methodology such as logit regression. Moreover, these models included so-called “business variables” such as global liquidity, financing requirement or political event.

Along the lines of early warning system studies, there are some interesting studies which try using an indirect way to calculate the impact of CAL on a currency crisis. Some of the empirical studies consider that the CAL process as a device for increase external vulnerability is rooted of external crises but not direct indicators of crisis. CAL variables is correlated with some of negative effect like moral hazard, sudden stop effect etc.<sup>130</sup>

Most of them try to analyse the impact of CAL on the “indicator” of currency crisis (in particular they want to evaluate some aspects of third generation models and sudden stop effects). The main leaders of these types of analyses are Jonhston and Ryan (1994), Quirk (1994), Kaminsky and Reinhart (1999), Kauffman (2000), Martin and Rey (2002) and Tudela (2004). For instance, Tudela has investigated the theoretical hypothesis that the capital account liberalization process might increase the number of investors and the existence of the risk of a moral hazard.<sup>131</sup> In this paper he puts forward a duration model for OECD countries during the 1970-1997 periods by using semi-parametric methods to estimate a model with unrestricted base-line hazards.<sup>132</sup> In contrast to Tudel’s (2004) study, Martin and Rey (2002) scrutinized the role of factors of self-fulfilling expectations such as credit constraints and over-borrowing syndrome for different groups of countries (developing or developed). According to his results, there is quite strong evidence of a negative relation between liberalization and financial crises for developing countries. Jonhston and Ryan (1994), Quirk (1994) and Gruszczynski (2001)<sup>133</sup> concentrate on the aspect variables connected with the first generation models such as domestic credit, balance of payments or level of foreign reserves. Quirk’s (1994) research produced quite different results for developing countries to Martin and Rey’s analysis (2002). Kaminsky and Reinhart’s (1999) analysis investigated the hypothesis that CAL increases the risk of banking crisis and then though the banking channel causes the macroeconomic instability and a currency crisis.<sup>134</sup> Kaminsky and Reinhart used a

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<sup>130</sup> Edison and Reihart (2001 a) “Stop Hot Money” *Journal of Development Economics* 66 (2), pp. 535, Edwards (1999) “On Crisis Prevention: Lessons from Mexico and East Asia” NBER Working Paper no. 7233, Cambridge, MA pp. 10.

<sup>131</sup> Gruszczynski (2001) pp.100-110, Singh (2005) pp. 11-16.

<sup>132</sup> The use of duration models allows us to account for duration dependence among the determinants of the likelihood of speculative attacks. They found that the length of time already spent on the peg is a determinant of the probability of exit into a currency crisis state.

<sup>133</sup> Gruszczynski’s analysis (2001) followed Quirk’s paper (1994). In the case of developed countries, Gruszczynski paper shows a similar results to the previous analysis. However, in the case of developing countries Gruszczynski suggests to be more cautions about developing the main conclusion.

<sup>134</sup> This hypothesis is supported by Furman and Stiglitz (1999) and Stiglitz (2000) and states that liberalization might cause an increase in competition among banks or financial institutions and then lead to the instability of the banking system through the irrational behaviour of market players. Klein and Olivei’s (1999) results, however, suggested that open of capital account over some part of the periods had a significant greater

sample of twenty countries, of which fourteen were developing ones, and covered the period between 1970 and 1995. They found that there has been a sharp increase in both types of crises since 1980. The average number of banking crises per year in their sample rose from 0.3 during 1970-1979 to 1.4 in 1980-1995. Moreover, they established that banking crises and currency crises are closely related and that banking crises are often preceded by financial liberalization. Demirguc-Kunt, Detriagiache (1998), Eihengreen and Rose (1999)<sup>135</sup>, Calvo and Reinhart (2000) and Licchenta (2006) following Kaminsky and Reinhart's line found strong empirical evidence in support of the existence of a positive statistically significant relationship between CAL and the occurrence of a banking or currency crisis. Last, Prasad et al (2003), Easterly et al. (2001) and Ramey and Ramey (1995) looked into capital account regulation, volatility of external capital flows (the episodes of sudden stop incidents) and macroeconomic stability. Easterly et al (2001) employed data for the period 1960 until 1997 for a sample of 74 countries. They gave support to the idea that financial variables play a crucial role in explaining both GDP and the likelihood of economic downturn. However, they suggested that financial openness and the volatility of capital flows do not have a significant impact on macroeconomic volatility and therefore on currency crisis incidents.<sup>136</sup> A further significant study, that of Prasad et al (2003), investigated the link between capital account liberalization and income/consumption volatility. They divided countries into three groups: industrial countries, more financially integrated economies of developing countries, less financially integrated developing countries. The evidence of their research suggests that capital account liberalization aided the improvement of macroeconomic stability in the case of income for all country groups but only for more financial economies consumption volatility has increased.

Another line of studies is concentrated directly on the investigation of the correlation between capital account liberalization and currency crisis episodes. The recent experience of the Argentinean crisis (2001-2002) and the Asian crisis provided almost laboratory experiments for testing the role of CAL in causing economic and currency crashes. Williamson and Drabek (1998) suggest that the only countries without capital account liberalization reforms did not have economic crises. On the other hand, Bartolini, Drazen

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increase in financial depth than period of closeness of capital flows. The more developed financial market should cause the improvement of financial stability.

<sup>135</sup>Eihengreen and Rose (1999) found that there was a highly significant correlation between changes in industrial country interest rates and banking crises in emerging markets. Moreover, they point out the important role of external conditions like global business cycles or OECD growth in heightening the vulnerability of emerging markets to banking conditions.

<sup>136</sup>Licchenta (2006) "Macroeconomic effects of capital account liberalization in emerging markets" University degli Studi di Roma pp. 9.

(1997) provide evidence to suggest that capital controls might not be effective and might increase the likelihood of a currency crisis. Similar results were found by Glick and Hutchison (2000), and Glick, Guo and Hutchison (2004): that capital control correlated positively with the occurrence of currency crises. Moreover, they suggested that new capital restriction can be regarded as signal of inconsistently implemented government policies that render a country more vulnerable to currency crises.

Finally, it is difficult to find the best way to investigate the link between CAL and currency crisis episodes. As I have discussed, there are many methods to predict the currency crisis episodes by using the multi-country data. However, there can be recognized the limitations of the multi-country analyses due to attempt to exploit the higher variability associated with cross-country information. It makes that evidence from multi-country studies are mixed and far away from unambiguous conclusion. On the hand, the empirical evidence from single-country studies might have obtained a clearer picture. The negative correlation between CAL and currency crisis episodes is suggested by the information from three cases from CEE country. Furthermore, these country cases shown that the speed and sequence of the CAL process needs to be adequate for the country development. If this economic-political stability conditions do not apply, the CAL process might increase the probability of a currency crisis (Latvian and Russian cases).

## CHAPTER III

### The cross-country empirical model

In this chapter I will investigate a cross-country analysis for CEE countries over period 1995-2005. This analysis will examine two methods to investigate the link between the currency crisis incidences and CAL episodes. The first method will calculate two kinds of frequency of currency crisis / CAL episodes for different countries or periods. The second method will use the cross-country-time panel probit methodology. These methods are adaptation of Glick, Gou and Hutchison's approach (2004).

#### 3.1. Motivation for the cross-country analysis

The evidence from the case studies and empirical models suggests that there may be a causal link between the currency crisis and CAL (see Chapter 2.1, 2.2). However, the case studies from CEE's countries did not give the unambiguous answer. It may be that the simple negative correlation between these two effects exists of CAL and currency crisis (Russian case) but on the other hand, two examples shown opposite view on this economic problem (Polish and Latvian cases). This may justify the implementation of the cross-country model which could lead to a better understanding of present the causal relationship between CAL and currency crisis episodes. Two questions arise in the context of cross-country analysis: first, what empirical model should be used from among of stocks of empirical analysis and the second, what sample of countries and period should be estimated.

I decided to employ Glick, Gua and Hutchison's (2004) approach to test the relation between CAL and Currency Crisis phenomena with some modification, mainly due to the problem of obtaining data and the fact that there are different areas of regional interests. Glick, Gua and Hutchison's (2004) model is an interesting approach because they tried to connect two different approaches: the leading-indicator methodology and analysis of the correlation between CAL and the political-economic environment. This model is particularly concerned with the fact that the policy choice to establish an environment with a liberalized capital account is correlated with macroeconomic, financial and institutional policy variables that sequentially decrease the probability of a currency crisis. A country with macroeconomic imbalances, financial weakness, political instability or institutional problems may choose to retain capital control in order to avoid difficulties connected with economic regulations and

therefore risk triggering a crisis (sample selection bias). Glick, Gua and Hutchison (2004) solved the selection problem by using matching and propensity score methods.

In contrast with Glick, Gua and Hutchison (2004), I investigated the different size and variety of country samples and period. Glick, Gua and Hutchison analyzed 69 developing countries (from different continents) over the period 1975-1997. The model I have developed, however, focuses only on the group of 12 countries from the former Soviet Bloc (transition countries), specifically Central and Eastern Europe (CEE) over the last 10 years.<sup>137</sup> However, two countries (Hungary and Romania) appeared in both models. There were three criteria of country selection in my cross-country studies: The first condition was the process of integration with the international capital market measured by participation in the OECD, IMF and UE (see Table 3). In the case of the EU integration process, the countries can be separated into three groups: members of the EU/EMU, accession candidatures to the EU (Ukraine) and those countries which were not interested in accession to the EU/EMU (Russia.). The criterion of membership of an international organization is a good way of evaluating the degree of capital control regulation. This is because before accession the country is forced to impose new laws on capita movement regulation such as the IMF Article VIII, European Commission Treaty (Article 56 EC to 60 EC) or the OECD Capital Movement Code. The second condition was the data requirements to be included in my study, such as GDP and government spending which are available for the countries.<sup>138</sup> There were two criteria which were applied to the period selected: the first one was that until 1995 most political transformation from a communist party system to a democratic structure. And second condition that data are available for the estimating period.

It seems clear, then, that the Central-Eastern European countries are good case studies to analyse the central question of being the causal link between CAL and currency crisis events. First, before the collapse of communism all these countries were shut off from the rest of the world in terms of commodity, capital and people movements. Since 1989 these countries have started the process of transformation through integration into the global market with different speeds of reducing the restrictions. For instance, the Baltic countries and the Czech Republic had removed almost all regulations on capital by 1995, having become members of the IMF (see Table 4.) in the early 1990s. Other countries such as Poland,

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<sup>137</sup> Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Russian Federation, the Slovak Republic, Slovenia, the Ukraine.

<sup>138</sup> For instance, Sachs, Tornell and Velasco (1996) excluded Hungary and Poland from the contagious currency crises analysis due to problems of obtaining data.

Hungary, the Slovak Republic and Slovenia had a more cautious attitude to reductions in capital control regulation.<sup>139</sup>

Table 4. Membership in OECD, IMF and European Union

Country	OECD	IMF***	EU
Bulgaria		1998	2007
Czech Rep	1995	1995	2004
Estonia		1994	2004
Hungary	1996	1996	2004
Latvia		1994	2004
Lithuania		1994	2004
Poland	1996	1995	2004
Romania		1998	2007
Russia	*	1996	
The Slovak Rep.	2000	1995	2004
Slovenia	*	1995	2004 (EMU -2007)
The Ukraine		1996	**

Note: A Black cell indicates the lack of membership in the international institutions, EMU - European Monetary Union, \*-open discussion about membership of the OECD, \*\* - accession candidature to EU \*\*\*-date of acceptance of IMF Article VIII.

Source: IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAE), [www.oecd.org](http://www.oecd.org), [www.europa.eu](http://www.europa.eu).

The last group could be considered as the most interesting one (the Ukraine and Russia). These countries started the process of liberalization of capital movement regulations (e.g. 1996- both countries membership in IMF, Russia –program of co-operation since 1992). However, after the currency collapse in 1998, both countries stopped the process of CAL and started what could be termed the ‘reverse of liberalization’.<sup>140</sup> Secondly, all the countries which were analysed experienced intense attacks on their currencies<sup>141</sup> and currency crisis problems (see Chapter 2.3.1 Table 5.) which forced them to seek IMF programs (see Appendix 2.1 Table 9.). Furthermore, 12 countries have different levels of development of their economic-institutions, which might also impact on the process of CAL and on the vulnerability to currency crisis.<sup>142</sup>

<sup>139</sup> Arvai (2005) “Capital Account Liberalization, Capital Flow Patterns, and Policy Responses in the EU’s New Member States” IMF Working Paper pp. 7-8.

<sup>140</sup> Russian IFCI indicators increased by two from 0.25 before the crisis to almost 0.6. (Edison and Warnock (2001: 28), Dabrowski (2001) “The episodes of Currency Crisis in the European Transition Economies ” Center for Social and Economic Research pp. 38-39, 60-61.

<sup>141</sup> According to my own calculations of the Ahluwalia’s (2000) and Cerra and Saxena’s (1998) indicators for the period 1995-2005 and Eichengreen, Rose and Wyplosz’s (1996) definition of speculative attacks there were between 77-99 episodes.

<sup>142</sup> Freedom House, Country Reports 2006, downloaded 1<sup>st</sup> August 2007, <http://www.freedomhouse.org/>.

### 3.2. Methodology

In my empirical analysis I follow Glick, Gua and Hutchison's (2004) model (henceforth GGH model). However, my analysis will focus on a specific region (CEE countries) in order to be able to analyze in more detail, by using a different variety of measures of currency crisis and CAL. However, I have to do some modifications due to the fact that the country-year sample is smaller compared with Glick, Gua and Hutchison's model (I have 120 observations, while the GGH model includes 1518 observations). Because of this I could not divide the different category of country-observation groups: the treatment group, the unmatched control group, the nearest neighbor group and the radius group.<sup>143</sup> In this case I also simplify the analysis by following Rubin's (1979) suggestion instead of the Heckman et al. (1997) procedure (regression-adjusted matching procedure). The currency crisis regression contains all available observations (those with capital control and without capital control).

The empirical model contains two fragments. In the first fragment, I provide a simple analysis of unconditional/conditional frequency of currency crisis/CAL episodes. These calculations follow Glick, Gua and Hutchison's (2004) methodology. I then investigate the relationship between the CAL incidents and currency crisis by using essentially two probit panel models: propensity scores equation and currency crisis equation (this idea was also taken from Glick, Gua and Hutchison's (2004) paper). These probit panel models are cross-time-country panels (where individual  $i$  is country, time  $t$  is year)<sup>144</sup> with discrete dependent variables  $y_{it}$ . These dependent variables are represented by a binary choice variable  $y_{it} = 1$  if the event happens or 0 if it does not for individual  $i$  at time  $t$ . In fact, if  $p_{it}$  is the probability that an individual participated in some events at time  $t$ , then this is usually modelled as a functional of some explanatory variables  $x_{it}$ :

$$p_{it} = \Pr(y_{it} = 1) = \Phi(x_{it}'\beta) \quad \text{where} \quad \Phi(x_{it}'\beta) = \int_{-\infty}^{x_{it}'\beta} \frac{1}{\sqrt{2\pi}} e^{-\frac{u^2}{2}} du$$
 is the cumulative distribution function for standard normal variable and  $u$  is the standardized random variable.<sup>145</sup>

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<sup>143</sup>A treatment group is a group of countries which have liberalized capital controls; control group has not liberalized capital flows. The near neighbor approach matches each CAL observation to the non-participation observation (non CAL) that has the nearest propensity score (probability of liberalization of the capital flows). After each non-participation observation is used, it is "returned" to the pool of non-participation observations. The radius approach matches each participation observation to the average of all the non-participation observations with propensity scores falling within a pre-specified radius from the propensity score of the participation observation.

<sup>144</sup>Bulgaria, The Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, The Russian Federation, The Slovak Republic, Slovenia and The Ukraine.

<sup>145</sup>Baltagi P. (2005) *Econometric analysis of Panel Data*. New York 2005, pp. 210-211.

The first model of so-called propensity scores examine the probability of CAL episodes with respect to three main categories of independent variables ( $x_{it}$ ): economic variables, structure variables and political variables. In this case, the incident of CAL happens in country  $i$  then  $CAL_{it} = 1$ , otherwise  $CAL_{it} = 0$ . I calculate two kinds of selection equation models: the benchmark probit model with three main categories of variables  $\Pr(CAL_{it} = 1) = \Phi(x_{it}\beta)$  and then the augmented specification probit model with an additional currency crisis dummy variable. The propensity scores equations are generally estimated in order to study the sample selection problem. The sample selection bias is connected with the systematic differences between countries that do and do not liberalize the capital account, since only countries with a stable economic-political situation are liable to liberalize the capital control. At the same time, these countries are less likely to have a currency crisis due to having good macroeconomic fundamentals (see chapter 1.1.2, 1.3).<sup>146</sup> The augmented specification probit selection equation was added to the analysis in order to test the effect of currency crisis episodes on the direction of liberalization reforms.

In the second model, I explore the reasons for change in the probability of currency crisis episodes. Similar to propensity scores analysis, I calculate the benchmark probit model and augmented specific model. The form of models are  $\Pr(CU_{it} = 1) = \Phi(x_{it}\beta)$  where the discrete dependent variables are described as if the currency crisis incident happens in country  $i$  then  $CU_{it} = 1$ , otherwise  $CU_{it} = 0$ . The seven independent variables in the benchmark probit model were generally identified from the leading-indicator models (Kaminsky's (1997, 2003) and Glick, Gua and Hutchison's (2004) model). The first six variables were chosen in order to analyze different reasons in the context of a different generation model of a currency crisis (2 variable –third generation model, 3 variables- second generation models, 1 variable-Sudden Stop approach). Moreover, I included the CAL variable in the augmented specific probit equation. However, I did not include the variables which might describe the first generation models. The reason for this is the assumptions that CAL is usually happened in countries with strong macroeconomic fundamentals and political stabilization (the sample selection bias). When the countries do not imposed the precondition of CAL, and then CAL process might cause the overreaction of investors or government authorities and lead to economic crashes (see Chapter 1.3).

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<sup>146</sup> Glick and Hutchison (2004), Eichengreen (2001) and Hendry (2006).

### 3.3. Data construction and descriptive statistics

#### 3.3.1. Definition of Currency Crises

To identify a currency crisis, I decided to use four different measures of currency crisis episodes in order to be able to obtain reliable estimation results. I also considered it important that all indicators used a different technique to measure the currency crisis episodes.

The first column of measurement is based and Frankel and Rose's methodology (1996) and used the annual changes of nominal exchange rate. The second and third measures were arrived at by using the monthly changes of parameters and by referring to the concept of a currency crisis as: "the intense increase in speculative pressure on the country currency". These indicators constructed the measures of exchange rate pressure so-called the Market Pressure Indexes (MPI). The first of them is Cerra and Saxena's (1998) indicators, which used three kinds of parameters: monthly changes in foreign reserves, interest rate and nominal exchange rate. The second is Ahluwalia's (2000) indicators which consider two kinds of parameters: foreign reserves and nominal exchange rate (see Chapter 1.2.1). The exchange rate, reserve and interest rate data are drawn from the International Monetary Fund's International Financial Statistics CD (line ae for Frankel and Rose's (1996) indicator, line rf for Ahluwalia's (2000) and Cerra and Saxena's (1998) indicators, line 1ld for reserve level and line 60 or 60B for interest rate).<sup>147</sup>

In order to provide the significant conditions that insure that any large depreciation is counted as a currency crisis and separates the incidents of speculative attacks from the episodes of currency crisis, I decided to use the different definitions (Ahluwalia (2000), Cerra and Saxena (1998)) of these two phenomena. The definition of speculative attack<sup>148</sup> was

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<sup>147</sup> These indexes need correcting in the case of high inflation since they do not reflect some currency crises episodes. In this case, it would be better to calculate the real exchange rate (as shown by Glick, Guo and Hutchison's (2004)) model, instead of nominal exchange rate. Glick, Guo and Hutchison's (2004) model stated that any nominal currency, changes are associated with the exchange rate pressures and should affect the purchasing power of the domestic currency and result in a change in the real exchange rate (at least in the short run). Moreover, they pointed out that this condition excludes some large depreciations that occur during high inflation episodes, but it avoids screening out sizable depreciation events in more moderate inflation periods for countries that have occasionally experienced periods of hyperinflations and extreme devaluation. However, I was not able to calculate the real exchange rate changes due to the lack of data available from the IMF's Direction of Trade. The IMF's Direction of Trade data are necessary in order to calculate the trade-weighted which are necessary to calculate the weight in the real exchange rate index of different bilateral exchange rates (e.g. the US dollar, German mark, or Japanese yen).

<sup>148</sup> The speculative attack involves massive selling of domestic currency assets by both domestic and foreign investors. In my research this is an attack against the domestic currency which not caused the collapsed of currency regime or central bank problems of foreign reserves. This attack is mainly linked with coming the

taken from Eichengreen, Rose and Wyplosz (1996) and defined the cut-off point as  $MPI_x > \mu_{MPI_x} + 1.5 * \sigma_{MPI_x}$  where  $\mu$  is the mean of the MPI in country  $x$ , and  $\sigma$  is the standard deviation of MPI. On the other hand, the definition the currency crisis is described when  $MPI_x > \mu_{MPI_x} + 3 * \sigma_{MPI_x}$  - this is the concept developed by Kaminsky, Lizondo and Reinhard (1998).

For each country-year, I constructed a binary measure of currency crises, as defined above (1=crisis, 0=no crisis).<sup>149</sup> A currency crisis is considered to have occurred for a given year if the change in market pressure index for any month of that year satisfied Kaminsky, Lizondo and Reinhard's (1998) crisis condition. Furthermore, I imposed a 24-month window on my data with the aim of reducing the change of capturing of the same currency crisis episode. I treated any large changes in the market pressure index the following 24-month window as part of the same currency episode and omitted the years of that change before continuing the identification of a new crisis. In addition, I decided to build my own variable to define a currency crisis for each country-year in order to reduce the risk of misinterpretation of the empirical results. The variable is equal to "1" when two of the calculated indicators<sup>150</sup> point to the currency crisis episodes; otherwise the variable which is equal to "0" indicated the lack of a currency crisis episode.

With this methodology, I identified 7-16 currency crises episodes over the period 1995-2005 according to different methods of calculation of currency crisis events (see Table 5 and Appendix 3.1.).<sup>151</sup>

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market (cornering the market means an illegal attempt to buy up enough of a commodity (stocks, assets, property etc.) to allow the price to be manipulated).

<sup>149</sup> The criteria for Frankel and Rose's index is different (see Chapter 1.2.1).

<sup>150</sup> Franckel and Rose (1996), Cerra and Saxena (1998) and Ahluwalia (2000).

<sup>151</sup> Franckel and Rose's methodology identified 10 episodes, Cerra and Saxena's indicates 16, Ahluwalia's method identified 7 and my own measures show 8.

Table 5. Currency crisis episodes in analyzing countries according to different currency crisis methods.

Country	Frankel and Rose (1996)	Cerra and Saxena (1998)	Ahluwalia (2000)	My own Variable
Bulgaria	1996	1997	1997	1997
The Czech Rep.	1997	1997,2002	1999	1997
Estonia		1999		
Hungary	1995	1995,2003		1995
Latvia			2005	
Lithuania		1995,1998	2005	
Poland		1995		
Romania	1995-1997,1999	1997,2005	1997	1997
Russia	1998	1998	1998	1998
The Slovak Rep.		2002		
Slovenia		1995		
The Ukraine	1995,1998	1995,1998	1998	1995,1998

Note: The blank cell indicates the occurrence of capital control implementation, the number indicates the years of currency crisis episode.

Source: My own calculations based on IFS data.

### 3.3.2. Measuring the liberalization of capital control regulations

In my analysis, I needed to construct the binary measure of CAL which is defined as “1” when liberalization of capital control exists or “0” when the country imposes restrictions on capital control. These kinds of measures are necessary for calculating the likelihood of the CAL process (probit panel model) which is the main part of the methodology of my empirical model. As suggested in Chapter 1.1.4, there are many ways of measuring and defining the CAL process. Under the implementation of Glick, Gua and Hutchison’s (2004) methodology, it is reasonable to use only rules-based measures rather than quantitative measures such as onshore-offshore interest differentials, black market foreign exchange premium, or international integration of securities markets (assets prices integration). The quantitative measures do not allow building the 0/1 variable of CAL due to it being difficult to say what increase or level of interest rate or capital flows is enough to be considered that country liberated the capita control regulation.<sup>152</sup> Other on/off measures such as the OECD Code of Liberalization of Capital Movements, the Montiel-Reinhart Intensity Measure (1999) can not be employed due to the lack of data. For instance, countries are not members of the OECD or the data about regulations of capital flows (FDI, FPI) are not obtainable for these country and

<sup>152</sup> Feldstein and Horiok’s (1980) measure could be used in this analysis, but after consideration the criticism of Obstfeld (1986) and Edwards (2000), the correlation between national saving and investments does not have to be caused by regulation of capital controls .

period. On the other hand, other measure on/off such as stock market liberalization indicators deemed small part of financial market and neglected other aspects of capital account liberalization connected with trade flows or multinational corporation activity (e.g. profit transfer or inter-company loan). Based on this, I decided to concentrate on the measures based on the data on external restriction in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAE).<sup>153</sup>

I am aware of concerns about the quality of the IMF data on CAL. IMF data only considers the existence of administrative controls, moreover, they do not distinguish between restrictions on capital inflows and outflows. However, the IMF measures are the main source of data available which can be collected with some consistency across this group of 12 countries and over this period over 1995-2005. After investigating different IMF measures, I chose two measures from the indicators' group that used AREAE: Chinn and Ito's (2002) measure and Glick, Guo and Hutchison's (2004) measure. Glick, Guo and Hutchison's measure seemed to fit my analysis due to the fact that this index is interested in the regulation of capital transaction. The regulation of capital flows should influence the overall volume and/or the composition of capital flows. As discussed in Chapter 1, the liberalization of capital control regulations might cause the increase of the flow of short-term capital and thus increase the vulnerability of the country experiencing the currency crisis. Chinn and Ito's measure included other aspects of the CAL process such as export/import regulation and current transaction. This additional information is interesting in the context of capital control efficiency.

Furthermore, I explored two different definitions of Chinn and Ito's (2002) measure in order to get different perspectives of the CAL process analysis. The first definition is in accordance with the description from the first chapter but does not include the dummy variable restriction on capital transactions. In this case, the index used three 0/1 measures on restriction on capital account transactions and requirements of the surrender of export receipts. If all parameters indicated "not restriction capital control", the index suggests that the country has already liberalized capital account regulation. The reason why I decided not to include the restriction on capital transaction is that Guo and Hutchison's (2004) and Chinn and Ito's (2002) indicators take account of the restriction of capital transactions from AREAE in their calculations. The second definition of Chinn and Ito's (2002) measure calculated four dummy variables: restriction on capital account transactions and requirement of the surrender

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<sup>153</sup> The IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAE) is a paper report that has been published annually since 1950.

of export receipts and capita account regulations and if all of them point “no capital control restrictions”, then country can be called as “liberated” in the context of capital account regulations . In contrast to original Chinn and Ito’s (2002) measure, the dummy variable on capital transaction regulations was constructed by using Guo and Hutchison’s (2004) index methodology. Unfortunately, during my research period 1995-1996, the form of the IMF’s Annual Report on Exchange Arrangements and Exchange Restrictions was modified. For instance, the AREAE codes countries published in the reports through 1996 took account only of the existence (or not) of “restriction” on payment for capital transactions. From the 1996 data, the IMF’s Annual Report reported 10 separate categories for controls on capital transactions. Since 1997, the IMF’s AREAE has included 11 categories for controls on capital transactions. The new category was termed the personal capital movements. Based on this information, Guo and Hutchison’s (2004) index was calculated following; for the 1995 year, the index indicated “0” if there was any “restriction” on payment for capital transactions; and otherwise it is “1”. For the 1996-2005 period, the index was defined that capital account to be restricted (the index is equal “0”) if controls were in place in 5 or more of categories of restriction of capital transaction and if “financial credits” was one of the categories restricted. Otherwise, the index was defined as “1” (the country liberalized capital control restrictions). Table 6. lists the countries included in the sample and corresponding CAL episodes. Moreover, I calculated the share index for the period 1995-2005 based on the information from the Table 6. (see Fig. 4.).

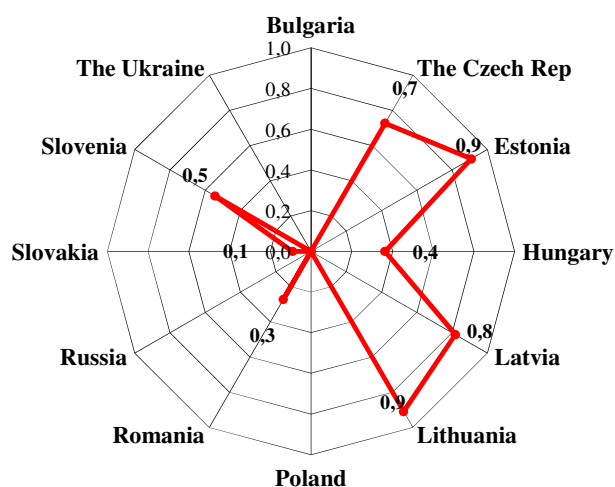
Table 6. Capital Account Liberalization episodes calculating according to different methods

Country	Glick, Guo and Hutchison's index	Chinn and Ito's index (3)	Chinn and Ito's index (4)
Bulgaria	2002		
The Czech Rep.	1998-2005	1995-2005	1998-2005
Estonia	1995-2005	1995-2001; 2003-05	1995-2001; 2003-05
Hungary	2001-2004	1997-2005	2001-04
Latvia	1995-96; 1999-2005	1995-2005	1995-96; 1999-2005
Lithuania	1995; 1997-2005	1995-2005	1995; 1997-2005
Poland		2003	
Romania	2002-05	2003-05	2003-05
Russia	1996-97		
The Slovak Rep.	2000-05	1997-98; 2000	2000
Slovenia	1999-2005	1999; 2001-05	1999; 2001-05
The Ukraine			

Note- (4)- Index based on four dummy variables: multiple exchange rate, restriction on currency account transactions, restriction on capital account transactions and requirement of the surrender of export receipts, (3)- Index based on three dummy variables: multiple exchange rate, restriction on currency account transactions and requirement of the surrender of export receipts. The blank cell indicates the occurrence of capital control implementation, the number indicates the years of CAL.

Source: My own calculations based on IFS data and the IMF's AREAE.

Fig. 4. Degree of the CAL process in 12 countries for the period 1995-2005



Source: My own calculations based on the IMF's AREAE.

The value of the share measure allowed me to split the countries into four groups: completely liberalized (share measure >0.7), liberalized (share measure  $\geq 0.5$ ), partially non-liberalized (share measure <0.5), non-liberalized (share measure  $\leq 0.3$ ). According to the calculations (see Table 7., Fig. 4.), Bulgaria, Poland, Romania, Slovakia, Russia and the Ukraine belong to a totally closed country group in terms of capital flows. On the other hand, the Czech Republic, the Baltic Countries and Slovenia which are open countries to capital flows. The main problem is the case of Hungary. According to the share measures based on Glick, Guo and Hutchison's index and Chinn and Ito's index, Hungary has not liberalized capital flows. However, the calculation implies that Hungary does not have capital control regulation. Because Chinn and Ito's index (3) does not include the information about capital transaction, the results of the Hungarian index could suggest that Hungary does not liberalize the restriction on capital transaction but on the others restrictions from Chinn and Ito's index were removed. Moreover, Hungary, Poland, and the Slovakia Republic are interesting cases. Compare to other countries from closed country group in terms of capital flows, Hungary, Poland, and the Slovakia Republic participated intensively in European integration and OECD accession (see Table 4.). It can suggest that these countries are more open than other countries from closed country group in terms of capital flows.

Table 7. Share measure calculations based on three different CAL indexes

Country	Glick, Guo and Hutchison's index	Chinn, Ito's index (4)	Chinn and Ito's index (3)
Bulgaria	non-liberalized	Non-liberalized	non-liberalized
The Czech Rep.	completely liberalized	completely liberalized	completely liberalized
Estonia	completely liberalized	completely liberalized	completely liberalized
Hungary	partially non-liberalized	Partially non-liberalized	liberalized
Latvia	completely liberalized	completely liberalized	completely liberalized
Lithuania	completely liberalized	completely liberalized	completely liberalized
Poland	non-liberalized	Non-liberalized	non-liberalized
Romania	Partially non-liberalized	non-liberalized	non-liberalized
Russia	non-liberalized	non-liberalized	non-liberalized
Slovakia	Partially non-liberalized	non-liberalized	non-liberalized
Slovenia	liberalized	liberalized	liberalized
The Ukraine	non-liberalized	non-liberalized	non-liberalized

Note: completely liberalized - share measure above/equal to 0.7, liberalized - share measure above/ equal to 0.5, partially non-liberalized-share measure below 0.5, total-liberalized-share measure below 0.3.

Source: My own calculations based on the IMF's AREAE

### 3.3.3. Descriptive statistics on Currency Crises and CAL

In order to get a general picture about currency crises episodes and the CAL process in the 12 countries analyzed over the period 1995-2005, I want to analyze two kinds of frequency of currency crisis incidences (unconditional and conditional frequency).<sup>154</sup> The first kind of frequency does not consider any assumption about the capital account process condition. The second frequency considers if the incidents of currency crisis exists during/after liberalization of capital flows.

In my research, the unconditional frequencies were calculated for both the whole group of countries as well as for individual countries. I used two measures to calculate this frequency: my own index of currency crisis and Chinn and Ito's(2002) CAL index. These measures were chosen based on the fact that both of them summarize the information from other measures (of currency crisis or CAL) which were calculated in the previous sections. The unconditional frequency for the whole group of countries includes the number of "crisis" or "liberalization in place" observations; it is then divided by the total number of observations. In this case the frequency was calculated for the whole period 1995-2005 and, in addition, for 4-year intervals (except for the 2003-2005 sub-sample) (see Table 8.).

Table 8. Currency crises and CAL, unconditional frequency (in percentages)

<b>Categories</b>	<b>1995-2005</b>	<b>1995-1998</b>	<b>1999-2002</b>	<b>2003-2005</b>
Currency crises *	5	15	0	0
Number of crises	7	7	0	0
CAL liberalization **	38,64	20,83	43,75	75,75

Note: \* - Number of crises divided by total country-years (my own index of currency crisis). Number of crises is in parentheses(Chinn and Ito's (4) index) \*\* - Number of country-years with CAL divided by total country-years with available data

*Source:* My own calculations based on IFS data and the IMF's AREAE.

The frequency of currency crisis episodes suggested that these episodes were relatively rare, accounting for only 5 percent of the observations. Also this frequency was very low during the sample period, only for period 1995-1998, the frequency was 15 percent and for the rest of periods the frequency was equal 0. Nevertheless, the frequency with respect to liberalization of capital flows was very high on average: 38 percent during the whole period.

<sup>154</sup> Glick, Guo and Hutchison (2004) "Currency Crises, Capital Account Liberalization and Selection Bias" *Federal Reserve Bank of San Francisco Working Paper*, pp. 20,8-9.

The high point of frequency was in the last sub-sample for the period 2003-2005. These results (see Table 8) might suggest that increase the intensity of the CAL process in CEE countries does not cause the increase of currency crisis episodes. This positive relation could exist in the first sub-sample 1995-1998 when the frequency of CAL was quite high (21 percent) and currency crisis episodes took place also.

A similar conclusion about an insignificant correlation between CAL and currency crisis episodes can be drawn for CEE countries over the period 1995-2005. Only the Czech Republic is the only example of a country where currency crisis episodes co-exist with liberalization of capital flows (see Table 9.).

Table 9. Currency crisis unconditional frequency and CAL across countries

Country	Unconditional Frequency (in percent)***	Degree of CAL*
Bulgaria	9	non-liberalized
The Czech Rep.	9	Liberalized
Estonia	0	Liberalized
Hungary	9	non-liberalized
Latvia	0	Liberalized
Lithuania	0	Liberalized
Poland	0	non-liberalized
Romania	9	non-liberalized
Russia	9	non-liberalized
Slovakia	0	non-liberalized
Slovenia	0	Liberalized
The Ukraine	18	non-liberalized

Note: \*-the measure is based on information from Table 2: liberalized-share measure above/equal 0.5 , non-liberalized-share measure below 0.5 \*\*\*- two CAL indexes from Table 2 which show that Hungary has liberalized capital control \*\*\* number of crises divided by total country-years (my own index of currency crisis).

Source: My own calculations based on the IMF's AREAE.

In order to calculate the conditional frequency of currency crisis episodes for this group of countries, I show first how many crises happened during the period in which the country liberalized the regulation of capital flows (see Table 8., Appendix 3.1). I construct the CAL-currency crisis matrix in which I collect all the information from the previous calculation of CAL and the currency crisis index (see Table 10.). Secondly, I calculate the conditional frequency of currency crisis in a similar way to the unconditional one, however, I use all three CAL indexes (Glick, Guo and Hutchison's index (GGH), Chinn and Ito's index (4) (CI4), Chinn and Ito's index (3)-(CI3).

The CAL-Currency Crisis matrix shows that according to the first two methods of calculating the currency crisis (my own index and Franckel and Rose's(1996) index), the currency crisis only took place once during the period of the liberalization of capital flows (the Czech crisis in 1997). (see Table 10.). In contrast, the CAL-Currency Crisis matrix shows that for Cerra and Rose's(1998) index and Ahluwalia's(2001) index, the situation of simultaneous existence of currency crisis events and CAL episodes looks a little different. Less than half the currency crisis episodes took place when the country liberalized capital movement across-borders over this period (see Table 10, Appendix 3.1).

Table 10. CAL indexes and Currency Crisis indexes for 12 countries for period 1995-2005

<b>CAL index</b> <b>Currency Crisis index</b>	<b>Chinn and Ito's (2002) index (4)</b>	<b>Glick, Guo and Hutchison's(2004) index</b>	<b>Chinn and Ito's(2002) index (3)</b>
my own variable of currency crisis	7-CC	7-CC	6-CC 1-CAL
Frankel and Rose's (1996)index	10-CC	10-CC	9-CC 1-CAL
Cerra and Saxena's(1998) index	10-CC 6-CAL	9-CC 7-CAL	9-CC 7-CAL
Ahluwalia's(2001) index	4-CC 3-CAL	4-CC 3-CAL	4-CC 3-CAL

Note: The number indicates the number of currency crisis incidences, CC- indicates the capital control episode in the year of the currency crisis incident, CAL- indicates the CAL episode in the year of the currency crisis incident.

Source: My own calculations based on IFS data and the IMF's AREAE.

The conditional frequency of the currency crisis analyses the possibility that controls are implemented in response to a crisis. In this case, the results show conditional absence of controls at the end of year prior to a crisis as well as at the end of the year in which a crisis occurs (see Table 11., Appendix 3.1.).

Table 11. Currency crisis, frequency condition on CAL for 12 countries for period 1995-2005 (in percentages)

Sequence of CAL	Yes*	No**
Currency Crisis and Liberalization took place during currency year	0-CI4 0-GGH 0,75-CI3	5,4-CI4 4,5-GGH 4,5-CI4
Currency Crisis happened and liberalization had taken place during previous year	0-CI4 0,75-GGH 0-CI3	0-CI4 0-GGH 0-CI3

Note:\*Number of currency crises for which CAL in place at end of current or previous year, divided by total number of country-years with liberalization in place, Yes-liberalization happened \*\*- Number of currency crises for which CAL not in place at end of current or previous year, divided by total number of country-years with liberalization in place, No –liberalization did not take place, Glick, Guo and Hutchison’s(2004) index-GGH, Chinn and Ito’s(2002) index (4)-CI4, Chinn and Ito’s (2002) index (3)-CI3).

Source: My own calculations based on IFS data and the IMF’s AREAE (my own index of currency crisis).

These results suggest that controls may not be effective in the case of CEE countries and indeed, may increase the likelihood of a currency crisis (see Table 11.). Specifically, countries with liberalized capital flows had crises contemporaneously between 0 and 0.75 percent of the time, compared to 4-5 percent for those with restrictions. This implies that the presence of capital controls does not reduce a country’s exposure to currency instability (e.g. Bartolini and Drazen (1997), Glick, Guo and Hutchison (2004)). Principally, the Russian and The Czech Republic crises might suggest that CAL influenced on probability of currency crisis episodes. Especially, the Russian case is interesting because two years before 1998 the Russian authorities liberalized the capital flows (only according Glick, Guo and Hutchison’s(2004) definition of CAL-see Appendix 3.1). The Russian authorities restricted capital flows in 1998 at the same year as the currency crisis event. The Czech Republic liberalized capital flows before 1997 (according all three CAL indexes (GGH, CI4, CI3) –see Appendix 3.1) and even after the currency crisis in 1997, the government authorities did not change the direction of the liberalization policy.

### 3.4. Empirical implementation and results: estimating propensity score and currency crisis equations

#### 3.4.1. Propensity Scores

In order to control the sample bias, I estimated two propensity scores equations: the benchmark probit equation and the augment specification probit equation (see Equations 1, 2). Both of these equations explain the likelihood of a country having a liberalized capital

account. However, the benchmark probit equation is similar to a simple version of the augment specification probit equation as it does not consider the impact of currency crisis episodes on the direction of the CAL process (see Equations 1, 2). The other independent variables in the augment specification probit equation were classified into three categories: structural, political and economical determinates of the capital account process. The selection of these potential independent variables is guided by the previous research in this area such as Eichengreen (2001), Glick Guo and Hutchison (2004), Bartolini and Drazen (1997), Bai and Wei (2000), Milessi-Ferretti (1998) and Grilli and Milessi-Ferretti (1995). They found that there is a positive correlation between the increase in the intensity of the capital liberalization process and the relaxation of fiscal policy/ trade openness / increase in current account deficits. Moreover, Bai and Wei (2000) and Milessi-Ferretti (1998) also found that countries with more independent central banks are less likely to use controls. Eichengreen (2001), Glick, Guo and Hutchison (2004) and Grilli and Milessi-Ferretti (1995) suggest that political stability is associated with a lower rate of capital control regulation. On the other hand, the higher international interest rate is connected with a relaxation of capital control regulation as the countries' authorities are less likely to be worried about the risk of a speculative attack. However, Bartolini and Drazen (1997b) found a rather different correlation and suggested that low world interest rates indicate small capital flows meaning that there is no incentive to remove the regulation of capital controls. In the case of currency crisis episodes, Edwards (1989) and Glick, Guo and Hutchison (2004) found that capital control is intensified in the year prior to the onset of a currency crisis (the case of the Russian Crisis).

Following these studies, I included in my models two macroeconomic variables, three economic structural variables and one political variable (see Equations 1, 2). The macroeconomic factors are the current account (as a percentage of GDP) and the level of real international interest rate (proxy by the level of the US real long-term interest rate). The economic structure variables are considered as the relative size of government spending, openness to world trade (measured by the sum of export and import as a percentage of GDP) and monetary independent variable. The "monetary freedom" index's range is between 0-100 percent. The higher value of index indicates the more independent monetary policy in the country. The political explanatory variable is measured in terms of political freedom (the variable is measured on a 0-3 scale where "0" indicates the highest level of freedom).<sup>155</sup>

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<sup>155</sup> In contrast to Glick, Guo and Hutchison's (2004) model, I did not use total changes in government as the measure of democratic changes, mainly due to the lack of data.

Most of the data for the 12 countries were drawn from the International Monetary Fund's International Financial Statistics CD.<sup>156</sup> Only the trade and current account data for Slovakia were drawn from the OECD database. The amounts for government spending for the 12 countries were taken from the United Nations Common Database. The monetary independent variable is one of ten factors from the Economic Freedom index (so-called "monetary freedom"). This index is based on the weighted average inflation rate and price controls.<sup>157</sup> The political freedom measure is drawn from the Freedom House website. All variables in national currency were converted to US dollars by using the exchange rate from the International Monetary Fund's International Financial Statistics CD (line ag).

Table 12. Estimation Equation

**Equation 1 Benchmark probit equation**

$$\Pr(CAL_{it} = 1) = \Phi(\beta_0 + \beta_1 CA/GDP_{t-1} + \beta_2 G/GDP_{t-1} + \beta_3 Op_{t-1} + \beta_4 MF_t + \beta_4 PF_{t-1} + \beta_5 r_{t-1}^*)$$

**Equation 2 Augment specification probit equation**

$$\Pr(CAL_{it} = 1) = \Phi(\beta_0 + \beta_1 CA/GDP_{t-1} + \beta_2 G/GDP_{t-1} + \beta_3 Op_{t-1} + \beta_4 mf_t + \beta_4 PF_{t-1} + \beta_5 r_{t-1}^* + \beta_6 CU_{t-1})$$

where CA- current account, GDP-GDP per capita, G-size of government spending, Op- openness to world trade, MF –monetary independence, PF-political freedom,  $r^*$ - international interest rate, CAL- 0/1 dummy variable based on Chinn and Ito's (2002) index (4), CU-0/1 dummy variable based on my own currency crisis index.

<sup>156</sup> The current account (line 78ald time xrrt to GDP per capita (nominal GDP to population 99B divided by 99Z), real international interest rate (line 61 zf minus 64 xzf), openness to world trade (lines 78 aa plus 78ab divided by 99B).

<sup>157</sup> The Economic Freedom index published every year for 160 countries by the Heritage foundation and the Wall Street Journal (downloaded 1<sup>st</sup> June 2007, [www.heritage.org/research/features/index/index.cfm](http://www.heritage.org/research/features/index/index.cfm)). The index contains 10 parameters: business freedom, trade freedom, monetary freedom, freedom from government, fiscal freedom, property freedom, investment freedom, freedom from corruption and labour freedom. The distribution of freedom index and its factors have the following range: between 100-80- free, 70-79.9- mostly free, 60-69.9- moderately free, 50-59.9- mostly unfree, 0-49.9- repressed monetary policy.

Source: My own analysis.

In addition to these explanatory factors, the independent variable was used for these two models in the form of Chinn and Ito's index (4). I applied this method of calculating CAL as this index collected all information from two different modern metrologies of calculation (Glick, Guo and Hutchison (2004), and Chinn and Ito (2002)). In the case of the augment specification probit equation, the additional explanatory variable was the lagged occurrence of currency crises. This variable allowed the impact of the previous historical event on the performance of economic policy to be measured.

Table 13. Probit Equation for Estimating CAL Propensity Scores

<b>Explanatory Variable</b>	<b>Benchmark probit equation</b>	<b>Augmented specification</b>
$CA/GDP_{t-1}$	-2.12 (3.4)	-2.26 (3.48)
$G/GDP_{t-1}$	0.89 (0.98)	0.119 (1.01)
$Op_{t-1}$	2.17 (3.5)	2.2 (3.54)
$r_{t-1}^*$	-0.1 (0.06)	-0.08 (0.07)
$PF_{t-1}$	1.04 (0.54)	1.06 (0.07)
$MF_t$	0.012 (0.07)	0.012 (0.563)
$CU_{t-1}$		-0.32 (2.03)
No.of observations	115	115

Note: The table shows estimation results of the population-average probit models. In this case, the change in the probability of CAL in response to a 1 unit change in the variable evaluated at the mean of all variables. Constant included, observations were weighted by GDP per capita (in dollars). The trade variable is lagged to limit simultaneity problems with current account surplus variable.

Source: My own estimation.

The estimation results from probit panel models are in accordance with the previous studies carried out in this area. Almost all coefficient signs on variables are consistent with the previous hypothesis that larger levels of government spending, greater trade openness, more political stability and independence of monetary authorities are associated with a higher probability that capital control is removed. The only problematic cases are the coefficient signs on interest rate and current account surpluses. In the case of interest rate, this result is

supported by Bartolini and Drazen's (1997b) hypothesis; however it showed rather different results to those of Glick, Guo and Hutchison's conclusion (2004). However, the negative coefficient on current account surpluses is problematic in terms of explaining it in a simple way. This coefficient suggests that a small increase in current account surpluses reduces the standardized probit index by 2.12 of the standard deviation, on average. This impact of current account surpluses is quite large compared to other variables. The only reasonable explanation that was found is that CAL has become a priority of the reforms in most CEE countries and they liberalized their capital control regulation even if there were outflows of capital (e.g. interest payments). Furthermore, the result from the augmented specification probit model implied that the occurrence of a currency crisis in the previous year reduced the standardized probit index by -0.32 of standard deviation, on average. The comparison of these two models suggests that currency crisis episodes in CEE countries had an impact on capital control policy for the period 1995-2005, however this effect was insignificant compared to political stability, trade and service flows (see Table 13.). Moreover, these results partly support the hypothesis that, specifically, countries with good macroeconomic fundamentals are likely to impose the liberalization of capital control (sample selection bias). Both models show that in a country with a more independent monetary policy and economic freedom there is a greater possibility of CAL. At the same time, countries with larger fiscal expansion are going on the liberalization of capital flows (increase the risk of currency crisis- though self-filling expectations –see Chapter 1.2.2) (see Table 13.).

### **3.4.2. Currency Crisis Equations**

In order to analyze the impact of CAL on currency crisis episodes, it is necessary to specify an equation that controls the factors other than the CAL effect (see Equation 3.). The selection of the potential factors is guided by leading-indicators methodology (the Early warning system- see Chapter 2.2).<sup>158</sup> Following the leading-indicators methodology, I chose six explanatory variables: the log ratio of broad monetary to foreign reserves, domestic credits growth, current account to GDP ratio, GDP growth, real international interest rate and real domestic interest rate. All these explanatory factors are connected to the different generation of models of currency crisis. The log ratio of broad monetary to foreign reserves and domestic credits growth are the indicators of the third generation models (see Kaminsky

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<sup>158</sup> Kaminsky (2003), Kaminsky (1997), Eduardo, Borensztein and Pattillo (2005), Kaminsky, Lizondo and Reinhart (1997), Esquivel and Larrain (1998), Kaminsky and Reinhart (1999) and Ahluwalia (2000).

(2003), Kaminsky, Lizondo and Reinhart (1997)). The second generation models are subsequently described by the current account to GDP ratio, GDP growth and real domestic interest rate (Ahluwalia (2000), Kaminsky (2003)). Lastly, the real international interest rate is the indicator of Sudden Stop models (Kaminsky (2003)). The CAL variable and currency crisis index are used according to the same calculation methodology as in the previous panel. These macroeconomic data series are taken from the International Monetary Fund's IFS CD-ROM.<sup>159</sup> Following Glick, Guo and Hutchison's (2004) model, all variables were put in lag in order to limit simultaneity problems (Equation 3.).

As above this analysis will include two models: the benchmark probit equation and the augment specification probit equation. The second one will mainly focus on the impact of CAL on currency crisis episodes (see Equations 3, 4).

Table 14. Estimation equations

**Equation 3. Benchmark Currency Crisis Equation**

$$\Pr(CU_{it} = 1) = \Phi(\beta_0 + \beta_1 \text{Log}(M2/R)_{t-1} + \beta_2 CA/GDP_{t-1} + \beta_3 \Delta DC_{t-1} + \beta_4 r_{t-1}^* + \beta_5 \Delta GDP_{t-1} + \beta_6 CAL_{t-1})$$

**Equation 4. Benchmark Currency Equation**

$$\Pr(CU_{it} = 1) = \Phi(\beta_0 + \beta_1 \text{Log}(M2/R)_{t-1} + \beta_2 CA/GDP_{t-1} + \beta_3 \Delta DC_{t-1} + \beta_4 r_{t-1}^* + \beta_5 \Delta GDP_{t-1} + \beta_6 CAL_{t-1})$$

where CA- current account, GDP-GDP per capita,  $\Delta DC$  domestic credit growth  $r^*$ - international interest rate, r- real domestic interest rate,  $\Delta GDP$  - GDP growth CAL- 0/1 dummy variable based on the Chinn and Ito's (2002) index (4), CU-0/1 dummy variable based on my own currency crisis index.

Source: My own analysis.

I also decided to follow Rubin's (1979) suggestion instead of the Heckman et al. (1997) proposal and Glick, Guo and Hutchison's (2004) procedure with the aim of simplifying the analysis. Moreover, my decision about employing all kinds of observations (those with capital control and without capital control) is principally supported by the fact that there is a small size of sample and regional research purpose.

<sup>159</sup> Log ratio of broad money to foreign reserves (line 34 plus 35 divided by 11d times ae, GDP growth (99b), domestic credit growth (line 32) and real domestic interest rate (line 60/60B minus 64 xzf).

The estimated outcome of the currency crisis equation (see Table 15.) supports the previous result for the frequency calculation about the lack of negative correlation between CAL and currency crisis in this group of countries over this period (see Table 8,9,10,11). These results shows that liberalization of capital control reduces the standardized probit index by 0.22 of standard deviation on average (see Table 15.). Furthermore, this outcome suggests that currency crises during this period have the features of all generations of currency crisis models. This is because the sing of coefficient of some factors of second and third generation models is as expected (M2/foreing reserves, real international interest rate, GDP growth and domestic interest rate). Where the one unit change M2/foreing reserves or real international interest rate increase the probability of a currency crisis. On the other hand, the one unit changes in GDP growth domestic or interest rate is associated with a lower likelihood of a currency crisis. Moreover, both results from the two probit pane models might suggest that countries which have liberalized the regulation of capital flows have weak macroeconomic fundamentals which could cause a currency crisis (see Table 15.).

Table 15. Estimation of currency crisis equation

<b>Explanatory Variable</b>	<b>Benchmark probit equation</b>	<b>Augmented specification equation</b>
$Log(M2/R)_{t-1}$	1.84 (0.11)	1.79 (1.21)
$CA/GDP_{t-1}$	4.4 (0.6)	4.42 (8.4)
$\Delta DC_t$	-2.30e-11 (6.9e-11)	-2.15e-11 (6.2e-11)
$r_{t-1}^*$	1.58 (0.56)	1.56 (0.505)
$r_{t-1}$	-0.007 (0.412)	-0.006 (0.001)
$\Delta GDP_{t-1}$	-1.4e-12 (1.7e-12)	-1.37e-12 (1.7e-12)
$CAL_t$		-0.22 (0.5)
No.of observations	129	129

Note: The table reports estimation results of the population-average probit models.Constant excluded. Observations were weighted by GDP per capita (in dollars).

Source: My own estimations.

In this case, the series of currency crises which hit the emerging market economies of Central and Eastern Europe might fit the first generation canonical model (see Table 15.). However, these crises have had some features of others models such as serious

microeconomic weaknesses and delays in structural and institutional reforms (see Chapter 2.1- The Russian Crisis).

## CONSLUSION

In this paper, I have investigated the issue of whether CEE countries that allowed international capital to flow freely without substantial administrative controls on international payments, subject themselves to greater risk of currency turmoil. This issue is an important one particularly in CEE countries but is clearly not solved yet. In order to find solution to this problem I asked three research questions. My research focused on the group of 12 countries from the former Soviet Bloc: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Russian Federation, the Slovak Republic, Slovenia and the Ukraine.

Firstly, I looked at the theoretical literature and how this literature can explain the relationship between the effects of CAL and Currency Crisis. At the beginning I analysed four core models of currency crisis: the first generation model, the second generation model, the third generation model and the Sudden-Stop model. For example, the so-called first generation models are based on the belief that a currency crisis takes place because of inconsistencies between government policy (fiscal and monetary policy) and the exchange rate regime. To some extent, the moment of currency a crisis can be predicted. The second and third group of models proved that a crisis can take place even if the macroeconomic fundamentals are correct. These models point to a different reason for the crisis such as investors' expectations of future government policy (the second generation model) or the weak microeconomic fundamentals (the third generation model). Lastly, the Sudden-Stop model suggests the impact of pure speculation and animal spirits of investors on the exchange rate instability. I then attempted to connect this explanation of a currency crisis with the existing literature on CAL and neoclassical theory. Based on this theoretical information and CAL analysis I identified two main approaches. The first approach analysed the negative impact of an allocative efficiency and precondition reforms of CAL or sequences of CAL on the risk of currency crisis episodes. This approach suggests that CAL has a positive impact on the real economic factors (such as investments and saving) and then on the lower risk of economic-currency instability. The second approach focused on the "animal spirit" effect (irrational behaviour of investors, self-fulfilling expectations, fragility of financial/banking sectors etc.) and the lack of impact on real economic variables (Stiglitz (2000), Charlton and Stiglitz (2004), Williamson and Mahar (1998), Singh (2002), Dollar and Kray (2001)). This approach suggests that CAL increases the "animal spirit" effect and then increases the risk of currency instability. Moreover, I analysed the effect of capital control on the stability of

macroeconomic variables (interest rate, exchange rate etc.). However, this effect is somewhat unambiguous. This analysis suggests that there is a problem with the inefficiency of capital control, mainly due to the market savvy of investors in avoiding capital control regulations. After analysing the theoretical literature on CAL and currency crises, the main conclusion drawn is that countries with liberalized capital account may or maybe more susceptible to crises depending on a host of economic, administrative and political factors as well as investor perspectives.

Secondly, I explore whether there is any empirical evidence from single-country studies that might maintain the negative correlation between CAL and currency crisis episodes. I chose to investigate three case studies from the group of 12 countries: Russia (1998), Poland (1997-1998) and Latvia (1995-1996). Latvia is an example of rapid CAL (it became an IMF member in 1994) this country did not have an appropriate domestic regulation of banking and the financial sector (these are the preconditions of CAL) that can accelerate the banking crisis process (see Appendix 3.1 – Glick, Guo and Gruz's (2004) index). However, the Latvian strong macroeconomic policy allowed keeping the stability of the exchange rate. In contrast, Russia is an example of a fairly rapid CAL process before 1998 (Russia became an IMF member in 1996) and the closed the CAL after the crisis in 1998 (see Appendix 3.1 –Glick, Guo and Gruz's (2004) index). This currency crisis in August 1998 in Russia had mainly domestic roots similar to a typical first generation model. It provides evidence that impropriated sequence of CAL and lack of appropriate preconditions of CAL led to an increase in the risk of overreaction of the market and then to an increase in the probability of exchange rate collapse. However, there was also an important international dimension such as speculative attacks against the ruble in the fall of 1997 which were triggered by the crisis events in Asia, particularly in Hong Kong and Korea. This suggests that the role of the “animal spirit” effect where there is an increase in the likelihood of a currency crisis. Lastly, Poland is a case in which casual CAL process takes place (Poland became a member of the IMF in 1995, a member of the OECD in 1996 and of the EU in 2004). Poland is also an example of lack of currency crisis or banking crisis events even during the increased the number of the speculative attacks after the Asian, Czech Republic and Russian crises. This might suggest that an appropriate sequence of CAL may help to avoid currency crisis episodes. In order to summarise the information from these three case studies, the speed and sequence of the CAL process needs to be adequate for the country's institutional/ financial development and economic-political stability. If this economic-

political stability conditions do not apply, the CAL process might increase the probability of a currency crisis.

Thirdly, I investigated how a cross-country analysis might explain the relationship between the increase in the likelihood of CAL and the decrease of the risk of a currency crisis. My cross country analysis was based on the group of 12 countries from the CEE country region over the period 1995-2005. For this period, I identified 7 main currency crisis episodes and 5 countries with total liberalization of capital flows. All currency crises took place in the first half of the 1990's (specifically: Bulgaria in 1997, the Czech Rep. in 1997, Hungary in 1995, Romania from 1997, Russia in 1998, the Ukraine in 1995 and 1998). Additionally, they can be defined as the first generation with the same features as other models ( e.g. the Ukraine and the Russian crisis-contagion effect). In other words, most of the crises were connected to fiscal imbalances which led to depletion in international reserves of the central bank and speculative attacks against national currencies. Moreover, by using two different methods (probit-panel and frequency calculation), the cross-country analysis shows that CAL episodes did not have positive impact on currency crisis incidences for these groups of countries. Indeed, these results support previous literatures in this area.

Finally, concluding whole research about the link between CAL and currency episodes in CEE's countries, it can be said that evidence from CEE countries suggests that CAL should be imposed cautiously, taking into consideration the country's macroeconomic-political-institutional situation. The results of country cases and cross country analysis also find a negative link between CAL and the onset of a currency crisis but this link need to be analyzed on the long sample.

## BIBLIOGRAPHY

- Abigail J., Chiodo and Michael T. Owyang. A case study of a currency crisis: the Russian Default of 1998. *The Federal Reserve Bank of Louis Working Paper*, 2002.
- Aiyagari. Explaining Financial Market Facts: The importance of incomplete markets and transaction costs. *Federal Reserve Bank of Minneapolis Quarterly Review*. No.17, 1993, pp 17-31.
- Aiyagari S.R., Gertler M. Overreactions' of Asset Prices in General Equilibrium. *Review of Economic Dynamics*, 1996.
- Aghion P., Bacchetta P. and Banerjee A. Corporate Balance sheet approach to currency crises. *Working Paper*. No.01.05, 2001.
- Aghion P, Bacchetta P., Banerjee A. Currency crises and monetary policy in an economy with credit constraints. *European Economic Review*. No. 45, 2001, pp. 1121-50.
- Aghion P., Bacchetta P., Banerjee A. Simple model of monetary policy and currency crises. *European Economic Review*. No. 44, 1999, pp. 728-738.
- Aherane A., Griever W., Warnock F. Information Costs and Home Bias: an Analysis of U.S. Holding of Foreign Equities. *International Finance Discussion Paper*. No. 691, 2000.
- Ahluwalia P. Discriminating Contagion: An Alternative Explanation of Contagious Currency Crises in Emerging Markets. *IMF Working Paper*, WP/00/14, 2000.
- Albuquerque R. The Composition of International Capital Flows: Risk sharing through foreign direct investment. *Journal of International Economics*. Issue 2, 2003, 353-385.
- Altar A., Dumitru N. The impact of capital account liberalization on exchange rate and the competitiveness of the Romanian economy. *European Institute of Romania Study*. No 2, 2005.
- Arteta C., Eichengreen B., Wyplosz C. When does capital account liberalization help more than it hurts?. *NBER Working Paper*. No.8414, 2001.
- Arvai Z. Capital Account Liberalization, Capital Flow Patterns, and Policy Responses in the EU's New Member States. *IMF Working Paper*, 2005.
- Bai C., Wei S.J. Quality of Bureaucracy and Open Economy Macro Policies. *NBER Working Paper*. No. 7766, 2000.
- Banerjee A. A simple model of herb behaviour. *Quarterly Journal of Economics*. No.3, 1992, pp. 797-817.
- Bank of Latvia. Origins of the Banking Crisis. Annual Report, 1997.
- Baltagi P. *Econometric analysis of Panel Data*. New York 2005.

- Bartolini L., Drazen A. Capital Account Liberalization as a Signal. *American Economic Review*. No.87, 1997a, pp.138-154.
- Bartolini L., Drazen A. When Liberal Policies Reflect External Shocks, What do we learn? *Journal of International Economics*. No.42, 1997b, pp.151-161.
- Bekaert B., Harvey, Lundblad. Does financial liberalization spur growth?. *NBER Working Paper*. .No. 8245, 2001.
- Bekaert.B. Market Intergration and Investment Barriers in Emerging Equity Markets. *World Bank Economic Review*. vol. 9, 1995, pp.75-107.
- Bernank B. and Gertler M., (1989), Agency costs, net worth, and business fluctuations. *American Economic Review*. No.79, pp. 14–31.
- Bernank B., Gertler M., Gilchrist. *The Financial accelerator in a Quantitative Business Cycle Framework. Handbook of Macroeconomics*. Amsterdam 1999.
- Berg A., Borensztein E., Pattillo C. Anticipating Balance of Payments Crises: The Role of Early Warning Systems. *IMF Occasional Paper*. no. 186, 2000.
- Berg A., Borensztein E., Pattillo C. Assessing Early Warning Systems: How have they worked in practice. *IMF Staff Papers*. vol. 52, no. 3, 2005.
- Bikhchandani S., Sharima S.. Herd behaviour in financial markets: a review. *IMF Working Paper*. No. 48, 2000.
- Bilson J. Leading Indicators of Currency Devaluation. *Columbia Journal of World Business*. Vol. 14, 1979, pp.62-67.
- Blanco H., Garber P. Recurrent Devaluation and Speculative Attacks on the Mexican Peso. *Journal of Political Economy*. Vol. 94, 1986, pp. 148-166.
- Blanchard, O.J. Speculative bubbles, crashes and rational expectations. *Economics Letters*, 1979.
- Bordo M. Growing up to financial stability. NBER Working Paper. No. 12993, 2007.
- Breiman L., Friedman J.H., Olshen R.A., Stone C.J. *Classification and Regression Trees*. Wadsworth, Belmont 1984.
- Buch C.M. and Heinrich. Capital flows Transition Economies: How Risky is Financial Integration ?. *ICEGEC Working Paper* No. 2, 2002.
- Buch C.M.. Financial crisis in the Russian Federation: Are the Russians learning to tango?. *Economics of Transformation*. Vol. 7,1999, pp. 687-715.
- Buiter W.H. Borrowing to defend the exchange rate and timing and magnitude of speculative attacks”, *NBER Working paper*. No.1844, 1986.

- Buiter W.H., Taci A. Capital Account Liberalization and financial Sector Development in Transition Countries in *Capital Liberalization in Transition Countries: Lessons from the Past and for the Future*. ed A. Bakker and B.Chapple. Cheltenham, England, and Northampton, Massachusetts 2003.
- Burnside C., Eichenbaum M., Rebelo S. On the fiscal implications of twin crises. *Federal Reserve Bank of Chicago. Working Paper*, 2001.
- Bustelo P. Capital Flows and Financial Crises: A comparative analysis of East Asia (1997-1998) and Argentina (2001-2002). *University of Madrid Working Paper*. No. 2004-017, 2004.
- Calomiris C. Lessons from the Tequila Crisis for successful financial liberalization. *Journal of Banking & Finance*. Vol 23, 1999, pp. 1457-1461.
- Campion M. K., and Neumann R. M. Compositional Effects of Capital Controls: Evidence from Latin America. *North American Journal of Economics and Finance*. Vol. 15 No. 2, 2004, pp. 161–178.
- Caprio G. Honohan P., Stiglitz J.E. *Financial Liberalization How Far, How Fast?*. Cambridge 2001.
- Calvo G. Capital flows and Capital-Market Crises: The simple economics of Sudden Stops. *Journal of Applied Economics*, Vol. 1. No.1,1998, pp.35-54.
- Calvo G.A., Izquierdo A., Mejia L.F. On the Empirics of Sudden Stops: the relevance of balance-sheet. *Inter-American Development Bank Research Working Paper*. No. 509, 2004.
- Calvo G., Izquierdo A., Talvi E. Sudden Stops, the Real Exchange Rate and fiscal Sustainability: Argentina's Lessons. *IADB Research Department Working Paper*, 2002.
- Calvo G., Mendoza E.G.. Rational contagion and the globalization of securities markets. NBER Working Paper , 2000.
- Calvo G., Reinhart. Rational contagion and the globalization of securities markets. *Journal of International Economics*, Vol. 51, 2000, pp. 79-113.
- Calvo G, Talvi E. Sudden Stop, Financial Factors and Economic Collapse in Latin America: Learning from Argentina and Chile, *NBER Working Paper 11153*, 2005.
- Central Bank of the Russian Federation. *Annual Report*, 1998.
- Сергей Матыцин, Ирина Синицина. Банковская система и финансовый рынок России в 1994-1995 гг. *Центр социально-экономических исследований*. Vol.61, 1995, pp.11-15.
- Cerra V., Saxena S.C. *Contagion, Monsoons and Domestic Turmoil in Indonesia: A Case Study in the Asian Crisis*. Washington 1998.

- Chanda N. The influence of capital controls on long-run growth: Where and how much?. *International Finance*. No. 02010001, 2001.
- Chang R., Velasco A. Financial fragility and the exchange rate regime, *NBER Working paper*. No. 6469, 1998 a.
- Chang R., Velasco A. Financial Crises in Emerging Markets: A canonical model. *Federal Reserve Bank of Atlanta Working paper*, 1998b.
- Chang R., Velasco A. The Asian liquidity crisis. *NBER Working paper*. No.6796, 1998c.
- Chapman S.A. and Mulino M. Explaining Russia's currency and financial crisis. *Kluwer Academic Publisher*. Vol.11, 2001, pp. 350-366.
- Chari A., Henry P.B. Capital Account Liberalization: Allocative Efficiency or Animal Spirits?, 2000.
- Charlton A, Stiglitz J E.Capital Market Liberalization and Poverty. *Initiative for Policy Dialogue Working Paper*. No. 118, 2004.
- Chinn M.D, Ito H. Capital Account Liberalization, Institutions and Financial Development: Cross Country Evidence. *NBER Working Paper*. No. 8967, 2002.
- Cowan K, De Gregorio J. International Borrowing, capital controls and the exchange rate: lessons from Chile. *NBER Working Paper*. No 11382, 2005.
- Dąbrowski Marek. The Episodes of Currency Crisis in the European Transition Economies. *CASE Report*. No. 40, 2001.
- De Gregorio J., Edwards S. , Valdés R. Controls on Capital Inflows: Do they work?. *Journal of Development Economics*. Vol. 63. Issue 1, 2000, pp.59-83.
- Dehejia R., Wahba M. Propensity Score Matching Methods for Non-experimental Causal Studies. *Review of Economics and Statistics*. Vol. 84 No.1, 2002 ,p. 151-161.
- Demetriades P.O., Luintel K.B. Financial Restraints in the South Korean Miracle. *Journal of Development Economics*. Vol. 64, No. 2, 2001, pp.459-479.
- Demirguc-Kunt A., Detriagiache E. Financial Liberalization and Financial Fragility. *IMF Working Paper*. No. 98/83, 1998.
- Desai M, Foley F.C., Hines James R. Capital controls, liberalizations, and foreign direct investment, *NBER Working Paper*. No.10337, 2004.
- Desai.M. Why did the ruble collapse in August 1998. *American economic Review*. Vol. 90. No.2, 2000.
- Devereux Micheal P. Taxes in EU New Member States and the Location of Capital and Profit. *IFS and CEPR*, 2006.

- Diamond D. W., Dybvig P. H. Bank runs, deposit insurance, and liquidity. *Journal of Political Economy*. Vol. 91 .No.3, 1983, pp.401-419.
- Dollar Kraay. Trade, growth and poverty. *The World Bank Policy Research working paper* No. 2615, 2001.
- Dolley Micheal. A. Survey of Academic Literature on Controls over International Capital Transactions. *IMF Working Paper*. No. 95/127, 1995.
- Dooley Micheal. Capital controls and emerging markets. *Journal of Finance and Economics*, 1996, s. 197-2005.
- Dooley M.D., Mathieson, Rojas-Suarez L.Capital Mobility, and Exchange Market Intervention in Developing Countries. *NBER Working Paper*. No. 6247 , 1997.
- Dornbusch R. Expectations and exchange rate dynamic, *The Journal of Political Economy*, 84, no.6, 1976, pp.1161-1176.
- Dornbush R. Collapsing exchange rate regimes. *Journal of Development Economy*. Vol. 27, 1987, pp.71-83.
- Dornbusch R. Special exchange rates for Capital Account Transactions. *World Bank Economic Review*. Vol.1, 1986, pp. 3-33.
- Duce M. Definitions of foreign direct investment (FDI): a methodology note. *BIS Meeting of the CGFS Working Group on FDI in the financial sector*, 2003.
- Durhan J.B. Foreign Portfolio Investment, Foreign Bank Lending and Economic Growth. *International Finance Discussion Papers*. No. 757, 2003.
- Durlauf Steven N., Johnson Paul. Multiple Regimes and Cross Country Growth Behavior. *Journal of Applied Econometrics*. Vol. 10 No. 4, 1995, pp. 365-384.
- Easterly W., Islam R., Stightz J.E.. Shaken and stirred: Explaining growth volatility. *Annual World Bank Conference on Development Economics*, 2001.
- Eaton J, Gersovitz M. Debt with Potential Repudiation: Theoretical and empirical Analysis. *Review of Economic Studies*. No. 48. 1981, pp. 289-309.
- Edison H.J, Klein M., Ricci L, Slók.Capital Account Liberalization and Economic Performance: Survey and Synthesis. *IMF Working Paper* No. WP/02/120, 2002.
- Edison H.J., Reinhart. Capital Controls during Financial Crises: the Case of Malaysia and Thailand. *International Finance Discussion Paper*. No. 662, 2001b.
- Edison H.J, Reinhart. Stop Hot Money. *Journal of Development Economics* .Vol. 66 No.2, 2001a ,pp. 533-553.

- Edison H.J., Warnock F.E. A Simple measure of the intensity of capital controls. *IMF Working Paper* . No. 01/180, 2001.
- Edwards S. Capital Mobility and Economic Performance: Are Emerging Economic Different?. *NBER Working Paper* .No. 8076, 2001.
- Edwards S. *Real Exchange Rates, Devaluation and Adjustment: Exchange Rate Policy in Developing Countries*. Cambridge 1989.
- Edwards S. On Crisis Prevention: Lessons from Mexico and East Asia. *NBER Working Paper*. No. 7233, 1999.
- Edwards S., Montiel P. Devaluations, Crises, and the Macroeconomic Consequences of Postponed Adjustment in Developing Countries. *IMF Staff Papers*. Vol. 36, 1998, pp. 875-903.
- Eichengreen B. Capital Account Liberalization : What do Cross-Country Studies Tell us?. *World Bank Economic Review*. Vol.15 No.3, pp. 341-365, 2001.
- Eichengreen B, Rose A, Wyplosz C. Contagious Currency Crises. *NBER Working Paper*. No. 5681, 1997.
- Eichengreen B. Capital Account Liberalization: What do cross-country studies tell us?. *The World Bank Economic Review*. Vol. 15. No.3, 2001 pp.341-365.
- Eichengreen B, Rose A, Wyplosz C. Exchange market mayhem: the antecedents and aftermath of speculative attacks. , Vol. 21,1995, pp. 249-312.
- Eichengreen B, Rose A, Wyplosz C. Contagious Currency Crises: First Tests. *Scandinavian Journal of Economics*, Vol. 98 . No.4,1996, pp. 463-84.
- Eichengreen B, Rose A. The empirics of currency and banking crises. *NBER Working Paper*, 2001.
- Eiteman D, Stonehill A., Moffett M.. *Multinational Business Finance*. Chicago 2006.
- Elitzur R., Mintz J. Transfer pricing rules and corporate tax competition. *Journal of Public Economics*. Vol. 60, 1996, pp.401-422.
- Esquivel G, Larrain F. *Explaining currency crises*. Harvard 1998.
- Falzone A. M .Statistic on Foreign Direct Investment and Multinational Corporations: A Survey. *Research Network on Foreign Direct Investment and the Multinational Corporation : New Theories and Evidence*, TMR Programme of the European Commission Governors of the Federal Reserve System, 2000.
- Feldstein M, Horiok C. Domestic Saving and International Capital Flows. *Economic Journal*. Vol. 90. No. 358, 1980, pp. 314-329.

- Fisher S.. Capital Account Liberalization and the Role of IMF. Paper presented at the seminar Asian and the IMF, held in Hong Kong, China, on September 19, 1997.
- Fleming J.M., Talley. The Latvian Banking Crisis: Lessons learned. *Working Bank Policy Research Working Paper*. No. 1590 , 1996.
- Flood, R. and Garber P. Collapsing Exchange-Rate Regimes: Some linear examples'', *Journal of International Economics*. Vol. 17, 1984, pp.1-13.
- Flood R., Garber P. and Cramer. Collapsing Exchange-Rate Regimes: Another linear examples. *Journal of International Economics*. Vol. 41. 1996, pp.223-234.
- Flood R. and Marion N. Perspective on the recent currency crisis literature. *NBER Working Paper*. No. 6380, 1998.
- Flood R., Hodrick R.Real aspects of exchange rate choice with collapsing fixed rates. *Journal of International Economics* 21. No. 3/4 , 1986, pp. 215-232.
- Franckel J.A., Rose A.K.. Currency Crashes in Emerging Markets: An Empirical Treatment, *International Finance Discussion Paper*. No. 534, 1996.
- Furman J, Stiglitz J.E. Economic crises: evidence and insights from East Asia. *Brookings Papers on Economic Activity*, 1999.
- Freedom House, Country Reports 2006, downloaded 10<sup>th</sup> August 2007 <http://www.freedomhouse.org/> .
- Furman J, Stiglitz J.E., Bosworth B.P., Radelt S. Economic Crises: Evidence and Insights from East Asia. *Brookings Papers on Economic Activity*. Vol. 1998, No.2, 1998, pp.1-135.
- Gaidar Y.. Lessons of the Russian Crisis for Transition Economies. *Finance & Devepolment*. Vol. 36. No.2, 1999.
- Galbis V. Currency Convertibility and the Fund: Review and Prognosis. *IMF Working Paper*. No. 96/39, 1996.
- Gallego F., Hernandez L. Microeconomics effects of Capital Controls: the Chilean experience during the 1990s. *International Journal of Finance and Economices*. Vol. 8, 2003, pp. 225-254.
- Gallego F., Hernández L., Schmidt-Hebbel. Capital Controls in Chile: Effective, Efficient?.Central Bank of Chile Working Paper Series. No. 59, 1999.
- Gerlach S., Smets F. (1995), '' Contagious speculative attacks'', *European Journal of Political Economy*. Vol.11, 1995, pp.45-63.
- Glick R., Hutchison M. Capital Controls and Exchange Rate Instability in Developing Economies. *Federal Reserve Bank of San Francisco Centre for Pacific Basin Studies Working Paper* . No. PB00-05, 2000.

- Glick R., GuoX., Hutchison M. Currency Crises, Capital Account Liberalization and Selection Bias. *Federal Reserve Bank of San Francisco Working Paper*, 2004.
- Gökkent G.M. Theory of foreign portfolio investment. *PhD thesis at Florida International University*, 1997.
- Goldberg L.G. Predicting exchange rate crises, Mexico revisited. *Journal of International Economics*. No.36, 1996, pp.413-430.
- Gourinchas, Jeanne. On the Benefits of Capital Account Liberalization for Emerging Economies. *IMF Working Paper*, 2002.
- Gregorio, Edwards S, Valdes. Controls on Capital Inflows: Do they Work?. *NBER Working Paper*. No. 7645, 2000.
- Griffith S., Gottschalk R., Cirera X. The OECD experience with capital account liberalization. *Institute of Development Studies University of Sussex Working Paper*, 2000.
- Grilli V., Milesi-Ferretti G.M. Controls on Capital Inflows: Do They Work?, *NBER Working Paper* No. 7645, 1995.
- Gruszczynski M. *Kryzysy walutowe a liberalizacja obrotów kapitałowych*. Warszawa 2002.
- Grubert H., Mutti J. Taxes, Tariffs and Transfer Pricing in Multinational Corporate Decision Making” *The Review of Economics and Statistic*. Vol. 73, No.2, pp.285-293, 1991.
- Gurvich E., Andryakov A. A model of the Russian crisis development. *Economics Education and Research Consortium Working Paper* .No. 02/03, 2002.
- Hallangan. Speed and sequencing of market reforms: The case of banking in Latvia. *Contemporary Economic Policy*, Vol. 15, Issue. 2, 1997.
- Harberger, A. C. On the use of distributional weights in social cost-benefit analysis. *Journal of Political Economy*. No.86, 1978, pp 87-120.
- Harberger, A. C. On the use of distributional weights in social cost-benefit analysis: reply. *Journal of Political Economy*, No.88, 1980, pp.1050-52.
- Heckman J, Hidehiko I, Petra T Matching as an Econometric Evaluation Estimator. *Review of Economic Studies*, Vol. 65, Issue 2, 1997, pp. 261-294.
- Hendry P.B. Stock Market Liberalization, Economic Reform, and Emerging Market Equity Prices”, *Journal of Finance*, Vol. 55, 2000.
- Hendry P.B. Capital Account Liberalization, the cost of capital and economic growth” NBER Stanford University, 2003.

- Henry P.B. Capital Account Liberalization: Theory, Evidence and Speculation. *NBER Working Paper* No. 12698, 2006.
- Heritage Foundation and The Wall Street Journal, downloaded 1<sup>st</sup> June 2007, *2007 Index of Economic Freedom*. <http://www.heritage.org/research/features/index/index.cfm/>.
- Holmes M., Wu Y. Capital Controls and Covered Interest Parity in the EU: Evidence from a Panel-Data Unit Root. *Weltwirtschaftliches Archiv* No. 133, 1997, pp. 76-89.
- Hutchison M., Noy. Sudden Stops and the Mexican Wave: Currency Crises, Capital Flow Reversals and Output Loss in Emerging Markets. *University of California, Santa Cruz Working Paper* No. 0413, 2004.
- IMF. *World Economic Outlook*, Washington, 2001.
- IMF *Annual Report on Exchange Arrangements and Exchange Restrictions* , Washington 1995.
- IMF *Annual Report on Exchange Arrangements and Exchange Restrictions* , Washington 1996.
- IMF *Annual Report on Exchange Arrangements and Exchange Restrictions* , Washington 1997.
- IMF *Annual Report on Exchange Arrangements and Exchange Restrictions* , Washington 1998.
- IMF *Annual Report on Exchange Arrangements and Exchange Restrictions* , Washington 1999.
- IMF *Annual Report on Exchange Arrangements and Exchange Restrictions* , Washington 2000.
- IMF *Annual Report on Exchange Arrangements and Exchange Restrictions* , Washington 2001.
- IMF *Annual Report on Exchange Arrangements and Exchange Restrictions* , Washington 2002.
- IMF *Annual Report on Exchange Arrangements and Exchange Restrictions* , Washington 2003.
- IMF *Annual Report on Exchange Arrangements and Exchange Restrictions* , Washington 2004.
- IMF *Annual Report on Exchange Arrangements and Exchange Restrictions* , Washington 2005.
- IMF *Annual Report on Exchange Arrangements and Exchange Restrictions* , Washington 2006.

- IMF. Exchange Rate Arrangements and Currency Convertibility: Developments and Issues, *World Economic and financial Survey*, Washington 1995.
- IMF. The IMF's Approach to Capital Account Liberalization. *Evaluation Report*, 2005.
- IMF. IMF Approves augmentation of Russia Extended arrangement and credit under CCFF; Activates GAB, 1998.
- IMF. *Balance of Payments Manual*, Washington 1993.
- Itay G, Razin A. Foreign direct investment vs foreign portfolio investment. *NBER Working Paper*. No.11047, 2005.
- Johnston B., Ötoker-Robe I. A modernized approach to managing the risks in cross-border capital movements. *IMF Policy Discussion Paper*, 1999.
- Johnston B., Ryan C. The impact of controls on capital movement on the private capital account of countries' balance of Payments: Empirical Estimates and Policy Implications. *IMF Working Paper*. No. 94/97, 1994.
- Kaminsky G L. Currency and Banking Crises: The Early Warnings of Distress. *International Finance Discussion Papers*. No. 627, 1998.
- Kaminsky G L. Varieties of currency crises. *NBER Working Paper Series*, 2003.
- Kaminsky G., Lizondo S., Reinhart C.M. Leading indicators of currency crises. *IMF Working paper*, 1998.
- Kaminsky G., Reinhart C.M. The twin crises: The causes of Banking and Balance-of-Payments Problems. *International Finance Discussion Paper* no. 544 , 1996.
- Kaminsky G.L., Reinhart C.M. The twin crises: the cause of banking and balance-of-payments problems. *The American Economics Review*, Vol. 89 No. 3, 1999, pp.473-500.
- Kaminsky G, Schumukler S. L.Short-Run Pain, Long-Run Gain: the Effects of Financial Liberalization. *IMF Working Paper*. No. 03/34, 2003.
- Kaplan E., Rodrik D. Did the Malaysian capital controls work?. *CEPR Discussion Paper*. No. 2754, 2001.
- Kawai M., Takagi S. Rethinking capital controls: the Malaysian experience. *Macroeconomics Working Papers* No. 473, 2003.
- Kim S., Kim S., Wang Y. Macroeconomic Effects of Capital Account Liberalization: The Case of Korea. *Kiep Working Paper* . No. 02-01, 2002.
- Kiyotaki N., Moore J. Credit Cycles. *Journal of Political Economy* Vol. 105 No.2 , 1997, pp 211-248.

- Klein M., Olivei G. Capital Account Liberalization, Financial Depth and Economic Growth. *NBER Working Paper*. No. 7384, 2001.
- Kopits G. Implications of EMU for exchange rate policy in Central and Eastern Europe, *IMF Working Paper*, 1999.
- Kraay A. In search of the Macroeconomic effect of Capital Account Liberalization. The World Bank, 1998.
- Kregel J.A. Some Risks and Implications of Financial Globalization for National Policy Autonomy. *UNCTAD Review*, 1996.
- Krkoska L. Foreign direct investment financing of capital formation in central and eastern Europe. *EBRD Working Paper*. No. 67, 2001.
- Krueger A. *Financial deregulation and integration in East Asia*, University of Chicago, 1996, pp.7-42.
- Krugman P. A model of balance of payment crises. *Journal of Money, Credit and Banking*. Vol. 11. No.3, 1979, pp. 311-325.
- Krugman P. Are currency crises self-fulfilling?. NBER Macroeconomics Annual, 1996.
- Krugman P. *Analytical Afterthoughts on the Asian Crisis*, mimeo, MIT, 1999b.
- Krugman P. *What happened to Asia*. mimeo. MIT, 1998.
- Krugman P. Balance sheets, the transfer problem, and financial crises, in P. Isard, A. Razin, and A. Rose (eds.), *International Finance and Financial Crises*, Essay in Honour of Robert P. Flood, Kluwer, 1999 a.
- Krugman P., Obstfeld M. *International Economics, Theory and policy*, 2003, London.
- Lane P.R, Milesi-Ferrtti G. M. Capital Flows to Central and Eastern Europe. *IMF Working Paper*. No.06/188, 2006.
- Lankes K.B., Stern N. Capital flows to eastern Europe and the former Soviet Union . *European Bank for Reconstruction and Development Working paper* . No. 27, 1998.
- Le Fort G., Lehman S. The Unremunerated Reserve Requirements and Net Capital Flows: Chile in the 1990s. *CEPAL Review*. No. 81, 2003.
- Levine R. and Zervos. Stock Markets, Banks and Economic Growth. *American Economic Review*. Vol. 88 , 1998, pp.537-558.
- Licchetta M. Macroeconomic effects of capital account liberalization in emerging markets. *Phd in Economics Working Papers University of Rome*. No. 1, 2006.

- Linne T. The links between Polish and International Financial Markets. *Center for Economic and Social Research: Studies and Analyses*. No. 170, 1999.
- Lipsey E.R The role of foreign direct investment in international capital flows. *NBER Working Paper*. No.7094, 1999.
- Lopez A. Mejia Alejandro S. Large Capita Flows: A survey of the causes, consequences, and policy responses. *IMF Working Paper*. No. 99/77, 1999.
- Nadal-De Simone F., Soros G. A Review of Capital Account Restrictions in Chile in the 1990s. *IMF Working Paper* . No. 99/52, 1999.
- Neely Ch.J. The giant sucking sound: did NAFTA devour the Mexican peso. *Review Reserve Bank of St Louis*. Issue July, 1996 ,pp. 33-18.
- Małeckı W., Sławiński A., Piasecki R., U. Żuławska U. (2001). *Kryzysy walutowe*. Warszawa 2001.
- Mathieson D. M., Rojas-Suarez L.. Liberalization of the Capital Account: Experiences and Issues. *IMF Occasional Paper*. No. 103, 1993.
- Martin P., Rey H. Financial Globalization and Emerging Markets: With or Without Crash?. *NBER Working Paper*. No.9288, 2002.
- Masson P.Contagion: Monsoonal effects, Spillovers, and Jumps between Multiple Equilibria. *IMF Working Paper*, 1998.
- McKinnon R.I.*The Order of Economic Liberalization*. New York 1993.
- McKinnon Ronald I., Huw Pill. Credible Economic Liberalizations and Overborrowing. *American Economic Review* No. 87:2, 1997, pp.189-193.
- Mc Kinnon R.I, Pill H. Exchange-Rate Regimes for Emerging Markets: Moral Hazard and International Over-borrowing. *Oxford Review of Economic Policy*. Issue 15 No. 3,1999.
- Mendoza E., Smith. Margin Calls, Trading Costs, and Asset Prices in Emerging Markets: The Financial Mechanics of the Sudden Stop Phenomenon. *NBER Working Paper*. No. 9286, 2002.
- Mendoza E. Credit, prices, and crashes: Business cycles with a sudden stop. *NBER Working Paper*. No. 8338, 2001.
- Milesi-Ferretti G.M. Why Capital Controls? Theory and Evidence in Sylvester Eijffinger and Harry Huizinga eds. *Positive Political Economy: Theory and Evidence*, Cambridge 1998.
- Mishkin F. S. Understanding Financial Crises: A Developing Country Perspective in Michael Bruno and Boris Pleskovic, eds., *Annual World Bank conference on development economics*. Washington DC: World Bank, 1996,pp. 29–62.

- Montiel, P., and Reinhart C.M.. Do Capital Controls and Macroeconomic Policies Influence the Volume and Composition of Capital Flows? Evidence from the 1990s. *Journal of International Money and Finance*. Issue 18 No. 4, 1999, pp. 619–635.
- Morales R.A. Czech Koruna and Polish Zloty Currency Options: Information Content and EU-accession Implications. *IMF Working Paper*, 2000.
- Mussa M. *Argentina and the fund: from triumph to tragedy*. Institute for International Economics, Washington 2002 .
- Obstfeld M. (1986) “Capital Mobility in the World Economy: Theory and measurement” in *Carnegie-Rochester conference series on Public Policy*, Vol.24, 1986.
- Obsfeld M.The logic of currency crises. *Cahiers Economiques et Monetaires*. No. 43, 1996.
- Obsfeld M. Rational and Self- Fulfilling balance of payments crises. *The American Economics Review*. Vol. 76, No. 1, 1986, pp. 78-81.
- Obstfeld M. Speculative attacks and external constraint in a maximising model of the balance payments. *Canadian Journal of Economics* No.19,1986, pp. 1-22 .
- O’Donnell B. Financial Openness and Economic Performance. Cambridge, 2001.
- Orłowski L. The Asian and Russian Financial Crises: Propagation effects and policy responses in Central Europe’s Transition Economies. *Halle Institute of Economic Research Working Paper*, 1999 a.
- Orłowski L. The development of Financial markets in Poland. *Center for Economic and Social Research: Studies and Analyses*, 1999 b.
- Ozkan F.G, Sutherland A.Policy measures to avoid a currency crisis. *The Economic Journal*. No. 105, 1995, pp. 510-519.
- Pawlik K.Dataset on Foreign Affiliates in Poland 1993-2002. *Department of Management and International Business Aarhus School of Business Working paper*. No. 04-10,2003.
- Pazarbaşıoğlu C., Ötker I.Likelihood versus timing of speculative attacks: A case study of Mexico. *European Economic Review*. 41, 1997, pp.837-845.
- Peltonen T.A. Are emerging market currency crises predictable?.*EBC Working Paper*. No. 571, 2006.
- Person T. Currency Unions and Trade: How large is the treatment effect?. *Economic Policy*, 2001, pp. 435-448.
- Prasad E., Kenneth r., Wei S.J., Kose M. A. Effects of Financial Globalization on Developing countries: some empirical evidence. *IMF Working Paper*, 2003.
- Quinn D.P. The Correlates of Changes in International Financial Regulation. *American Political Science Review*. Vol 91. No. 3, 1997, pp.531-551.

- Quirk P.J., Evans. The Correlates of change in International Financial Regulation. *American Political Science Review*. Vol. 91, No. 3, 1995, pp. 531-551.
- Quirk P.J. Adopting currency convertibility: experience and monetary policy considerations for advanced developing countries. *IMF Working Paper* No.96, 1994.
- Rajan N., Globalization of capital markets: Some analytical and policy issues in Globalization and Economic Development. Essay in honor of Waardenburg, Eds. Storm, Naastepad. Edward Elgar, 2003.
- Radel S., Sach J. The onset of the East Asian Financial Crisis, *NBER Working Paper*, No.6680,1998.
- Ramey V., Ramey G. Volatility and Growth. *American Economic Review*, 85(3),1995, pp. 559-586.
- Reisen H. Domestic causes of Currency Crises: Policy lesson for Crisis Avoidance'', *OECD Development Centre Working Paper* ,1998.
- Rodrik D. Who needs capital –account convertibility. *Essays in International Finance*. No. 207,1998.
- Rodrik D. Velasco A. Short-term Capital Flow. *Annual World Bank Conference on development Economics*, 1999, pp.59-90.
- Rothenberg D.A. and Warnock F.E. Sudden flight and true sudden stops. *NBER Working Paper*. No. 12726, 2006.
- Rubin D.B. Using multivariate matched sampling and regression adjustment to control bias in observational studies. *Journal of the American Statistical Association*. Vol. 74 No. 366, 1978.
- Rybiński K. Impediments to the Development of Polish Financial Markets. *Center for Economic and Social Research: Studies and Analysis*. No. 15, 1998.
- Sachs J, Tornell A., Velsco A. Financial crises in emerging markets: the lessons from 1995. *NBER Working Paper*. No. 5576, 1996.
- Sadowska-Cieslak E.Znaczenie zagranicznych inwestycji bezpośrednich dla polskiej gospodarki. *Zeszyt BRE Bank CASE*. Nr. 48, 2000 ,pp.7-30.
- Salant S., Henderson D. (1978), '' Market anticipation of government policy and the price of gold'', *Journal of Political Economy*. Vol. 86, pp.627-648.
- Saxena N., Wong S. Currency Crises and Capital Controls : A selective Survey. *World Bank Working Paper*, 1999, pp.16-18.
- Schleifer A., Triesman D. *Without a Map: Political Tactics and Economic Reform in Russia*, Cambridge 2000.

- Schneifer A. Conference on Capital Account Liberalisation: A Developing Country Perspective, 2000.
- Shatz H. *The location of U.S. multinational affiliates*, Harvard, 2000.
- Singh A. Capital Account liberalization, free long-term capital flows, financial crises and economic development. *ESRC Centre for Business Research University of Cambridge*, 2002.
- Stiglitz J. E. *Globalisation and its discontents*. New York 2002.
- Stiglitz J.E. Capital market liberalization, economic growth and instability. *World Development*. Vol. 28. No.6, 2000, pp. 1075-1086.
- Stiglitz, Charlton. Capital market liberalization and poverty“ *Initiative for Policy Dialogue Working paper*, 2004.
- Standard&Poors. *S&P Emerging Market Index methodology*. New York 2006.
- Stock, James H., Watson, Mark W. New Indexes of Coincident and Leading Economic Indicators,” in Olivier Jean Blanchard and Stanley Fischer, eds. *NBER Macroeconomics Annual*, 1989, pp. 351–94.
- Stulz R.M. Globalization of equity markets and the cost of capital. *Conference on Global Equity Markets*, 1999.
- Summers L.H. International Financial Crises: Causes, Prevention and Cures. *American Economic Review*. Issue 90. No. 2, 2000, pp.1-16.
- Süppel R. Russian’s financial market boom, crisis and recovery 1995-2001, 2002.
- Sutela P. The Financial Crisis in Russia. Bank of Finland Institute for economics in transition. *BOFIT Working Paper*, 1999.
- Swank D. Funding the Welfare State: Globalization and the Taxation of Business in Advanced Market Economies. *Political Studies*, 1998.
- Tobin J. A proposal for International Monetary Reforms. *Eastern Economic Journal*. Vol. 4, 1978, pp. 153—159.
- Tudela M. Explaining currency crisis: A duration model Approach. *Journal of International Money and Finance*. Vol. 23 No.5, 2004.
- Uri Dadush, Dipak Dasgupta, and Dilip Ratha. The Role of Short –term debt in recent crisis. *Finance & Development*. Vol.37. No.4, 2000.
- Williamson J., Mahar. A Survey of Financial Liberalization. *Princeton essays in International Finance*. No. 211, 1998.

- Williamson J., Drabek J. Whether and When to liberalize Capital Account and financial services. *WTO Staff Working Paper*. No. 99-03, 1999.
- Wong C, Yunk P. Black market exchange rates and capital mobility in Asian Economics. *Contemporary Economic Policy*. Vol.15 No.1,1997. pp 21-36
- World Bank. *World Development Report 2002: Building Institutions for Markets*. Oxford, 2002.
- Wyplosz C., Halpern L. Equilibrium Exchange Rates in Transition Economies. *International Monetary Fund Staff Papers*. Vol. 44 No.4, 1997, pp. 430-461.
- Wyplosz C. How Risky is Financial Liberalization in the Developing Countries?. *CEPR Discussion Paper*. No. 2724, 2001.
- Wyplosz C., Nadezhda Ivanova. Who Lost Russia?. *Graduate Institute of International Studies Working Paper*. presented at the conference Money Doctors in Paris on December 14-16, 2000.
- Velasco A. *The impossible duo? Globalization and Monetary independence in Emerging Markets*. Mimeo, Harvard University, 2001.
- Żywiecka H. Przyczyny i mechanizmy kryzysów walutowych ze szczególnym uwzględnieniem znaczenia międzynarodowych przepływów kapitału. *Materiały i Studia Narodowego Banku Polskie*, 2002.

## INDEXES

### Henceforth index

CAL	- Capital Account Liberalization
IMF	- International Monetary Fund
CEE	-Central Eastern Countries
GGH model	- Glick, Guo, Hutchison's model
IFS	-International Financial Statistics
DCSD EWS models	- Developing Country Studies Division of the IMF -Early Warning System models
CI4	-Chinn and Ito's(2002) index with the capital transaction regulation
CI3	- Chinn and Ito's (2002) index without the capital transaction regulation
AREA	- Annual Report on Exchange Arrangements and Exchange Restrictions

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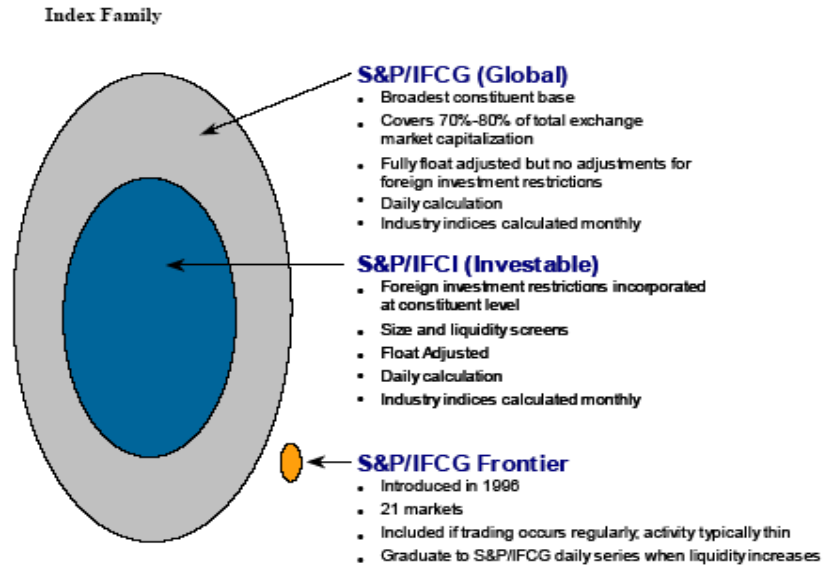
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## APPENDIXES

### Appendix 1.1. IFCI and IFCG index

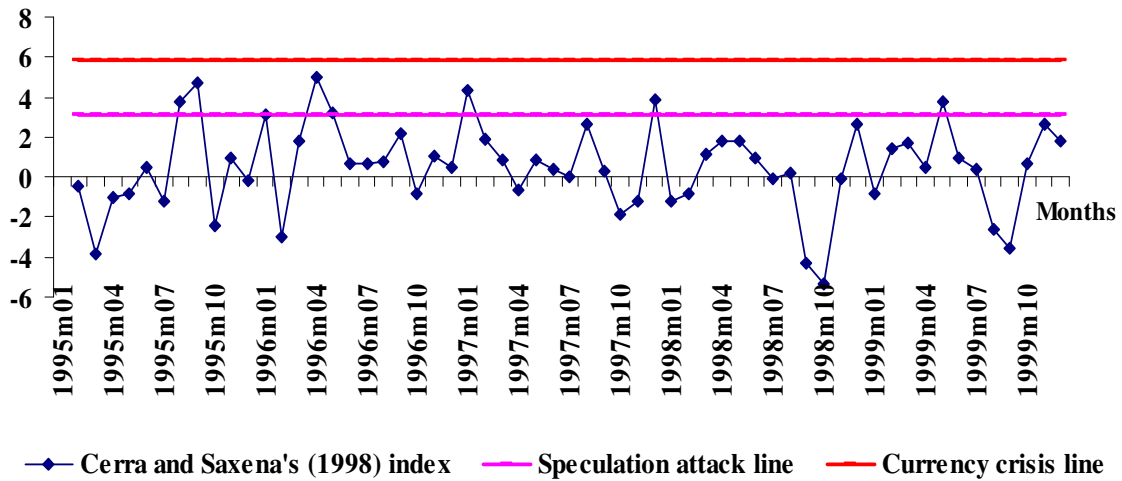
Fig. 1. IFCI and IFCG indexes



Source: Standard & Poor (2006).

## Appendix 2.1 Market Pressure Indexes

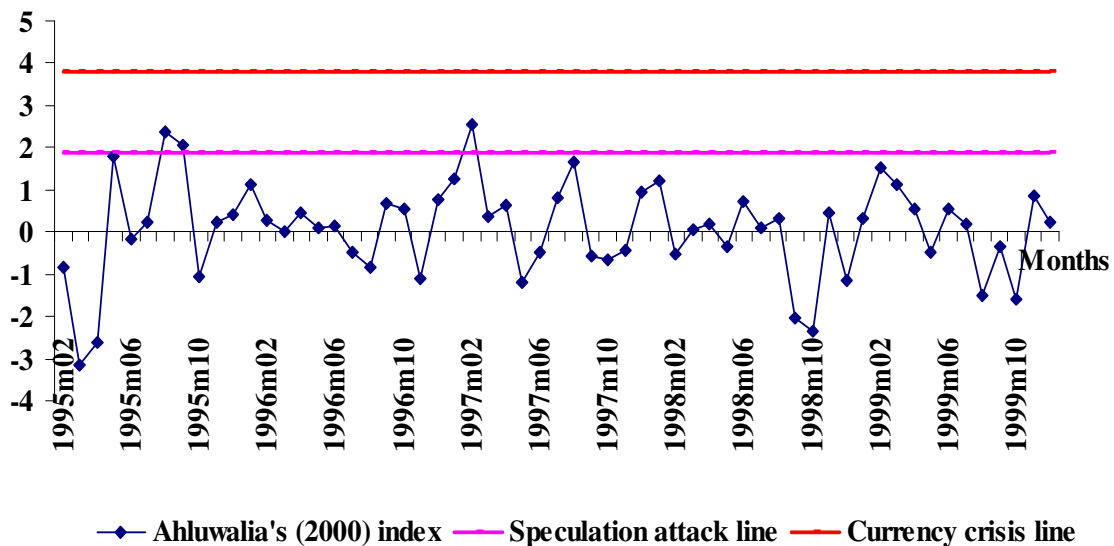
Fig. 1. Cerra and Saxena's (1998) market pressure index for Latvia



Note: The definition of speculative attack was defined the cut-off point as  $MPI_x > \mu_{MPI_x} + 1.5 * \sigma_{MPI_x}$  where  $\mu$  is the mean of the MPI in country  $x$ , and  $\sigma$  is the standard deviation of MPI. The currency crisis is described when  $MPI_x > \mu_{MPI_x} + 3 * \sigma_{MPI_x}$ .

Source: My own calculations based on IFC CD.

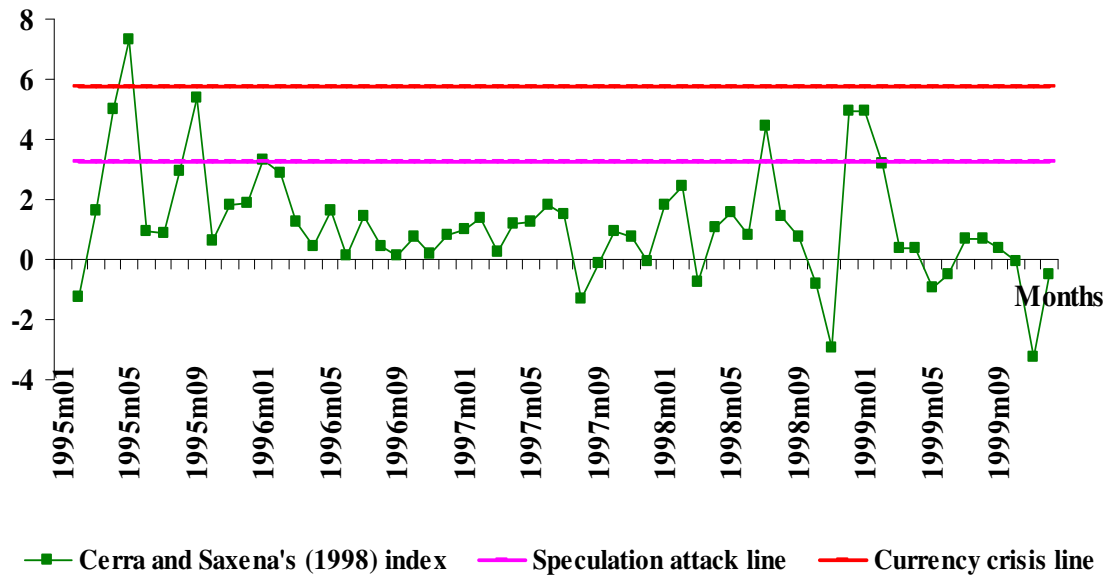
Fig. 2. Ahluwalia's (1998) market pressure index for Latvia



Note: The definition of speculative attack was defined the cut-off point as  $MPI_x > \mu_{MPI_x} + 1.5 * \sigma_{MPI_x}$  where  $\mu$  is the mean of the MPI in country  $x$ , and  $\sigma$  is the standard deviation of MPI. The currency crisis is described when  $MPI_x > \mu_{MPI_x} + 3 * \sigma_{MPI_x}$ .

Source: My own calculations based on IFC CD.

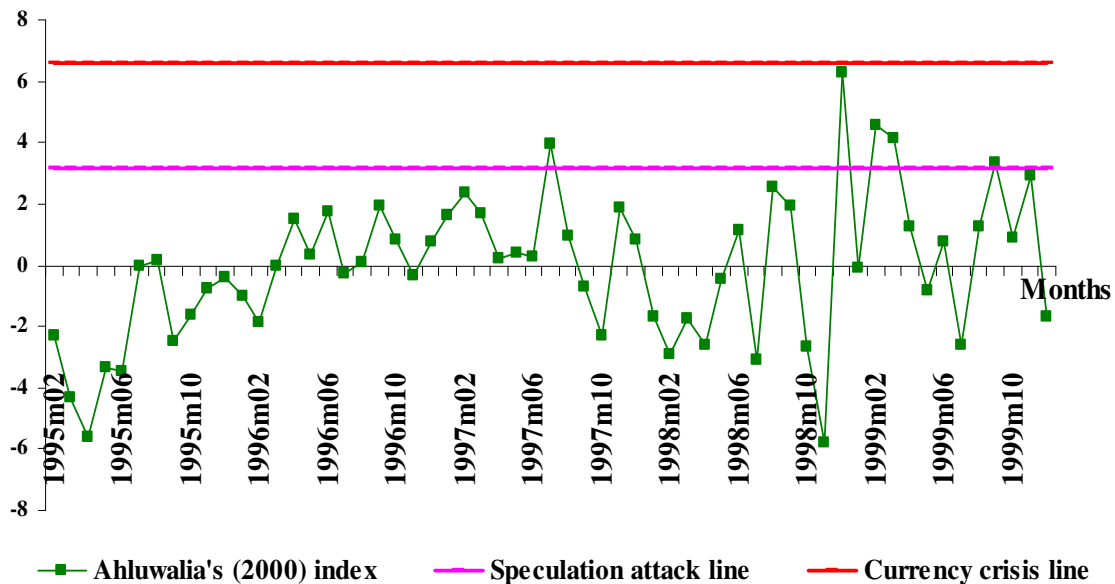
Fig. 3. Cerra and Saxena's (1998) market pressure index for Poland



Note: The definition of speculative attack was defined the cut-off point as  $MPI_x > \mu_{MPI_x} + 1.5 * \sigma_{MPI_x}$  where  $\mu$  is the mean of the MPI in country  $x$ , and  $\sigma$  is the standard deviation of MPI. The currency crisis is described when  $MPI_x > \mu_{MPI_x} + 3 * \sigma_{MPI_x}$ .

Source: My own calculations based on IFC CD.

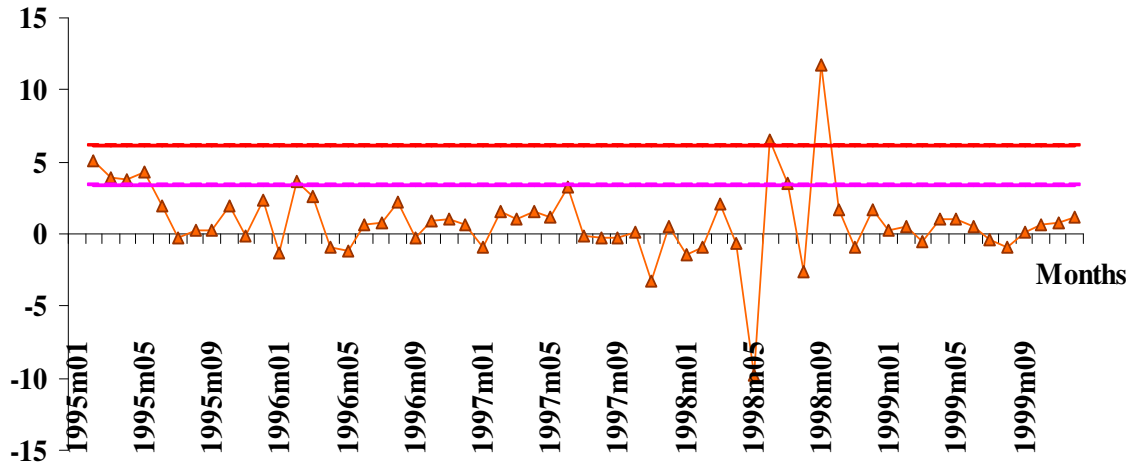
Fig. 4. Ahluwalia's (2000) Market Pressure Index for Poland



Note: The definition of speculative attack was defined the cut-off point as  $MPI_x > \mu_{MPI_x} + 1.5 * \sigma_{MPI_x}$  where  $\mu$  is the mean of the MPI in country  $x$ , and  $\sigma$  is the standard deviation of MPI. The currency crisis is described when  $MPI_x > \mu_{MPI_x} + 3 * \sigma_{MPI_x}$ .

Source: My own calculations based on IFC CD.

Fig. 5. Cerra and Saxena's (1998) market pressure index for Russia

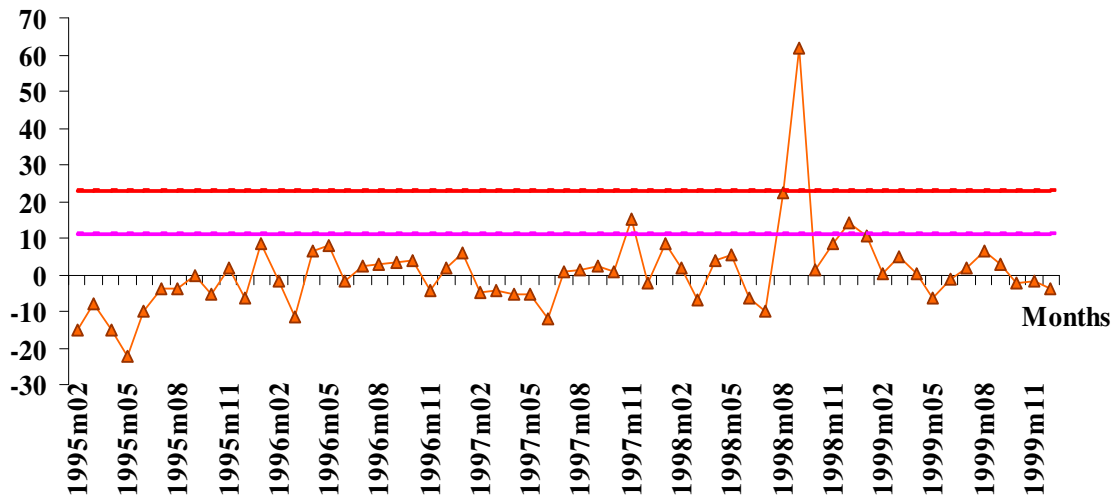


—▲ Cerra and Saxena's (1998) index    — Speculation attack line    — Currency crisis line

Note: The definition of speculative attack was defined the cut-off point as  $MPI_x > \mu_{MPI_x} + 1.5 * \sigma_{MPI_x}$  where  $\mu$  is the mean of the MPI in country  $x$ , and  $\sigma$  is the standard deviation of MPI. The currency crisis is described when  $MPI_x > \mu_{MPI_x} + 3 * \sigma_{MPI_x}$ .

Source: My own calculations based on IFC CD.

Fig. 6. Ahluwalia's (2000) market pressure index for Russia

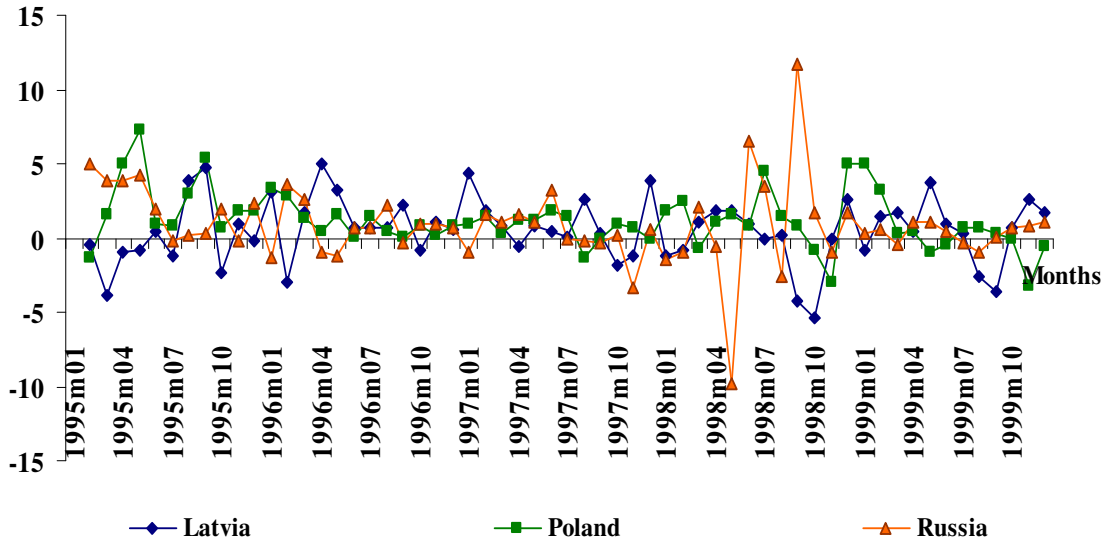


—▲ Ahluwalia's (2000) index    — Speculation attack line    — Currency crisis line

Note: The definition of speculative attack was defined the cut-off point as  $MPI_x > \mu_{MPI_x} + 1.5 * \sigma_{MPI_x}$  where  $\mu$  is the mean of the MPI in country  $x$ , and  $\sigma$  is the standard deviation of MPI. The currency crisis is described when  $MPI_x > \mu_{MPI_x} + 3 * \sigma_{MPI_x}$ .

Source: My own calculations based on IFC CD.

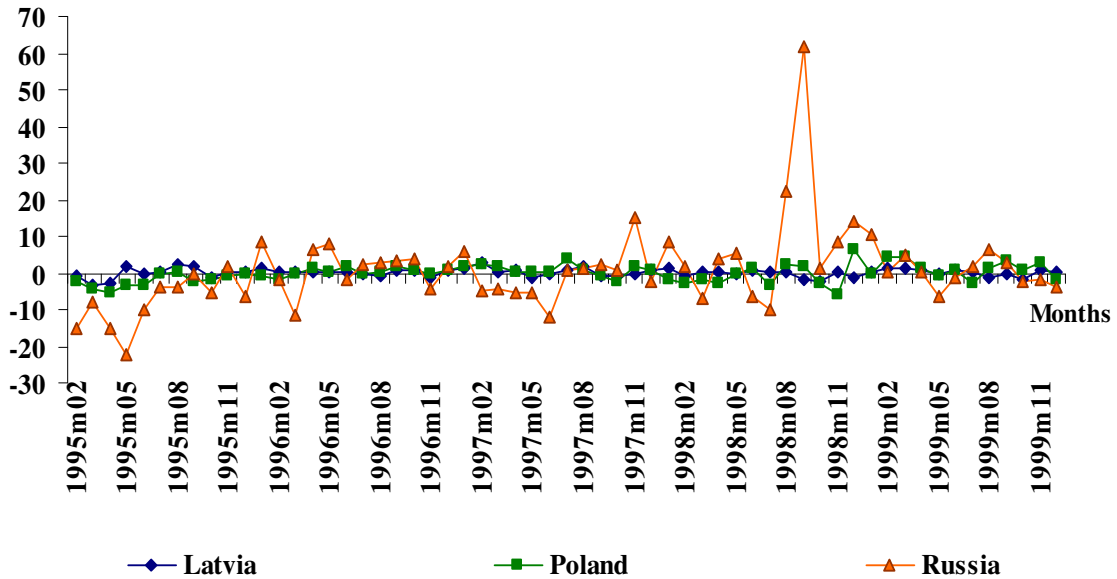
Fig. 7. Cerra and Saxena's (1998) market pressure index for Poland, Latvia and Russia



Note: The definition of speculative attack was defined the cut-off point as  $MPI_x > \mu_{MPI_x} + 1.5 * \sigma_{MPI_x}$  where  $\mu$  is the mean of the MPI in country  $x$ , and  $\sigma$  is the standard deviation of MPI. The currency crisis is described when  $MPI_x > \mu_{MPI_x} + 3 * \sigma_{MPI_x}$ .

Source: My own calculations based on IFC CD.

Fig. 8. Ahluwalia's (2000) Market pressure index for Poland, Latvia and Russia



Note: The definition of speculative attack was defined the cut-off point as  $MPI_x > \mu_{MPI_x} + 1.5 * \sigma_{MPI_x}$  where  $\mu$  is the mean of the MPI in country  $x$ , and  $\sigma$  is the standard deviation of MPI. The currency crisis is described when  $MPI_x > \mu_{MPI_x} + 3 * \sigma_{MPI_x}$ .

Source: My own calculations based on IFC CD.

Table 9. IMF evaluation of proper sequencing of CAL process

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Bulgaria	-	1	1	1	2	2	2	1	2	2	2	1	1
Czech Republic	-	1	1	1	2	2	-	-	-	-	-	-	-
Hungary	1	1	1	1	1	-	2	1	2	-	-	-	-
Poland	1	1	1	1	1	1	1	-	2	-	1	1	-
Romania	1	1	1	1	1	1	1	1	2	1	1	1	1
Russia	-	-	1	1	-	1	1	1	1	2	-	-	2
Slovak	-	1	1	-	1	1	1	2	-	-	-	-	-
Slovenia	1	1	-	1	-	-	-	2	2	-	-	-	-

Note: The IMF's advice for a particular year is assessed when capital account liberalization was part of that year's discussion with country authorities. "1" indicates that no explicit mention is made of sequencing, and "2" indicates that mention is made. A yellow area corresponds to a period in which there was an IMF-supported program.

Source: IMF (2005).

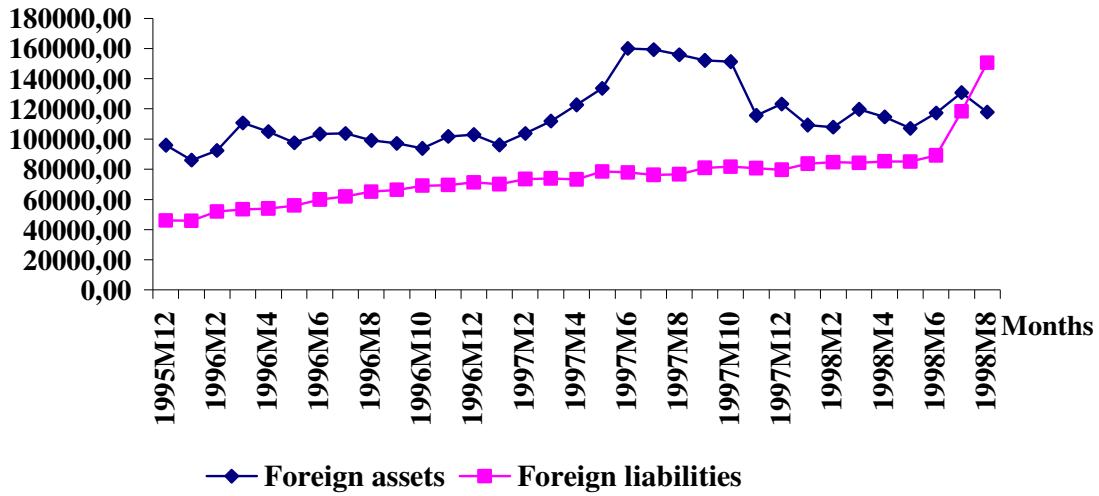
## Appendix 2.2 Russian Case

Table 1. Events in Russia over period 1995-1999

July 1995	The autonomy of the Central Bank of the Federation of Russia.
1996	The capital liberalisation for non-residents. Negotiations with the Paris and London Clubs for repayment of Soviet debt begin.
1997	Trade surplus moving toward balance. Inflation around 11 percent. Oil selling at \$23/barrel. Analysts predict better credit ratings for Russia. Russian banks increase foreign liabilities. Real wages sagging. Only 40 percent of workforce being paid fully and on time. Public-sector deficit high.
September/October 1997	Negotiations with Paris and London Clubs completed.
November, 1997	Non-resident hold of GKO's signed forward contracts with CBR in anticipation of a decision in the ruble following the Collapse of Asian crisis.
November 11, 1997	Asian crisis causes a speculative attack on the ruble CBR defends the ruble, losing \$6 billion.
December 1997	Year ends with 0.8 percent growth. Prices of oil and nonferrous metal begin to drop.
February 1998	New tax code submitted to the Duma. IMF funds requested.
March 23, 1998	Yelstin fires entire government and appoints Kiriyenko-prime minister. Continued requests for IMF funds.
April 1998	Another speculative attack on the ruble.
April 24, 1998	Duma finally confirms Kiriyenko's appointment
Early May 1998	Dubin in warns government ministers of impending debt crisis, with reporters in the audience. Kiriyenko calls the Russian government "quite poor."
May 19, 1998	CBR increases lending rate from 30 percent to 50 percent and defends the ruble with \$1 billion.  Mid May 1998 Lawrence Summers not granted audience with Kiriyenko. Oil prices continue to decrease.
May 23, 1998	IMF leaves Russia without agreement on austerity plan.
May 27, 1998	CBR increases the lending rate again to 150 percent. Summer 1998 Russian government formulates and advertises anti-crisis plan.
July 20, 1998	IMF approves an emergency aid package (first disbursement to be \$4.8 billion).
August 13, 1998	Russian stock, bond, and currency markets weaken as a result of investor fears of devaluation; prices diminish.
August 17, 1998	Russian government devalues the ruble, defaults on domestic debt, and declares a moratorium on payment to foreign creditors.
August 23-24, 1998	Kiriyenko is fired.
September 2, 1998	The ruble is floated.
December 1998	Year ends with a decrease in real output of 4.9 percent.

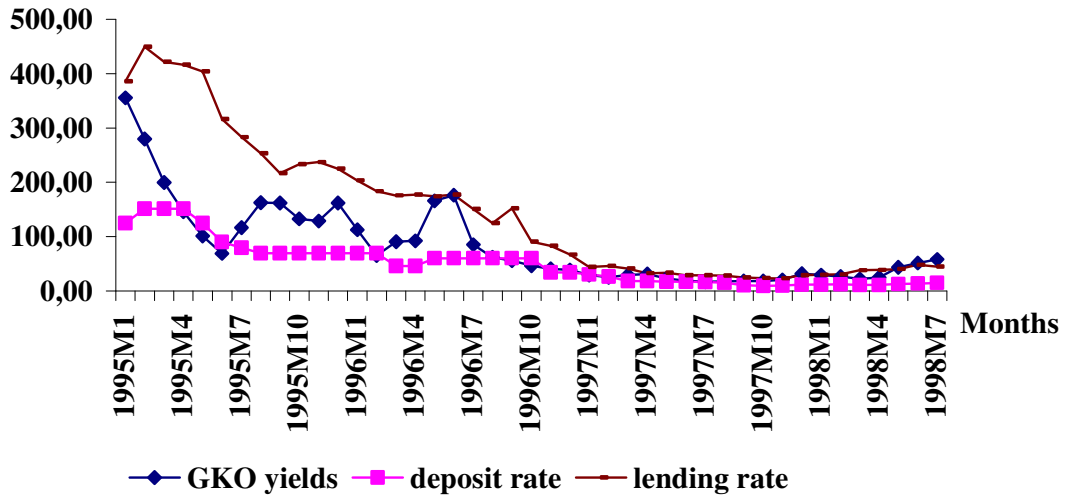
Source: Stiglitz J.E. Globalisation and its discontents. New York 2002, Shleifer A., Treisman D. Without a map: Politics tactics and economic reform in Russia. Cambridge 2000, Desai P. Why did the ruble collapse in August 1998. *American Economic Review*. Vol. 90. No.2, 2000, Chapman S.A., Mulini M. Explaining Russia's currency and financial crisis. *Kluwer Academic Publishers*. No.11, 2001, Abigail J., Chiodo and Michael T. Owyang. A case study of a currency crisis: the Russian Default of 1998. *The Federal Reserve Bank of Louis Working Paper*, 2001.

Fig. 1. Foreign assets and liabilities of CBR in millions roubles



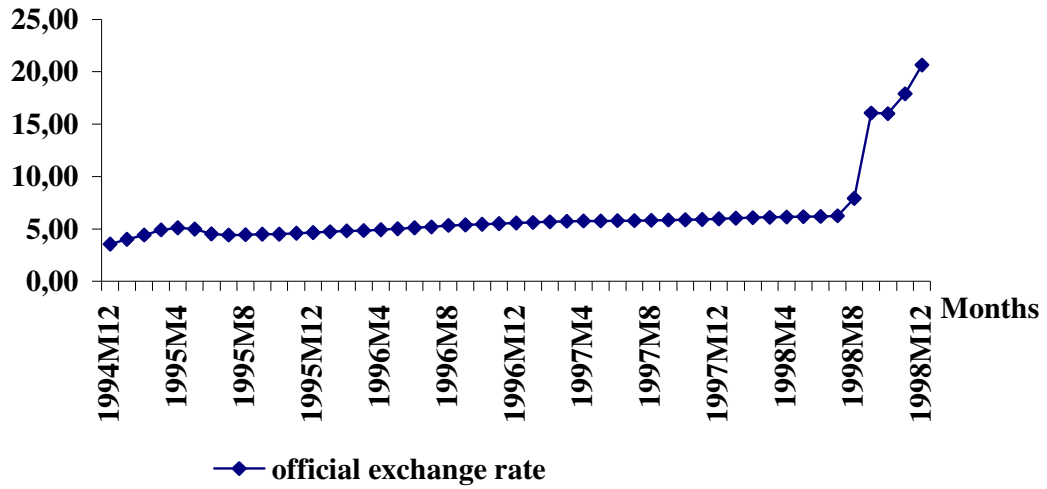
Source: CD IFS.

Fig.2. The interest rate in Russia



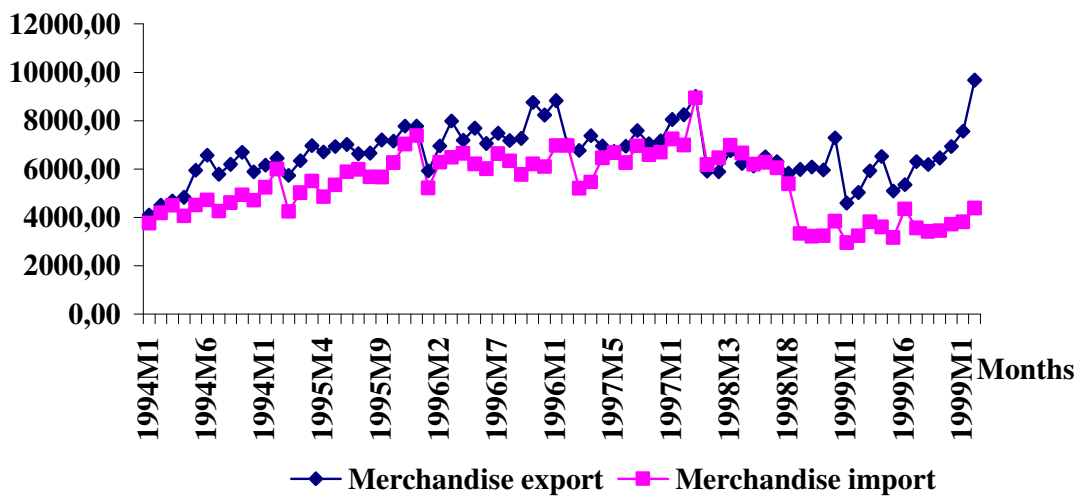
Source CD IFS.

Fig. 3. The official exchange rate: ruble per US dollar



Source: CD IFS.

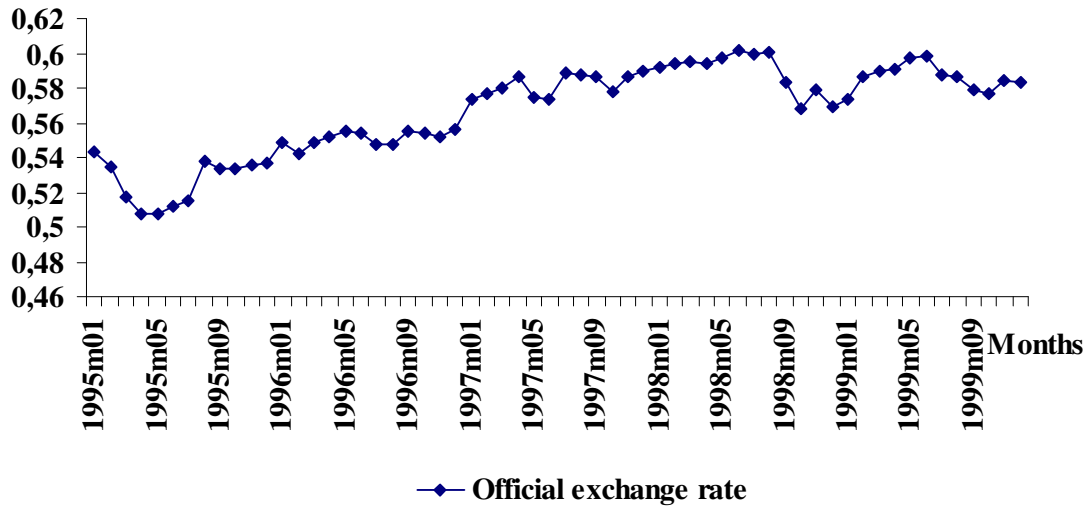
Fig. 4. The Russian trade balance in millions of US dollars



Source: CD IFS.

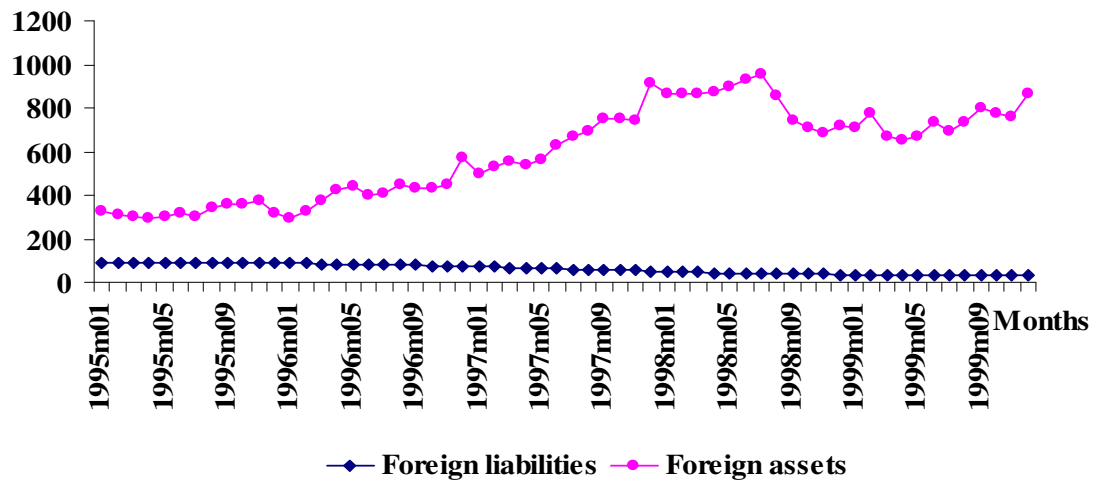
### Appendix 2.3. Latvian and Polish cases

Fig. 1. The official exchange rate: Lats per US dollar



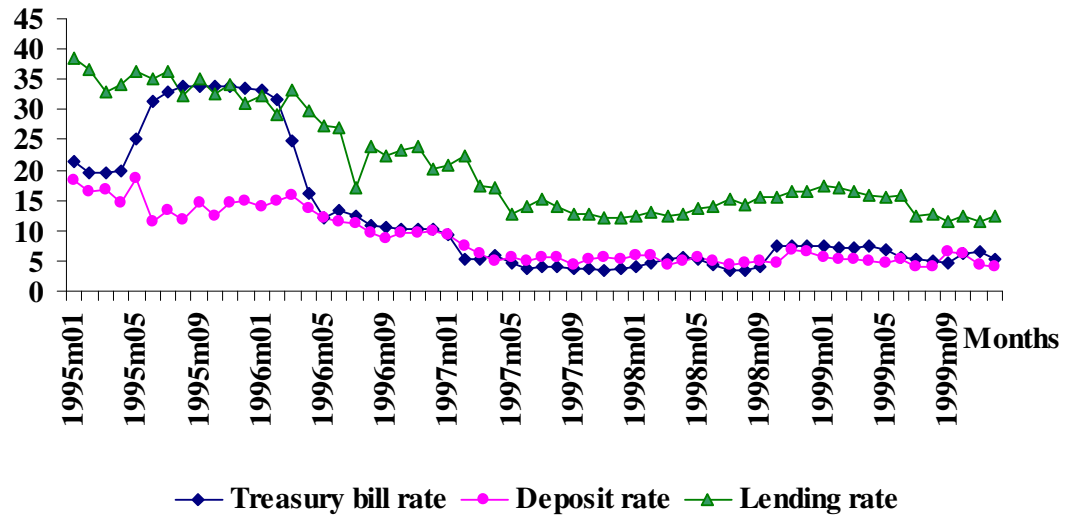
Source: IFS CD.

Fig. 2. Foreign assets and liabilities of National Bank of Latvia in millions Lats



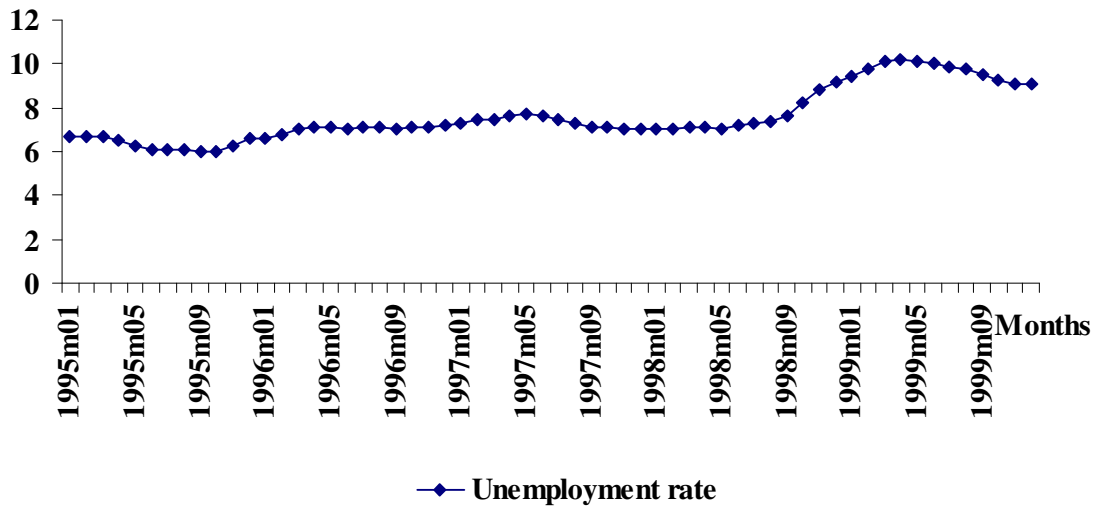
Source: IFS CD

Fig. 3. The interest rate in Latvia



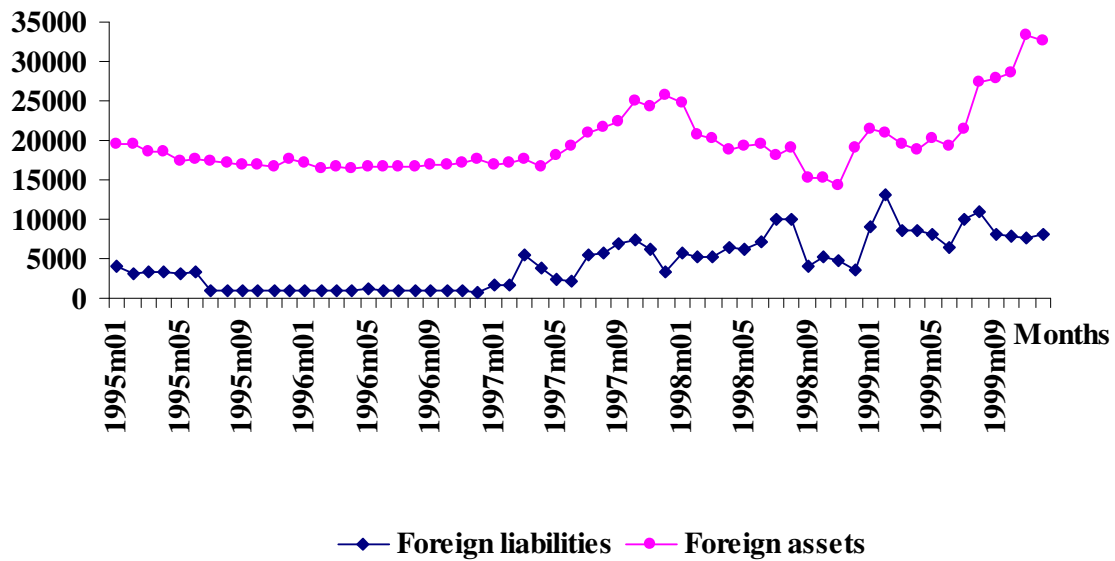
Source: IFS CD.

Fig. 4. Unemployment rate in Latvia



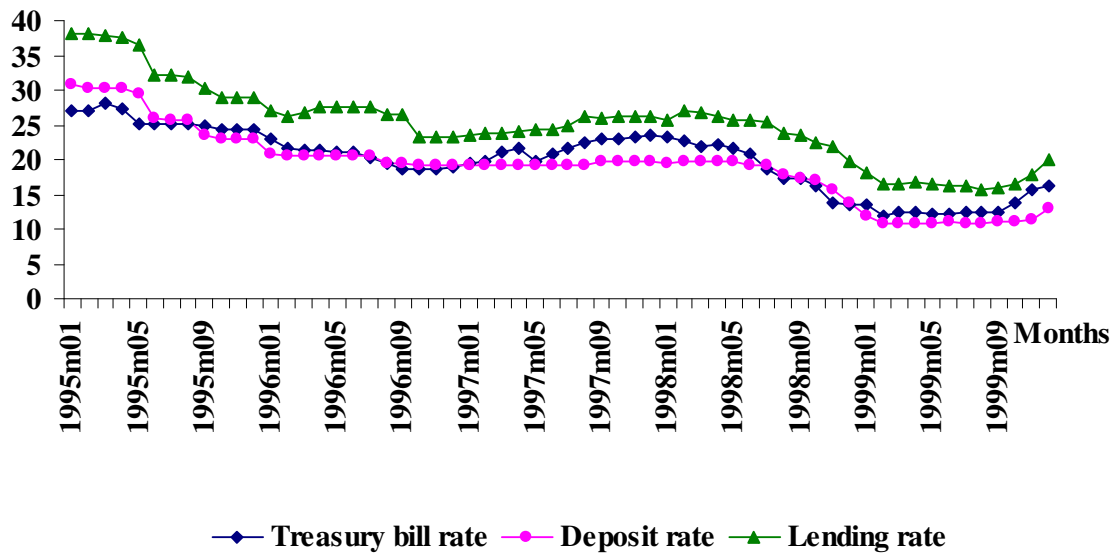
Source: IFS CD.

Fig. 5. Foreign assets and Liabilities of National Bank of Poland in millions zloty



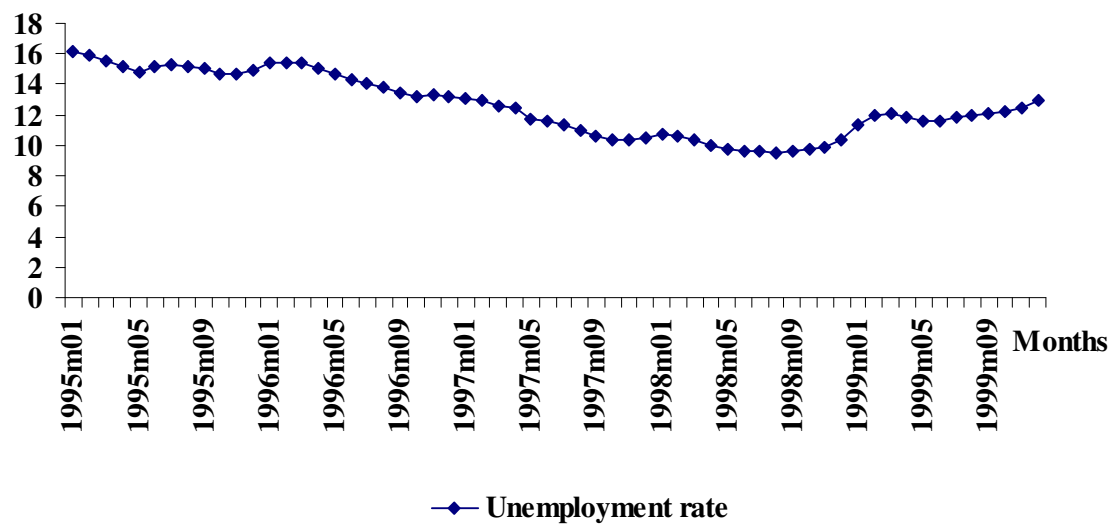
Source: IFS CD.

Fig. 6. The interest rate in Poland



Source: IFS CD.

Fig. 7. Unemployment rate in Poland



Source: IFS CD.

Table 1. Capital Account Liberalization process in Poland (1998-2005)

Years	Capital Account Liberalization events
1989	Permission for buying/selling currencies. <sup>160</sup>
1990	The commercial banks did not have to sell all foreign currency to the National Bank of Poland.
1991	Foreign investors can transfer their profits and purchase the companies shares bearing design for public turnover.
1992	Foreign investors could purchase long-term treasury bonds (26,39, 52 weeks) and can freely turnover the 3-years treasury bonds.
1993	Acceptance of VIII statutes of IMF (e.g. legal descriptions of currency risk). Exchange banks obtained legal permission to acquire the currency from NB to close the currency positions. The Finance Ministry Act allowed the transfer of profits from treasury securities abroad. Foreign inventories could purchase short-term securities bonds (4-8, 13 weeks).
1994	WTO member (Code on Capital Account Transactions) Free financial flows in the context of all current transactions balance of payment. Non-residents can purchase and freely turnover treasury bonds (the buy-out date of which is 1996, 1999 with fixed interest rate) and indexed annual government loans.
1995	Poland notified the IMF and since 1 <sup>st</sup> of June 1996 Poland covenanted to respect IMF statute VIII. Exporters obtained permission to allocate a part of earnings in foreign currency on account in exchange bank but they were obliged to bring in the funds from abroad. The obligation of reselling the foreign currency (over a period of two months), only exception re-export firms.
1996	OECD member. Permission for purchasing the companies' share and participations above 10% of vote in company, the company's base allocated in OECD countries or countries with which Poland has an agreement of mutual investment protection. Realization of the OECD recommendations about FDI and selling the shares and investment fund units by foreign investors.
1997	Obligations of immediate transfer of exchange currency from abroad, if this currency was obtained from export. Transfer of domestic currency and ownership of fund units if the residents are abroad (over a period of 2 months).
1998	New Act of exchange currency turnover: (not law consolidation)
1999	Elimination of most restrictions on convertibility of their currencies for capital transactions; there are some restrictions on investments in non-OECD countries and by their residents and maintains limits on foreign borrowing by domestic financial institutions. Investments in the country's financial markets by OECD residents and institutions are fully permitted. Investment in financial instruments with maturity not exceeding one year is restricted.
10.2002	All remaining short-term restrictions were eliminated.
1. V. 2004	Polish accession to EU.

Sources: Sadowska-Cieslak (2000, 2003), Arvai (2005), Gruszczynski (2002), IMF (1990-2005) Annual Report on Exchange Arrangements and Exchange Restrictions Report.

<sup>160</sup> There was an obligation that all currencies from export need to resell immediately (in two months).

### Appendix 3.1. Currency Crisis and Capital Account Liberalization

Table 1. Currency Crisis and Capital Account Liberalization ( Chinn and Ito's(2002) CAL index (4) and my own index of Currency Crisis)

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Bulgaria											
The Czech Rep											
Estonia											
Hungary											
Latvia											
Lithuania											
Poland											
Romania											
Russia											
The Slovak Rep.											
Slovenia											
The Ukraine											

Source: My own calculations.

Table 2. Currency Crisis and Capital Account Liberalization (Glick, Cruz and Hutchison's (2004) CAL index and my own index of Currency Crisis)

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Bulgaria											
The Czech Rep											
Estonia											
Hungary											
Latvia											
Lithuania											
Poland											
Romania											
Russia											
The Slovak Rep.											
Slovenia											
The Ukraine											

Source: My own calculations.

	- non CAL		- CAL and currency crisis episodes
	- CAL		- non CAL and currency crisis episodes

Table 3. Currency Crisis and Capital Account Liberalization (Chinn, Ito's (2002) CAL index (3) and my own index of Currency Crisis)

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Bulgaria	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
The Czech Rep	non CAL	non CAL	CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Estonia	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL
Hungary	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Latvia	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Lithuania	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Poland	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Romania	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Russia	non CAL	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
The Slovak Rep.	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Slovenia	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
The Ukraine	non CAL and currency crisis episodes	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL

Source: My own calculations.

Table 4. Currency Crisis and Capital Account Liberalization (Chinn, Ito's (2002) CAL index (4) and Frankel and Rose's (1996) index of Currency Crisis)

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Bulgaria	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
The Czech Rep	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Estonia	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL
Hungary	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Latvia	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Lithuania	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Poland	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Romania	non CAL and currency crisis episodes	non CAL and currency crisis episodes	non CAL and currency crisis episodes	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Russia	non CAL	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
The Slovak Rep.	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Slovenia	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
The Ukraine	non CAL and currency crisis episodes	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL

Source: My own calculations.

- non CAL  
 - CAL and currency crisis episodes  
 - CAL  
 - non CAL and currency crisis episodes

Table 5. Currency Crisis and Capital Account Liberalization (Glick, Cruz and Hutchison's (2004) CAL index and Frankel and Rose's (1996) index of Currency Crisis)

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Bulgaria	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
The Czech Rep	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Estonia	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Hungary	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Latvia	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Lithuania	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Poland	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Romania	non CAL and currency crisis episodes	non CAL and currency crisis episodes	non CAL and currency crisis episodes	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Russia	non CAL	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
The Slovak Rep.	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Slovenia	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
The Ukraine	non CAL and currency crisis episodes	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL

Source: My own calculations.

Table 6. Currency Crisis and Capital Account Liberalization (Chinn and Ito (2002) CAL index (3) and Frankel and Rose's (1996) index of Currency Crisis)

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Bulgaria	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
The Czech Rep	non CAL	non CAL	CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Estonia	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Hungary	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Latvia	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Lithuania	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Poland	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Romania	non CAL and currency crisis episodes	non CAL and currency crisis episodes	non CAL and currency crisis episodes	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Russia	non CAL	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
The Slovak Rep.	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Slovenia	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
The Ukraine	non CAL and currency crisis episodes	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL

Source: My own calculation.

- non CAL  
 - CAL and currency crisis episodes  
 - CAL  
 - non CAL and currency crisis episodes

Table 7. Currency Crisis and Capital Account Liberalization (Chinn and Ito (2002) CAL index (4) and Cerra and Saxena's (1996) index of Currency Crisis)

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Bulgaria	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
The Czech Rep	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	CAL and currency crisis episodes	non CAL	non CAL	non CAL
Estonia	non CAL	non CAL	non CAL	non CAL	CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Hungary	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	CAL and currency crisis episodes	non CAL	non CAL
Latvia	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Lithuania	CAL and currency crisis episodes	non CAL	non CAL	CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Poland	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Romania	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	CAL and currency crisis episodes
Russia	non CAL	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
The Slovak Rep.	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL
Slovenia	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
The Ukraine	non CAL and currency crisis episodes	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL

Source: My own calculation.

Table 8. Currency Crisis and Capital Account Liberalization (Glick, Cruz and Hutchison's (2004) CAL index and Cerra and Saxena's (1996) index of Currency Crisis)

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Bulgaria	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
The Czech Rep	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	CAL and currency crisis episodes	non CAL	non CAL	non CAL
Estonia	non CAL	non CAL	non CAL	non CAL	CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Hungary	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	CAL and currency crisis episodes	non CAL	non CAL
Latvia	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Lithuania	CAL and currency crisis episodes	non CAL	non CAL	CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Poland	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
Romania	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	CAL and currency crisis episodes
Russia	non CAL	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
The Slovak Rep.	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	CAL and currency crisis episodes	non CAL	non CAL	non CAL
Slovenia	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL
The Ukraine	non CAL and currency crisis episodes	non CAL	non CAL	non CAL and currency crisis episodes	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL	non CAL

Source: My own calculation.

- non CAL
  - CAL and currency crisis episodes  
 - CAL
  - non CAL and currency crisis episodes

Table 9. Currency Crisis and Capital Account Liberalization (Chinn and Ito(2002)'s (2004)CAL index (3) and Cerra and Saxena's (1996) index of Currency Crisis)

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Bulgaria											
The Czech Rep											
Estonia											
Hungary											
Latvia											
Lithuania											
Poland											
Romania											
Russia											
The Slovak Rep.											
Slovenia											
The Ukraine											

Source: My own calculation.

Table 10. Currency Crisis and Capital Account Liberalization (Chinn and Ito(2002)'s (2004)CAL index (4) and Ahluwalia's (1996) index of Currency Crisis)

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Bulgaria											
The Czech Rep											
Estonia											
Hungary											
Latvia											
Lithuania											
Poland											
Romania											
Russia											
The Slovak Rep.											
Slovenia											
The Ukraine											

Source: My own calculation.

- non CAL    
 - CAL and currency crisis episodes  
 - CAL    
 - non CAL and currency crisis episodes

Table 11. Currency Crisis and Capital Account Liberalization (Glick, Guo and Hutchison's (2004) CAL index and Ahluwalia's (1996) index of Currency Crisis)

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Bulgaria											
The Czech Rep											
Estonia											
Hungary											
Latvia											
Lithuania											
Poland											
Romania											
Russia											
The Slovak Rep.											
Slovenia											
The Ukraine											

Source: My own calculation.

Table 12. Currency Crisis and Capital Account Liberalization (Chinn and Ito's (2002) CAL index (3) and Ahluwalia's (1996) index of Currency Crisis)

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Bulgaria											
The Czech Rep											
Estonia											
Hungary											
Latvia											
Lithuania											
Poland											
Romania											
Russia											
The Slovak Rep.											
Slovenia											
The Ukraine											

Source: My own calculation.

- non CAL
  - CAL and currency crisis episodes  
 - CAL
  - non CAL and currency crisis episodes