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

Malgorzata Sulimierska
Economics Department, University of Sussex
Capital Account Liberalization and Currency Crisis – The Case of Central Eastern European Countries

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.

This paper, co-winner of the best student paper award, was presented at the 18th International Conference of the International Trade and Finance Association, meeting at Universidade Nova de Lisboa, May 22, 2008.
INTRODUCTION

Nowadays, these two topics such as capital account liberalization (henceforth CAL) and currency crisis episodes have become important especially in emerging market economies in the context of multinational financial integration, the technology progress and development of international organizations. Nonetheless, the CAL process is not a new phenomena; for instance, between 1870 and 1914 capital flows were free of any restrictions. However, at that time the technology development was on a different development level so money could not be transferred so fast.

Especially now, in the face of global economic problems on property and financial markets, the debate about the relationship between CAL and the currency crisis phenomena has become very intensive. Many scholars asked if after two decades of the increase of the intensity of the CAL process and increase of currency and banking crises phenomenon - particularly in developing countries if the capital control policy is an efficient way to avoid the currency turbulences or not. For instance, many countries imposed capital controls (e.g. Malaysia, Chile), however, these capital controls have different forms, and their efficacy in promoting or deterring currency crisis episodes or economic growth is questionable.

What is more important, the macroeconomic empirical analysis and theoretical models have not reached an unambiguous conclusion that CAL increases the risk of a currency crisis.

In this context, Central and Eastern European (henceforth CEE) countries seem to be very interesting case studies for analyzing the connection between CAL and currency crisis events. Since the Berlin Wall fell most of the CEE countries have transformed their economy from totally closed to an almost fully

2 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.
6 Russia and Ukraine were included to this analysis because 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.
integrated economy with a global market (e.g. participation in international organizations, liberalization of capital and trade regulations). In addition, most of these countries have had constant speculative attacks on their currency over the last ten years, which has often forced them to seek help in IMF or World Bank programs. 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. 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).

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. In the beginning, the theoretical explanation will be described whether there is any 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

---

7 Since 2004, 8 CEE countries have acceded to EU and most of them were members of the IMF.
8 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).
10 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.
from single-country studies that might maintain the negative correlation between 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.

In the first step, chapter II analyses different dimensions of CAL process such as efficiency of capital control, sequence of CAL reforms and CAL measures. Then the second step describes the theoretical currency crisis models and providing definitions of currency crisis episodes. In the last step, a summary of 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 is analyzed. Chapter V summarises the argument and draws some conclusions.

12 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’ imperfections 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

According to original maturity, capital flows can be distinguished into three different categories: Foreign Direct Investment (FDI) (long-term investments) and Foreign Portfolio Investment (FPI) (short-term investments)\(^\text{13}\) and Foreign Portfolio Investment (FPI) (short-term investments).\(^\text{13}\)

---

\(^{13}\) 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)\(^{14}\) and other investments (see Fig. 1.).

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


Generally, this capital flow classification is 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, the original maturity is now of relatively little importance.\(^{15}\) Moreover, it is an often heard statement that FDI flows tend to be more stable compared to FPI. Still, the empirical and theoretical analysis have not found conclusive evidence to support.\(^{16}\) (Stiglitz (2000), Liccheta (2006), Albuquerque

---

\(^{14}\) The FPI is 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).

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

\(^{16}\) 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).

In that way, there are two questions left without concrete answers. The first one is what kind of capital is better for a country and causes less distributions in macroeconomic-currency stability?. And the second one is how to distinguish between short or long run capital flows (FDI or FPI).

1.1.2. Capital controls

In this section, the questions what is the capital control and why this control can exist in the modern world will be considered. Essentially, two dimensions of efficiency will be explored in this section. Firstly, the capital control impact on real economic variables. Secondly, how capital control regulations might be avoided.

Capital controls is a government policy instrument to control local residents from buying foreign assets (capital outflow) and/or restricting foreigners from acquiring local assets (capital inflow) (Sulimierska (2008 a,b)). This capital control might be mainly considered in two categories: administrative restriction (direct control) and market restriction (indirect controls). Administrative regulations are legal regulations such as legal permission of a risky financial transaction, limits imposed on the amount of a firm's stock a citizen 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 market restrictions work in different directions, these restrictions try to discourage an investor from making a risky financial transaction by increasing the cost of this transaction e.g. uniform tax, require reserve level, capital gain tax Gruszczynski (2002), Sulimierska (2008 a,b).

Afterwards the discussion of the reasons to implement capital control might be considered in a pros and cons structure (Box 1).
Box 1. The argument pros and cons capital control

<table>
<thead>
<tr>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>• independence of monetary policy (e.g., domestic policy instrument provides greater independence of interest rate policy or exchange rate regime)</td>
<td>• the implementation of capital control restriction may affect investors opinion and then lead to herding behaviours or financial panic. These irrational investors’ behaviour can cause a net capital outflow and increased financial instability.</td>
</tr>
<tr>
<td>• altering the maturity of capital flows and that way reducing the risk of negative turbulences such as investors animal spirits, boom-bust cycles, procyclical nature of capital and capital flight</td>
<td>• new capital restriction can be regarded as a signal of inconsistently designed government policies that render a country more vulnerable to currency crises.</td>
</tr>
<tr>
<td>• to navigate the risky global environment, some countries impose certain kinds of control on different categories of capital due to limit volatile short-term capital flows (sudden capital reversal), avoid balance of payments crises, exchange rate volatility and the spread of economic shocks.</td>
<td>• control regulation gave the power to the bureaucrats. It can lead to economic misallocation, corruption and rent seeking activities and then to economic instability.</td>
</tr>
</tbody>
</table>


All the effects described above lead us to ask an open question about the effectiveness of capital control. The efficiency of capital control can be considered from two dimensions. Firstly, if capital control has any real effects on domestic policy and its impact are according to policy makers intentions (e.g. changing the composition of capital flows). The second case analysed how market players might circumvent capital control regulations.

Unfortunately, in the first case, the unambiguous answer was found neither for the empirical cross-country analysis (see Table 1) nor single country studies.

---

17 According to Montiel (2003) the effectiveness depends on different factors exogenously such as the “international in scope” factors, a domestic “structural” nature, macroeconomic factors, and factors related to the design of the restrictions themselves. For instance, the “international in scope” factors includes technology and the international legal environment. The second one consider the efficiency of the bureaucracy, “structural” factors e.g. financial reform, trade integration and increase of FDI. A macroeconomic factors concentrated on the size of the domestic incentives motivating inflows or outflows. The last factors determine whether laws controlling capital flows are on the book than whether the laws are enforced, whether they effectively stem the flows of capital (Sulimierska (2008a,b)).
(e.g. the Chile case (Box 2) and the Malaysian case (1998-2001) (Box. 3). However, these cross-country results might suggest some positive effect of capital control, but these evidences are not convincing enough (see Appendix 1.1 Table 1).

Box 2 Capital control in Chile

**Chile case**

- Chilean example of capital control can be analyzed in two periods the early 80s and later 90s. The first period is linked to a currency collapse and financial crisis in 1982. The second period concerned the episodes of tighter currency matching requirement on the banking sector. Cowan K et al (2005), Gallego et al (1999).

  **First period 80s**

  - Since 1974 capital account regulation had been relaxed by starting to allow Chilean non-financial firms and individuals to borrow abroad. But there was restriction about maturities of capital inflows (greater than 6 months). In 1976 Chilean authorities further lengthened this minimum maturity to 2 years after the short-term capital tabulations. Furthermore an unremunerated reserve requirement (an encaje or URR) was introduced in 1979 on all foreign loans shorter than 65 months. In short-term debt was only 19% of total debt as the result of capital control. Though this did not prevent a twin crisis in 1982 Cowan K, De Gregorio J (2005)

  - Gallais (1996) pointed that quantitative controls on capital flows should not have been used due to they were inefficient. Instead Chilean authorities should have used temporary tax on capital inflows.

  **Second period 90s**

  - In 90s, Chile introduced again capital restriction known as an unremunerated reserve requirement on new capital inflows. The URR required that a fraction of the capital inflow be deposited in a non-interest bearing account in the Chilean Central bank. Initially, it was set 20 percent of the inflow, for a period from 3 months to 12 months depending on the maturity and the nature of the credit. In the next following years the URR was expanded various times. Between 1992 and 1995 the base was broadened to include foreign currency deposits and the proceeds from the issuance of ADR’s (American Depository Receipts), IMF (1990-2005). In May 1992, the rate was raised to 30 percent for foreign currency borrowing except by corporations. In June 1998 the rate was reduced to 10 percent. The URR finally eliminated in September 1998. Kawai Takagi (2003).

  - The empirical analyses of Chile provided some evidence of reducing the vulnerability of capital inflows by lengthening their maturity or total size of inflows (Table 2). However, they suggested that the effect was temporary. In long run the private agents found way to avoid regulation Edison, Klein, Rico, Slok (2002). Especially De Gregorio et al (2000), Gallego et al (1999),(2003) argued that trade credit was way of circumvent the URR. Furthermore Cowan K et al (2005) found that the composition of external debt tilted toward the non-financial sector that can cause the stronger biased on results. (see Appendix 1.1 Table 2)
Box 3 Capital control in Malaysia

**Malaysian case**

- After the devaluation of the Thai baht in July 1997 (Thailand) and the Russian currency collapse on 1 September 1998, the authorities imposed controls on capital outflows. Malaysian government ignored the IMF’s advice and took an alternative route. Kapila, Rodrik (2001) On 2 September, Malaysian government pegged the exchange rate per U.S. dollar; reduced interest rates, and increased spending. They eliminated any room for private investors to take speculative positions against the ringgit through restrictions on all international financial transactions unrelated to trade and foreign direct investment (FDI). They effectively closed the offshore market, cut off ringgit credit to foreigners and put a 12-month moratorium on the repatriation of portfolio capital. Since September 1999, capital controls began to ease the restrictions by allowing a certain amount of portfolio capital to flow out. In February 1999, the 12-month holding period rule for repatriation of portfolio capital replaced by a tax on outflows. In September 1999, the whole two-tier, price-based system of graduated exit levies was relaxed and on May 2001, the exit levy on profits repatriated was abolished completely. Kawai, Takagi (2003).

- Malaysia’s capital controls were strongly criticised by international financial institutions. For instance, the rating agency, Moody’s reduced Malaysia securities to junk bond status. However, the controls were effective in achieving the immediate goal of discouraging capital outflows and closing offshore markets. In addition, capital controls altered the maturity structure of capital inflows. Edison, Klein, Rcci, Siok (2002) Kawai, Takagi (2003). This capital control policy allowed Malaysia recover from the Asian financial crisis compared to IMF programs’ countries faster and with smaller declines in employment and real wages. The Malaysian experience demonstrated that the implementation of selective capital controls can be as effective in reducing the investor’s speculation pressure. But Malaysian similar policy cannot necessarily be appropriated for other countries facing crisis problem. Charlton, Stiglitz (2004). The strong macroeconomic policy, bank and corporate restructuring, a currency widely perceived to be undervalued, and a competent bureaucracy supported that capital control was effective. Kawai, Takagi (2003).

In the second case, the channels through which market participants can circumvent capital control regulations are similar to the circumvention of corporation taxations and profit transfer, especially for multinational corporations. The main seven methods of avoiding capital controls might be indicated according to Eiteman, Stonehill, Moffett (2006), Montiel (2003) and Sulimierska (2008):

- Transfer pricing - the financial transactions between the subsidiary and the parent company for purchasing raw materials, services and intellectual property from the parent.
- Over invoicing of import, undervouching of export, creating unrelated exports
- Use of payment leads and lags to effectively lend and borrow abroad- 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.
- Changing of trade credits condition
- Unbundling of Capital Service Payments -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 ,
- Fronting Loans-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, would be an effective way of transferring funds from the
subsidiary to the parent. If a country's regulations on the transfer of capital
prohibits loans from a subsidiary to a parent company but allows 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 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.
- Special Dispensation- creation of centre profit of multinational corporations
  There are a few empirical studies that tried to present the problem of
avoiding capital control regulations. Mathieson and Rojas-Suarez (1993)
analysed mainly under- and over-invoicing, transfer pricing policies, and leads
and lags and its impact on efficiency of capital control regulations. They pointed
that capital controls had lost effectiveness in the 1980s with the liberalization of
exchange and trade controls. On the other hand, Desai, Foley and Hines (2004)
study the impact of capital control of FDI investment by using American
affiliate–level data makes for the period 1982-1997. Their results show that
American multinational firms circumvent capital controls by adjusting their
reported intra-firm trade, affiliate profitability and dividend repatriations (The
same affiliates have a 4.7 percent lower reported profit rates than do comparable
affiliates in countries without capital controls).

1.1.3. The preconditions and sequencing of Capital Account Liberalization

As the discussion above shows, capital controls might become more
ineffective over time and create negative effects such as additional costs and
distortions (Summers (2000)). Since the late 1960s, several developed countries
decided to implement a gradual CAL approach. Then, in the 1990s many developing countries took this path but adopting a deeper approach, the so-called “big bang” (Schneider (2000), Griffith, Gottschalk and Cirera (2000), Sulimierska (2008 a,b)). The gradual approach principally referred to laissez-faire concept which required precondition reforms in the financial system and macroeconomic consistence before opening the capital account (Singh (2002)). After the Latin American and Western European financial crashes in the 1990s, a gradualist approach started winning over. Specifically, the Asian crisis in 1997 moved the whole burden to gradual methods of CAL (Singh (2002), Stiglitz (2004)). Essentially, there are two main questions to be asked: what order and speed of capital account restriction removal should be implemented and what pre-liberalization reforms should be imposed before liberalization of capital flows.

Sequencing of capital account liberalization process

The sequence of CAL might be implemented in different speed and pattern. For instance, the capital account should be liberated following the liberalization of the current account and the domestic financial system. Otherwise it should be simultaneous liberalization of the current and capital account (McKinnon (1993), Saxena and Wong (1999)). However practical experts from the IMF and OECD suggest that capital flows should be liberalized by using a type of two-step procedure (the IMF’s Articles of Agreement and OECD Code Liberalization). In the first step, the regulation on long-term foreign transactiond should be removed and then the second step considered the liberalization of short-term financial transactions and inter-bank market (Griffith, Gottschalk and Cirera (2000), IMF (2005)).

Pre-liberalization conditions

Some researchers have a sceptical view of the importance of liberalization pattern of the CAL process and underline the role of adequate institutional safeguards. They point out that institutional safeguards must be implemented fully then an economy can obtain the benefit from free access to international capital markets (Mathieson and Rojas-Suarez (1993), Kaminsky and Schumukler (2003), Kawai and Takagi (2003), Sulimierska(2008 a,b)). The capital account pre-conditions are necessary for a country to meet before capital flows liberalization in order to create adequate institutional safeguards. There are four main pre-liberalization conditions:
- a stable macroeconomic policy: 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), Sulimierska(2008a,b)),
- an efficient domestic financial-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 (Kawai and Takagi (2003)),
- an accurate and comprehensive data disclosure, including information on central bank reserves and forward operations (Saxena and Wong (1999)), Sulimierska(2008 a,b).

To summarize both conceptions of capital account liberalization (preconditions and sequencing of liberalization) should perhaps be adopted simultaneously according to Johnston, Ötker-Robe (1999) ‘s modernized approach to managing the risks of cross-border capital flows. Moreover, a modern approach pointed that there are pitfalls in inappropriate sequencing of liberalization, but also that once a country has begun to liberalize its capital account, the degree of protection that a residual regime of capital controls can provide against volatile capital flows may be relatively limited. The model emphasized the need to accelerate the supporting structural and institutional reforms and the adoption of consistent macroeconomic policies.

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 a consistent way of measuring capital account restrictions across a wide range of countries (Edwards (2000)). In addition, as suggested in the last section, there are problems of significant discrepancies between the legal (de jure measures) and the actual degree of capital controls (de facto measures) (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.\textsuperscript{18}

\textit{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.

\textbf{IMF measures}

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

\textbf{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 line (E2) contains 10 categories: time and distinctions between restriction on inflows and restrictions on outflows.\textsuperscript{19} 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

\textsuperscript{18} For instance, Eichengreen (2001) distinguished three main approaches to the calculation of capital flows: measures based on statue 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.

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)) 20.

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

Share measures represent the proportion of year the capital account is judged as free of capital restriction, according to IMF standards (line E2). 21 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)).

Additionally there are some measures that use both the E2 line and Share measures (Chinn and Ito (2002), Cowan and Gregorio (2005)) 22.

Intensity measures-Quinn measures (1997)

Quinn’s (1997) measures capture the intensity of the enforcement of

---

20 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, personal capital movements, provision specific to commercial banks and other credit institutions and Institutional investors.

21 Some investigators used only a few categories which were provided by the IMF’s reports (Eichengreen (2001)).

22 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.
controls on both regulations: the capital account and the current account. Both regulations were based on 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), Arrieta, 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)). Since 1961 the OECD measure has changed over time by incorporating new financial instruments and transactions.23

The Montiel-Reinhart Intensity Measure (1999)

The measure of intensity of controls on international transactions used

23 In 1964 the code was expensed 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)).
annual report of the country’s central bank (15 countries). 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 researchers 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 implementation dates is to monitor IFC indexes (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)).

---

24 Argentina, Brazil, Chile, Colombia, Costa Rica, the Czech Republic, Egypt, Indonesia, Kenya, Malaysia, Mexico, the Philippines, Sri Lanka, Thailand, Uganda.

25 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.).
**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 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 rates. 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 concludes with sudden-stop models. This looks over the empirical definitions of crisis and theoretical models that 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 the magnitude of change be 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 as the currency crisis phenomena and is expressed essentially by the so-called Market Pressure index (MPI) or index of “exchange rate pressure” or the “speculative pressure index” (Eichengreen, Rose and Wyplosz (1995, 1996); Kaminsky, Lizondo and Reinhard (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:

\[
MPI_{i,t} = \frac{\left(\%\Delta e_{i,t}\right)}{\sigma_{\Delta e_{i,t}}} + \frac{\left(\Delta i_{i,t}\right)}{\sigma_{\Delta i_{i,t}}} - \frac{\left(\%\Delta r_{i,t}\right)}{\sigma_{\Delta r_{i,t}}}
\]

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. 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

\[
MPI > \mu_{MPI} + 1.5 \times \sigma_{MPI}
\]

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. On the other hand, Eichengreen and Rose (2001) implied that a currency crises cannot 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.

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\textsuperscript{29} 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 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 Reinhard’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.\textsuperscript{30} 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

\textsuperscript{29} The exchange rate is defined as units of domestic currency per U.S. dollar or per Deutschmark, depending which one is the most relevant.

\textsuperscript{30} where is the percentage change in the exchange rate, is the percentage change in reserves over the relevant interval, are the variance of the percentage changes in the exchange rate and international reserves respectively.
sample for each country. 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

\[ MPI_x > \mu_{MPI_x} + 2 \sigma_{MPI_x} \]

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.

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 followed by Sulimierska (2008 a,b) and Kaminsky, Schumukler (2003). In the beginning, I start by exploring the first generation of Krugman’s (1979) and

---

31 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.

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 (Obstfell (1986)) and pure speculative models such as contagion effects models (Gerlach and Smets 2000, Eichengeen, 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), McKinnon and Huw (1996), Kaminsky and Reinhart (1999), a company’s balance sheet and the effects of monetlcy 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 them on the herding behaviour models (Calvo (1998)) and concentrating 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 influence by the CAL process.

**The first generation models**

The first generation models point that currency crises are caused by weak economic fundamentals (such as excessive fiscal and monetary expansion). The story is simple; the inconsistency between monetary and fiscal policy creates the origin for speculation by investors. (Krugman’s (1979) and Salant and Henderson’s (1978)). 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.33 The systematic decline of foreign exchange reserves increase the market agents’ doubts of the ability of the central bank to control the fixed

---

exchange rates system. And then eventually, reserves fall to a critical level at which the rational agents decide to do the speculative attacks on the foreign exchange reserve of the central bank and causing the collapse of the exchange rate.

This simple version of Krugman’s (1979) and Salant and Henderson’s (1978) models have been extended more by several authors such as Dornbusch (1987), Flood and Garber (1986), Flood, Garber and Kramer (1996). On the whole, these researchers 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.

The second generation model

After the EMS crises of the early 1990s, the first generation story did not provided the convincing explanation to understand the currency crisis. These European countries did not have macroeconomic fundaments and a crisis happened without a significant change in these fundaments. In that case, economists have pointed out that the adverse consequences of changing the exchange rate regime such as higher interest rates or other key economic parameters (for example, unemployment levels or GDP etc.) can force governments to maintain exchange rate parity. Simultaneously, it gave room to form the market agents’ expectation about exchange rate policy and then it might lead to bad equilibrium such as self-fulfilling currency crisis. The first pioneer of the self-fulfilling currency crisis model was Obstfeld (1986). In the same research line can be found other studies including Obstefel (1994, 1996), Ozkan

35 It is clear that speculative attacks 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.
36 Obstfeld’s 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.
and Sutherland (1995), Reisen (1998) and Krugman (1996). The steady state is not applied to the models, theirs became the basis for a body of literature on speculative bubbles, sun-spot equilibrium and consider nonlinear behaviour rules by one or more agents that can led to multiple solutions and then to self-fulfilling solution. These models 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. 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). This variety of factors may affect the authority’s objective function that could be used as the indicator of a currency crisis (Sulimierska(2008 a)).

The second group of second generation models concentrate on the consequence of pure speculation against the currency such as herding behaviour (Calvo and Mendoza (2000) and Binkhchnadami and Sharma (2000)) and/or contagion effects (Gerlach and Smets (1995), Eichenngreen, Rose and Wyplosz (1997), Masson (1998) and Ahiuwalia (2000)).

The herding behaviour can be regarded in two different ways. Firstly, if there are so many different pieces of information on the market, it can be rational for individual players to base behaviours on the behaviours of others in order to reduce the cost of information access. They will base their behaviour on the behaviours of other market players, mostly those who have good reputations. This kind of investor’s behaviour might lead to an ineffective distribution of the financial market decisions and moves the market to a crisis outcome (Calvo and Mendoza (2000)). The second group of herding models points the incentive structures of portfolio managers. For them, it is less costly to be wrong along with other managers than standing out against the crowd because the salary of the manager will not decrease so much if the other investors on the market make

---

37 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 Obsfeld (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.

38 Sometimes the contagion and herding effect should not be added to the second-generation models and many economics authorities have put them to the special category such as financial market in efficiencies. However, despite this, I decided to use it in my theoretical presentation, the same way as Kaminsky, Lizono and Reinhard (1997) and Esquivel and Larrain (1998) did. After the development of the third generation models that mostly depends on the microeconomics fundaments it can suggest that contagion and herding effects should be considered as the second generation models due to the fact that they present the same kind of game between the investors and government as well.
the same mistake. (Binkhchnadami and Sharma (2000)). In that case, the managers are following the behaviours of the other member of portfolio manager group.

On the other hand, contagion effects are presented in two variants: spill-over effect (trade linkages) and monsoonal effects. The first variant story is that the crisis in trade partner market may affect macroeconomic fundamentals in another trade partner country, market via the loss of competitiveness of the courtiers associated with devaluation of currency. (see Gerlach and Smets (2000), Eichenngreen, Rose and Wyplosz (1997)). The monsoonal effects are linked with multiple-equilibrium. A crisis in one country may raise the probability of a crisis in another country because a currency crisis in one country is like a signal which encourages a self-fulfilling speculative attack. Perhaps the crisis in one country leads to shifts in market sentiment or changes in the interpretation given to existing information. (see Eichenngreen, Rose and Wyplosz (1997) and Masson (1998)), Sulimierska (2008 a,b)).

**Third generation model**

The Asian financial crisis at the end of the 1990s caused a third generation model of currency crisis to start developing very quickly. The Asian experience showed that if something does not work in the micro fundamentals of an economy that could lead to a currency crisis. 39

The three main microeconomic aspects are in these group of models 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 (Krugman (1999 a, b), Aghion, Bacchetta and Banerjee (2000, 2001)).

Both the first and second issues are difficult to be analysed separately due to the existence of feedback connections to each other. In that case most of empirical and theoretical literatures of third generation models consider fragility of the banking system and financial market inefficiency together. (see McKinnon and Huw Pill (1996), Chang and Velasco (1998 a, b, c), Stoker (1994), Mishkin (1996) Kaminsky-Reinhart (1999).

The starting point of review the third generation models are so-called twin

---

39 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)).
banking-currency crisis models. These models show that the authorities cannot directly finance the fiscal deficit by printing money. However, they explain how this problem can change in a currency crisis 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 (banking crisis and currency crash), giving life to what have been called the “twin crises” (Kaminsky, Reinhart (1999)).

On the other side of the twin crisis model are Stoker (1994) and Mishkin’s (1996) models which concentrated more on the financial aspects of asymmetric information and moral hazard than twin model effect. More recently, an approach to financial fragility and currency crisis was developed by Chang and Velasco (1998a, 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. On the other hand, the exchange rate regime and authorities’ credit policy allow to increase social welfare. Moreover, in an open economy, the banks play another active role in generating large capital inflows to the economy through the banking system. The domestic and foreign investor might borrow money from abroad at a low interest rate and then invest in the domestic market where yields are higher. At the same time, 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 of the domestic financial system plus financial liberalization is at the centre of the problem (Sulimierska 2008a:80). For instance, depositors can 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. This lack of confidence can lead to a banking crisis due to the shift in expectations. For example, if agents expect devaluation, early withdrawals will be beneficial. The domestic banks cannot have enough domestic deposits in liquid form so in the world asset it raises render of self-fulfilling bank run possibility. In a closed economy, the

---

40 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 equilibrium 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).  

41 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 (1998c)).
situation is simple, generally the central bank protects against market panic by acting as a lender of the resort. The central bank plays the similar role in an opened economy like in closed economy if they hold the exchange rate peg regime. They run against the intermediaries, generates pressure on the peg and then increases demand for foreign exchange reserves. As long as the exchange rate peg regime is held then will the banking system be stable. Moreover, in the case of domestic banks financial problems, the central bank can pursue a different expansionary policy and keep interest rates from rising. However, 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 and currency crisis. Furthermore, Chang and Velasco (1998) model pointed out that financial liberalisation might cause boom-bust cycles. Because domestic banks 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 (see McKinnon and Huw (1996), Kaminsky and Reinhart (1999), Sulimierska (2008 a,b))

The lending boom converges levels gradually in inflation and then causing the expectation of exchange rate depreciation on the market which then leads to banking and currency crisis (see Sulimierska(2008a)).

The problems of balance sheet firms has been neglected in the currency crisis literature, however, after the Asian crisis the research attention moved into this area (see Krugman (1999 a, b) and Aghion, Bacchetta and Banerjee (1999, 2001)). The new currency crisis models tied to find a connection between all three micro economic aspects: the fragility of the banking system, asymmetrical information (moral hazard) and company balance sheets. The third generation models state that currency crisis can happen both under fixed and flexible exchange rate pegs as the primary source of crises is the deteriorating balance sheet of private firms because these balance sheets play a key role in the crisis itself. According to these models, entrepreneurs can borrow in domestic currency from domestic consumers or in foreign currency from foreign lenders. Indeed, they 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 and the entrepreneurs’ wealth is therefore the fundamental variable that determines investment and output (Bernanke and Gertler (1989), Sulimierska (2008 b)). In order to simplify the analysis, output is defined as the Cobb-Douglass function. However, the wealth of each individual entrepreneur

---

itself 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 like productivity, 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 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 therefore investment and output in a credit-constrained economy. Further, reducing capital inflows reduces the demand for the domestic currency and leads to depreciation. Loosely speaking, the financial crisis cycles started to close circle.

Nevertheless it is one of the possibilities multiple equilibrium in these models, and this multiple short run equilibrium in the foreign exchange market are thus possible when expectations change or when a real shock shifts the economy to a bad equilibrium currency crisis. In addition this story of currency crises has two well-known significant facts. Firstly, a country goes into a crisis where firms hold a lot of foreign currency denominated debt (measure of aggregate foreign currency exposure is the ratio of claims to liabilities with respect to BIS banks43). It is striking that all the countries that 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 (Krugman (1999a), Aghion, Bacchetta and Banerjee (1999)).

These third -generation models offer a role for monetary policy to prevent or solve currency crises. In these lending-constrained economies of firms, the credit market is not clear. A rise in the interest rates, is not enough to compensate investors for the increase in perceived default risk. Clearly, higher domestic interest rates should make it costlier to speculate, presumably propping up the local currency, but this is not the normal case where increasing the domestic

43 The Bank for International Settlements (BIS) is an international organisation which fosters international monetary and financial cooperation and serves as a bank for central banks. Established on 17 May 1930, the BIS is the world's oldest international financial organisation.# As its customers are central banks and international organisations, the BIS does not accept deposits from, or provide financial services to, private individuals or corporate entities. The BIS strongly advises caution against fraudulent schemes (http://www.bis.org/index.htm).

44 Debt to banks from the BIS countries is often used as a measure of foreign currency debt, as no good measure is available (Aghion, Bacchetta and Banerjee ( 2001::2)).
interest rate raises the supply of domestic lending. In this case the increase of interest rate can make the holders of domestic short-term debt more inclined to refuse to roll it over or increase the probability default on its loan by the firms (moral hazard effects) that forces banks to restrict lending. 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. As in Change and Velasco (1998 a,b,c,), in these models of multiple equilibrium, in which a loss of confidence can produce a financial collapse that validates investor pessimism, however, the mechanism of that collapse is different in these models. If firms’ leverage in the domestic market is substantially reduced, they may be forced to accumulate a large amount of foreign-denominated debt. When, in domestic markets, nominal interest rate will reduce the amount of available lending in order that, the central bank can deepen a crisis by further reducing firms’ ability to invest and then decrease output. Due to lending being highly sensitive to the interest rate; an increase in the nominal interest rate can be detrimental, altering the productive capacity of the economy by stifling investment. The perceived drop in output puts additional pressure on the exchange rate, which bankrupts the firms through the foreign currency debt. In this situation, an alternative strategy for the central bank is warranted: it is actually beneficial to lower the interest rate to spur investment (Stiglitz and Furman (1998), Radelet and Sachs (1998), A. Velasco (2001)).

Sudden –Stop Model

The sudden stop phenomenon was defined by Calvo (1998). Calvo’s research about sudden stop episodes was based on the currency crashes in the 1990s such as Asian crisis 1997-1998, Russian Crisis 1998, Mexican crisis 1994. There are no perfect measures or definition of the sudden stop episodes. Mainly the definition considers the sudden stop effect as an abrupt

---


46 The expansionary monetary policy is assumed not to be inflationary since prices are stickling in short run. A. Velasco (2001), ‘‘ The impossible duo? Globalization and Monetary independence in Emerging Markets’’, Mimeo, Harvard University, pp. 12.

47 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). The sudden stop event is defined as 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.
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). However, Mendoza (2001), Mendoza and Smith (2002), Rothenberg and Warnock (2006) and Hutchison and Noy (2004) widened this definition by looking at 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. This imprecise definition might lead to some significant problem in research perspective (see Sulimierska (2008 a,b) and Rothenberg and Warnock (2006)).

There are mainly three mechanisms through which a sudden stop in international capital flows may bring about a currency and balance of payments crisis (Calvo (1998), Rodrik and Velasco (1999), Calvo, Izquierdo and Talvi (2002), Kaminsky (2003), Hutchison and Noy (2004)). The first two channels were built on the financial friction of the “great depressions” model (the Keynesian hypothesis of price or wage stickiness and external financing premium (Bernanke, Gertler and Gilchrist (1999)). The second channel was invented by Kiyotaki and Moore (1997) and Mendoza (2001) and it so-called Fisherian analysis of debt-deflations driven by collateral constraints. 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. Lastly, the third approach is focused on analysing the multiple equilibria such as the second and third generation currency crisis model (see Calvo (1998), Rodrik and Velasco (1999) and Aghion, Baccheta and Banerjee (2001)). According to these approaches the 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 (see Rodrik and Velasco (1999)).

1.3. The connection between the regulation of capital control and currency crisis events

In this part, the connection between CAL and Currency Crisis will be presented by using the information collected in the two previous sections and exploring general neoclassical economic theory (see Sulimierska (2008 a,b) and

The neoclassic story can be said in two ways: firstly allocative efficient approach and secondly “intertemporal trade”. In the case of allocative efficient, the CAL works in the same way as the liberalization of the domestic market by improving the efficiency of capital investment and removing the distortions (e.g. monopolization of market) (Fischer (1997), Summer (2000)). For instance, the diversification of the investor’s portfolio will improve by reducing the portfolio risks and/or increasing the purchase of lower risk equity, then increase the efficiency of saving allocation smooth the consumptions in response to shocks and increase economic growth 50 (see 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 (Sulimierska(2008 a,b)). The second story states that capital flows are similar to the trade between time periods (temporal borrowing and lending) and to the trade between countries. They called these capital flows “intertemporal trade” and suggest that trade liberalization is beneficial for the economy across jurisdictions under argument for competitive markets (Fischer (1997), Summer (2000)). (Fig 3). Neoclassical economists say that CAL process can be linked to the risks of market overreaction. However, they argued that the market overreactions are caused by the lack of precondition reforms or wrong sequences. 51 Essentially, they consider the currency crisis described in the perspective of the first generation models (Krugman (1979), Salant and Henderson (1978)) or the simple version of “twin models” (McKinnon and Huw (1996), Chang and Velasco (1998 a,b,c)). The currency crisis is generally caused by bad macroeconomic fundaments or weak banking supervision.

On the other hand, the second generation models (Obsfeld (1986, 1994, 1997)) recognized the special factors such as high unemployment levels, increase of interest rate levels, drop in GDP as reasons of creating self-fulfilling

50 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)).

51 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)).
expectations of investors. However, this assumption about precondition reforms
CAL becomes an incentive for good policies or reforms (e.g. independence of
monetary policy or property rights) should decrease the effect of negative factors
and decrease the probability of a currency crisis. (Gourinchas and Jeanne (2002),
Eichengreen (2001), Klein and Olivei (2001)) (see Figure 2).

There is the other side of the debate about CAL and currency crises which
said that it is not a direct causal link between CAL and the incidence of a crisis
and pointed evidence to support this conclusion. (Stiglitz (2000), Charlton and
(2001), Sulimierska (2008 b)). Their opinion is based on the wrong neoclassical
paradigms like those financial and capital markets are essentially the same as the
goods-services markets. Moreover, they suggest that the theory ignores
important aspects such as non-full information, irrational agents’ behaviour. 52
These wrong paradigms and neoclassical assumptions gave reasons why CAL
could lead to economic instability, macroeconomic instability and banking
booms and then to a currency crisis (the lack of neoclassical theory) (see Figure
2). In order to simplify the whole discussion, these factors and outcome might
be divided into main two categories. The first group of factors is regards as
animal spirits 53, the procyclical nature and volatility in capital flows, self-
fulfilling expectations, the systemic risk through contagion from one economy to
other, momentum trading 54 and the sensitivity of international markets to changes
in information (financial panic). (Stiglitz (2000), Singh (2002), Sulimierska
(2008 a,b)). These reasons essentially consider as the indicators of sudden stop

52 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)).

53 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.

54 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)).
models (Mendoza (2001), Hutchison and Noy (2004)), pure speculation- herding behaviour models (second generations 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)). Afterwards, the second category of indicators in linked to third generations models as banking/financial fragility and companies’ balance sheet models (James and Stoker (1994), Mishkin (1996), Chang and Velasco (1998 a,b,c), Kaminsky and Reinhart (1999), Krugman (1999 a,b), Aghion, Bacchetta and Banerjee (2000, 2001)). In this group of factors, there are financial panics, boom-bust cycles\textsuperscript{55}, increased the competition among banks following liberalization and the short-termism of leading players and momentum trading. It is important to add that the financial panic and momentum trading take special place in both second and third generation models of a currency crisis (Stiglitz (2000), Charlton and Stiglitz (2004), Chari and Henry (2002) (see Figure 2).

Figure 2. The theoretical background for linking CAL and Currency Crisis episodes.

\textsuperscript{55} Boom-bust cycles following capital inflows imply an initial surge in investment and asset bubbles, followed by capital outflows and recession.

All these above described factors that indicated connection between CAL and currency crisis episodes, become intensive during the process of liberalization of the capital flows. There are still a few practical sides of these phenomena (Sulimierska(2008 a,b)). First observable fact is that the liberalization of capital flows increases the number of investors and availability of new foreign assets which might raise the risk of asymmetric information and problem animal spirit effects (e.g. adverse selection, moral hazard, financial panic) (Mishkin 1996). For instance, the differences in the legal, social and business environment might cause foreign investors to have less knowledge.
about domestic markets than domestic ones. Simultaneously, domestic investors can have problems with accessing full information about new foreign assets (e.g. additional costs) (Banerjee (1992), Calvo and Mendoza (2000), Binkhchnadami and Sharma (2000)). Secondly, the liberalization of capital flows exposes the country to short-term debt/short-term capital inflows (e.g. East Asian counties, Russia, Argentina and Brazil in 1990s) and makes a country more vulnerable to financial panic and sudden stop effect (Rodrik and Velasco (1999), Gruszczyński (2002), Uri Dadush, Dasgusta and Rata (2003)).

Lastly, in the case banking system, the CAL process might increase the fragility of this system (Sulimierska (2008 a,b)). The foreign managers may suffer from the poorer knowledge of the behaviour of borrowers. Consequently, the domestic-owned banks might have less problem from information asymmetries than foreign-owned banks (Mc Kinnon and Huw (1999)). Additionally, the efficiency of financial-banking supervision might deteriorate due to increase the intensity of foreign participation through the increase of capital flows. This less efficient financial supervision by monetary authorities can lead to a banking crisis through increase of the amount of bad credit in a foreign currency for firms or individual-domestic financial dollarization (Chang Velasco (1998a,b), Kaminsky and Reinhart (1999), Demirguc-Kunt and Detragiache (1998)).

Furthermore, some economic research suggests 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)). Certainly, this situation might be explained quite simply.

To begin with economic distortions and economic shocks that developing countries are more suspected due to the weak legal framework. Secondly, most developing countries have a small economy (smaller capacity of economy) therefore, CAL process influenced negatively on efficiency of the monetary policy and leave fewer tools to protect against the speculation attacks. Lastly, it is sometimes very difficult to implement any preconditions reforms and correct order of removal CAL legal regulation in developing countries (see Fig. 3.).

Generally speaking, it is complicated to obtain a simple answer about the relation between CAL and Currency Crisis Episodes- it is positive or negative (56)

---

56 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)).
see Glick, Guo, Hutchison (2004), Sulimierska (2008 b)). As has been described, there are two main ways in which this link can be considered—certainly, the direction of this link can be discussed longer. Mainly, in the first part of this chapter, it was discussed that capital control might be efficient (e.g. the Malaysian case). However, in the long-term, investors always find a way to avoid the legal restrictions. The other problem is what kind of capital control regulation should be imposed on different categories of capital flows. There is common opinion that short-term capital flows bring volatility of balance of payments (Singh (2002)). As we have seen, both definition of capital flows (such as FDI and FPI) are very imprecise. It is relatively easy to transfer FDI to FPI, for instance, foreign companies can take secured advance for its subsidiaries in domestic bank and in that way transfer earlier invested money (Sulimierska (2008 a,b)).

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 Argentinian 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.57 Nevertheless, there is an extensive empirical literature measuring the effects on capital account liberalization on particular variables such as interest differentials, inflation or output.58 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 multi-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.  

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.

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 county 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). 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. 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

59 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.


62 CAL might be measured by considering different data (see Chapter 1.3, Chapter 3.3.1).
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). 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 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-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).64

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.65 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. 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.

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. 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. 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. In June 1996, Russia signed the IMF

---

70 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. Abbigail J., Chiodo and Michael T.
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; 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 in a narrow band between 5 and 6 roubles to the dollar. (see Appendix 2.2 Figure 3.) The trade balance never posed any threat. (see Appendix 2.2 Figure 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.

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. However, the biggest weakness in the Russian economy was low tax collection. Many firms

---


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.


did not pay taxes and the government did not pay for its purchases, which permitted barter transactions, especially at the regional government level.\textsuperscript{74} 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 – \textit{vekselya}- or other non-monetary payments) reached 26 percent of taxes in 1996 and 20 percent in 1997.\textsuperscript{75} 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 regional government (a kind of barter trade). This can explain why federal revenues dropped more rapidly than regional revenues.\textsuperscript{76}

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.\textsuperscript{77} 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. 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, assisted the government by purchasing new GKO issues at primary auctions. The remaining GKO 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. This relation between capital account liberalization and CRB/ Sberbank is indicated the risk of currency crisis in Russia.

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. 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. 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 Figure 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 ). Also, a substantial amount of the liabilities of large Russian commercial banks were off the balance sheets, consisting mostly of forward contracts signed with foreign investors. 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. So, this external shock hurt the Russian economy, especially the balance of trade and Russia’s ability to generate tax revenue. 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.86

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 the to refinance the payment of the ensuing debt. (see Appendix 2.2 Figure 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 GKOs 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.87

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).88 (see Appendix 2.2 -Figure 2, Appendix 2.1- Figure 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.89

---

By mid-June, it was becoming increasingly clear that the storm would hit (see Appendix 2.2 Figure 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. 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. 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 August 17, the government floated the exchange rate, devalued the rouble (see Appendix 2.2 Figure 3.), defaulted on its domestic debt, halted payment on rouble-denominated debt (primarily GKOs), 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 GKOs into 17 year dollar-denominated Eurobonds. The IMF tried to insist on an equal approach to resident and non-resident holders of GKOs, but the new Russian government decided to offer different restructuring schemes (reverse of capital account liberalization reforms). Additionally, the Russian crisis caused a big turmoil in other countries of the former USSR and other developed countries (e.g. Brazil crisis).

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”\(^{94}\) 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 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.


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.\(^{95}\) 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.\(^{96}\) Moreover, both countries had similar problems such as high unemployment rates and government spending (see

\(^{94}\) 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.


Appendix 2.3 Figure 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. 97 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 supplement to the Russia ruble 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. 99 However, before EU accession in 2004, Latvia had completed all transitional arrangements for the acquisition of agriculture and forestry land. 100 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 Figure 1.). 101 Latvia experienced a major banking crisis in the first half of 1995, which involved the bankruptcy of eleven prominent banks, including Bank Baltija (the largest one). 102 The banking crisis involved the loss of

98 The formal introduction of the national currency was in March 1993.
about 40 percent of the banking system’s assets and liabilities and the interest rate dropped (see Appendix 2.3 Figure 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. However, the first problems started appearing in 1994 when the licenses of several commercial banks were suspended. 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 Figure 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 fixed exchange rate policy, the economy avoided the transformation of a banking crisis into a currency crisis (see Appendix 2.3 Figure 1.).

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). 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 Figure 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 Figure 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

---

103 Sixty-seven banks were granted a license (in 1991, 14 banks; in 1992, 36 banks; in 1993, 16 banks; in 1994, 1 bank).
development and monetary/exchange rate policies. 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). Some experts suggest that this attitude to liberalization of capital regulation helped the Polish economy to avoid currency and financial crises, even in the face of currency crises in neighboring countries or the international economic crash (e.g. Asian crisis). It is clear 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 Figure 3,4,7,8, see Appendix 2.3 Figure 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.

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.

107 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.


However, the single-country analysis has the limitations that only presents the one-country perceptive (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 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). 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, Reinhard (1997), Esquivel, Larrain (1998), G. L. Kaminsky, C. M. Reinhart (1999), Ahluwalia (2000), Berg, Borenszttein, 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,

---

The first papers which tried to developed the indicators of currency crises in this line are: Bilson (1979), Blanco, Garber (1986), Cumby and Van Wijnenbergen (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.
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) 114 (see
Table 2.). In addition I will mention Berg and others’ (2005) description of the
private currency crisis prediction models.115

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. 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.116 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.117 If the value of the

114 DCSD EWS models – Developing County Studies Division of the IMF -Early Warning System models.
115 Peltonen’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.
116 Saxena (1999) “Currency Crises and Capital Controls: A Selective Survey” University of
Washington pp.17.
117 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 \( H \) when \( H \) 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

\[
(1 - \alpha) = \frac{\text{number of months with good signals}}{\text{number of months in the crisis window}}
\]

\[
\beta = \frac{\text{number of months with bad signals}}{\text{number of months in the crisis window}}
\]

A good signal is issued the signals inside
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 and the Russian crisis of 1998, and then tried to find countries that had signals in with these countries.\textsuperscript{118}

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”.

Table 2. EWS models

<table>
<thead>
<tr>
<th>Specification of EWS models</th>
<th>Signal approach</th>
<th>Source</th>
<th>Horizon</th>
<th>Method</th>
<th>Variables</th>
<th>Procedure</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kaminsky, Lizondo, Reinhart (1997)-KLAR (1997)</td>
<td>Ahluwalia (2000)</td>
<td>2 years</td>
<td>Weighted average of indicators. Variables measured as 0/1 indicators according to threshold chosen to minimize noise</td>
<td>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</td>
<td>Cross-sectional, OLS estimation</td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>Kaminsky (1998)</td>
<td>Kaminsky (2003)</td>
<td>2 years</td>
<td>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</td>
<td>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</td>
<td>Ex-ante unknown non-linearity approach: Regression tree analysis (Breiman 1984, Durlauf, Johnson 1995) and regime signal approach (Kaminsky 1998)</td>
<td></td>
</tr>
</tbody>
</table>

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 |

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)

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


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.\(^{119}\)

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 Johnston 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.\(^{120}\) 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.\(^{121}\) 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. Johnston and Ryan (1994), Quirk (1994) and Gruszczynski (2001)\(^{122}\) 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.\(^{123}\)

---


\(^{121}\) 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.

\(^{122}\) 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 cautious about developing the main conclusion.

\(^{123}\) 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
Kaminsky and Reinhart used a 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)\textsuperscript{124}, 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.\textsuperscript{125} 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

\textsuperscript{124}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.

\textsuperscript{125}Licchetta (2006) “Macroeconomic effects of capital account liberalization in emerging markets” University degli Studi di Roma pp. 9.
economic crises. On the other hand, Bartolini, Drazen (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. 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

126 Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Russian Federation, the Slovak Republic, Slovenia, the Ukraine.
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.\textsuperscript{127} 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, Hungary, the Slovak Republic and Slovenia had a more cautious attitude to reductions in capital control regulation.\textsuperscript{128}

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’.\textsuperscript{129} Secondly, all the countries which were analysed experienced intense attacks on their currencies\textsuperscript{130} 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.\textsuperscript{131}

Table 4. Membership in OECD, IMF and European Union

\textsuperscript{127} For instance, Sachs, Tornell and Velasco (1996) excluded Hungary and Poland from the contagious currency crises analysis due to problems of obtaining data.


\textsuperscript{130} 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.

\textsuperscript{131} Freedom House, Country Reports 2006, downloaded 1\textsuperscript{st} August 2007, http://www.freedomhouse.org/.
<table>
<thead>
<tr>
<th>Country</th>
<th>OECD</th>
<th>IMF***</th>
<th>EU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td></td>
<td>1998</td>
<td>2007</td>
</tr>
<tr>
<td>Czech Rep</td>
<td>1995</td>
<td>1995</td>
<td>2004</td>
</tr>
<tr>
<td>Estonia</td>
<td></td>
<td>1994</td>
<td>2004</td>
</tr>
<tr>
<td>Hungary</td>
<td>1996</td>
<td>1996</td>
<td>2004</td>
</tr>
<tr>
<td>Latvia</td>
<td></td>
<td>1994</td>
<td>2004</td>
</tr>
<tr>
<td>Lithuania</td>
<td></td>
<td>1994</td>
<td>2004</td>
</tr>
<tr>
<td>Poland</td>
<td>1996</td>
<td>1995</td>
<td>2004</td>
</tr>
<tr>
<td>Russia</td>
<td></td>
<td>1996</td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td></td>
<td>1995</td>
<td>2004 (EMU - 2007)</td>
</tr>
<tr>
<td>The Ukraine</td>
<td>1996</td>
<td></td>
<td>**</td>
</tr>
</tbody>
</table>

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.


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. 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

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.
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) \(^{133}\) 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. 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 \( x_{it} \):

\[
p_{it} = \Pr(y_{it} = 1) = \Phi(x_{it} \beta) \quad \text{where} \quad \Phi(x_{it} \beta) = \int_{-\infty}^{x_{it} \beta} \frac{1}{\sqrt{2\pi}} e^{-\frac{u^2}{2}} du \quad \text{is the cumulative distribution function for standard normal variable and} \ u \ \text{is the standardized random variable.}^{134}
\]

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.


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, Guà 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).

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

\[135 \text{ Glick and Hutchison (2004), Eichengreen (2001) and Hendry (2006).} \]
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).\(^\text{136}\)

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\(^\text{137}\) was taken from Eichengreen, Rose and Wyplosz (1996) and defined the cut-off point as 
\[
MPI_x > \mu_{MPI_x} + 1.5 \times \sigma_{MPI_x}
\]
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 
\[
MPI_x > \mu_{MPI_x} + 3 \times \sigma_{MPI_x}
\]
- 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).\(^\text{138}\) 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

\(^{136}\) 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).

\(^{137}\) 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 corning the market (corning the market means an illegal attempt to buy up enough of a commodity (stocks, assets, property etc.) to allow the price to be manipulated).

\(^{138}\) The criteria for Frankel and Rose’s index is different (see Chapter 1.2.1).
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\(^{139}\) 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 crises events (see Table 5 and Appendix 3.1.).\(^{140}\)

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

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Estonia</td>
<td></td>
<td>1999</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td></td>
<td></td>
<td>2005</td>
<td></td>
</tr>
<tr>
<td>Lithuania</td>
<td></td>
<td>1995,1998</td>
<td>2005</td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>1995</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Slovak Rep.</td>
<td></td>
<td>2002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td>1995</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.


\(^{140}\) 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.
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, Guo 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. 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 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).

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

---

141 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.

142 The IMF’s Annual Report on Exchange Arrangements and Exchange Restrictions (AREAE) is a paper report that has been published annually since 1950.
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 of export receipts and capital 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 Figure 3.).

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

<table>
<thead>
<tr>
<th>Country</th>
<th>Glick, Guo and Hutchison’s index</th>
<th>Chinn and Ito’s index (3)</th>
<th>Chinn and Ito’s index (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>2002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td>2003</td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td>2002-05</td>
<td>2003-05</td>
<td>2003-05</td>
</tr>
<tr>
<td>Russia</td>
<td>1996-97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Ukraine</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.
The value of the share measure allowed me to split the countries into four groups: completely liberalized (share measure > 0.7), liberalized (share measure ≥ 0.5), partially non-liberalized (share measure < 0.5), non-liberalized (share measure ≤ 0.3). According to the calculations (see Table 7., Figure 3.), 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

<table>
<thead>
<tr>
<th>Country</th>
<th>Glick, Guo and Hutchison’s index</th>
<th>Chinn, Ito’s index (4)</th>
<th>Chinn and Ito’s index (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>non-liberalized</td>
<td>Non-liberalized</td>
<td>non-liberalized</td>
</tr>
<tr>
<td>The Czech Rep.</td>
<td>completely liberalized</td>
<td>completely liberalized</td>
<td>completely liberalized</td>
</tr>
<tr>
<td>Estonia</td>
<td>completely liberalized</td>
<td>completely liberalized</td>
<td>completely liberalized</td>
</tr>
<tr>
<td>Hungary</td>
<td>partially non-liberalized</td>
<td>Partially non-liberalized</td>
<td>Liberalized</td>
</tr>
<tr>
<td>Latvia</td>
<td>completely liberalized</td>
<td>completely liberalized</td>
<td>completely liberalized</td>
</tr>
<tr>
<td>Lithuania</td>
<td>completely liberalized</td>
<td>completely liberalized</td>
<td>completely liberalized</td>
</tr>
<tr>
<td>Poland</td>
<td>non-liberalized</td>
<td>Non-liberalized</td>
<td>non-liberalized</td>
</tr>
<tr>
<td>Romania</td>
<td>Partially non-liberalized</td>
<td>non-liberalized</td>
<td>non-liberalized</td>
</tr>
<tr>
<td>Russia</td>
<td>non-liberalized</td>
<td>non-liberalized</td>
<td>non-liberalized</td>
</tr>
<tr>
<td>Slovakia</td>
<td>Partially non-liberalized</td>
<td>non-liberalized</td>
<td>non-liberalized</td>
</tr>
<tr>
<td>Slovenia</td>
<td>Liberalized</td>
<td>Liberalized</td>
<td>Liberalized</td>
</tr>
<tr>
<td>The Ukraine</td>
<td>non-liberalized</td>
<td>non-liberalized</td>
<td>non-liberalized</td>
</tr>
</tbody>
</table>

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).\(^\text{143}\) 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)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Currency crises*</td>
<td>5</td>
<td>15</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Number of crises</td>
<td>7</td>
<td>7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CAL liberalization **</td>
<td>38,64</td>
<td>20,83</td>
<td>43,75</td>
<td>75,75</td>
</tr>
</tbody>
</table>

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. 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

<table>
<thead>
<tr>
<th>Country</th>
<th>Unconditional Frequency (in percent)***</th>
<th>Degree of CAL*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>9</td>
<td>non-liberalized</td>
</tr>
<tr>
<td>The Czech Rep.</td>
<td>9</td>
<td>Liberalized</td>
</tr>
<tr>
<td>Estonia</td>
<td>0</td>
<td>Liberalized</td>
</tr>
<tr>
<td>Hungary**</td>
<td>9</td>
<td>non-liberalized</td>
</tr>
<tr>
<td>Latvia</td>
<td>0</td>
<td>Liberalized</td>
</tr>
<tr>
<td>Lithuania</td>
<td>0</td>
<td>Liberalized</td>
</tr>
<tr>
<td>Poland</td>
<td>0</td>
<td>non-liberalized</td>
</tr>
<tr>
<td>Romania</td>
<td>9</td>
<td>non-liberalized</td>
</tr>
<tr>
<td>Russia</td>
<td>9</td>
<td>non-liberalized</td>
</tr>
<tr>
<td>Slovakia</td>
<td>0</td>
<td>non-liberalized</td>
</tr>
<tr>
<td>Slovenia</td>
<td>0</td>
<td>Liberalized</td>
</tr>
<tr>
<td>The Ukraine</td>
<td>18</td>
<td>non-liberalized</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>CAL index</th>
<th>Chinn and Ito’s (2002) index (4)</th>
<th>Glick, Guo and Hutchison’s(2004) index</th>
<th>Chinn and Ito’s(2002) index (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>my own variable of currency crisis</td>
<td>7-CC</td>
<td>7-CC</td>
<td>6-CC 1-CAL</td>
</tr>
<tr>
<td>Frankel and Rose’s (1996) index</td>
<td>10-CC</td>
<td>10-CC</td>
<td>9-CC 1-CAL</td>
</tr>
<tr>
<td>Cerra and Saxena’s(1998) index</td>
<td>10-CC 6-CAL</td>
<td>9-CC 7-CAL</td>
<td>9-CC 7-CAL</td>
</tr>
<tr>
<td>Ahluwalia’s(2001) index</td>
<td>4-CC 3-CAL</td>
<td>4-CC 3-CAL</td>
<td>4-CC 3-CAL</td>
</tr>
</tbody>
</table>

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.).

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.

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

<table>
<thead>
<tr>
<th>Sequence of CAL</th>
<th>Yes*</th>
<th>No**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currency Crisis and Liberalization took place during currency year</td>
<td>0-CI4</td>
<td>5,4-CI4</td>
</tr>
<tr>
<td></td>
<td>0-GGH</td>
<td>4,5-GGH</td>
</tr>
<tr>
<td></td>
<td>0,75-CI3</td>
<td>4,5-CI4</td>
</tr>
<tr>
<td>Currency Crisis happened and liberalization had taken place during previous year</td>
<td>0-CI4</td>
<td>0-CI4</td>
</tr>
<tr>
<td></td>
<td>0,75-GGH</td>
<td>0-GGH</td>
</tr>
<tr>
<td></td>
<td>0-CI3</td>
<td>0-CI3</td>
</tr>
</tbody>
</table>

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).

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). Most of the data for the 12 countries were drawn from the International Monetary Fund’s International Financial Statistics CD. 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.

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.

The current account (line 78 ald 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).

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

\[
\Pr(CAL_{it} = 1) = \Phi(\beta_0 + \beta_1 CA_t / GDP_{t-1} + \beta_2 G / GDP_{t-1} + \beta_3 Op_{t-1} + \beta_4 MF_t + \beta_5 PF_{t-1} + \beta_6 r^*_{t-1})
\]

### Equation 2 Augment specification probit equation

\[
\Pr(CAL_{it} = 1) = \Phi(\beta_0 + \beta_1 CA_t / GDP_{t-1} + \beta_2 G / GDP_{t-1} + \beta_3 Op_{t-1} + \beta_4 mf_t + \beta_5 PF_{t-1} + \beta_6 r^*_{t-1} + \beta_7 CU_{t-1})
\]

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.

---

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.
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

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>Benchmark equation</th>
<th>probit specification</th>
<th>Augmented specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>$CA/GDP_{r-1}$</td>
<td>-2.12 (3.4)</td>
<td></td>
<td>-2.26 (3.48)</td>
</tr>
<tr>
<td>$G/GDP_{r-1}$</td>
<td>0.89 (0.98)</td>
<td>0.119 (1.01)</td>
<td></td>
</tr>
<tr>
<td>$O_{r-1}$</td>
<td>2.17 (3.5)</td>
<td>2.2 (3.54)</td>
<td></td>
</tr>
<tr>
<td>$r^{*}_{r-1}$</td>
<td>-0.1 (0.06)</td>
<td>-0.08 (0.07)</td>
<td></td>
</tr>
<tr>
<td>$PF_{r-1}$</td>
<td>1.04 (0.54)</td>
<td>1.06 (0.07)</td>
<td></td>
</tr>
<tr>
<td>$MF_{t}$</td>
<td>0.012 (0.07)</td>
<td>0.012 (0.563)</td>
<td></td>
</tr>
<tr>
<td>$CU_{r-1}$</td>
<td></td>
<td>-0.32 (2.03)</td>
<td></td>
</tr>
<tr>
<td>No.of observations</td>
<td>115</td>
<td>115</td>
<td></td>
</tr>
</tbody>
</table>

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. These variables are significant at level 5%, however there is a problem with PF in an augmented equation. I decided to leave this variable due to important economics interpretation and small size of sample.

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). 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 (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. 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**

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

**Equation 4. Benchmark Currency Equation**

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

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.

---

148 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).
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.

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.).

Table 15. Estimation of currency crisis equation

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>Benchmark equation</th>
<th>Augmented specification equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \log(M_{2}/R)_{t-1} )</td>
<td>1.84 (0.11)</td>
<td>1.79 (1.21)</td>
</tr>
<tr>
<td>( CA/GDP_{t-1} )</td>
<td>4.4 (0.6)</td>
<td>4.42 (8.4)</td>
</tr>
<tr>
<td>( \Delta DC_{t} )</td>
<td>-2.30e-11 (6.9e-11)</td>
<td>-2.15e-11 (6.2e-11)</td>
</tr>
<tr>
<td>( r_{t-1}^{*} )</td>
<td>1.58 (0.56)</td>
<td>1.56 (0.505)</td>
</tr>
<tr>
<td>( r_{t-1} )</td>
<td>-0.007 (0.412)</td>
<td>-0.006 (0.001)</td>
</tr>
<tr>
<td>( \Delta GDP_{t-1} )</td>
<td>-1.4e-12 (1.7e-12)</td>
<td>-1.37e-12 (1.7e-12)</td>
</tr>
<tr>
<td>( CAL_{t} )</td>
<td>-0.22 (0.5)</td>
<td></td>
</tr>
<tr>
<td>No.of observations</td>
<td>129</td>
<td>129</td>
</tr>
</tbody>
</table>

Note: The table reports estimation results of the population-average probit models. Constant excluded. Observations were weighted by GDP per capita (in dollars). These variables are significant at level 5%, however there is a problem with \( \log(M_{2}/R) \) and \( CA/GDP \) in benchmark probit equation in an augmented equation. I decided to leave this variable due to important economics interpretation and small size of sample.

Source: My own estimations.

Furthermore, this outcome suggests that currency crises during this period have the features of all generations of currency crisis models. This is because the sign of coefficient of some factors of second and third generation models is as
expected (M2/foreign reserves, real international interest rate, GDP growth and domestic interest rate). Where the one unit change M2/foreign 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.).

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).

**CONCLUSION**

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 fundaments 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 fundaments (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


Devereux Micheal P. Taxes in EU New Member States and the Location of Capital and Profit. *IFS and CEPR,* 2006.


---: Capital Account Liberalization, the cost of capital and economic growth” NBER Stanford University, 2003.


Heritage Foundation and The Wall Street Journal, downloaded 1st June 2007, 2007 *Index of Economic Freedom*.online:
http://www.heritage.org/research/features/index/index.cfm/.

http://services.bepress.com/itfa/18th/art33


--: IMF Approves augmentation of Russia Extended arrangement and credit under CCFF; Activates GAB, 1998.


Krueger A. *Financial deregulation and integration in East Asia*, University of Chicago, 1996, pp.7-42.


--: *Analytical Afterthoughts on the Asian Crisis*, mimeo, MIT, 1999b.


Sulimierska M. The theoretical link between Capital Account liberalization and Currency Crisis Episodes. *International Journal of Business and Management* Vol. 3, No. 4, in April, 2008a, pp. 75-95


**INDEXES**

**Henceforth index**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAL</td>
<td>Capital Account Liberalization</td>
</tr>
<tr>
<td>IMF</td>
<td>International Monetary Fund</td>
</tr>
<tr>
<td>CEE</td>
<td>Central Eastern Countries</td>
</tr>
<tr>
<td>GGH model</td>
<td>Glick, Guo, Hutchison’s model</td>
</tr>
<tr>
<td>IFS</td>
<td>International Financial Statistics</td>
</tr>
<tr>
<td>DCSD EWS models</td>
<td>Developing County Studies Division of the IMF - Early Warning System models</td>
</tr>
<tr>
<td>CI4</td>
<td>Chinn and Ito’s (2002) index with the capital transaction regulation</td>
</tr>
<tr>
<td>CI3</td>
<td>Chinn and Ito’s (2002) index without the capital transaction regulation</td>
</tr>
<tr>
<td>AREAE</td>
<td>Annual Report on Exchange Arrangements and Exchange Restrictions</td>
</tr>
</tbody>
</table>

**Figure index**

Figure 1. International capital flows classification according to the investment instrument used (OECD, IMF)
Figure 2. CAL and Currency Crisis from a theoretical perspective
Figure 3. Degree of the CAL process in 12 countries for the period 1995-2005
**Box index**

Box 1. The argument pros and cons for capital control  
Box 2. Capital control in Chile  
Box 3. Capital control in Malaysia

**Table index**

Table 1. The efficiency of capital control  
Table 2. EWS models  
Table 3. Currency Crisis Indicators according to Kaminsky (2003)  
Table 4. Membership in OECD, IMF and European Union  
Table 5. Currency crisis episodes in analyzing countries according to different currency crisis methods  
Table 6. Capital Account Liberalization episodes calculating according to different methods  
Table 7. Share measure calculations based on three different CAL indexes  
Table 8. Currency crises and CAL, unconditional frequency (in percentages)  
Table 9. Currency crisis unconditional frequency and CAL across countries  
Table 10. CAL indexes and Currency Crisis indexes for 12 countries period 1995-2005  
Table 11. Currency crisis, frequency condition on CAL for 12 countries for period 1995-2005 (in percentages)  
Table 12. Estimation equations  
Table 13. Probit Equation for Estimating CAL Propensity Scores  
Table 14. Estimation equations  
Table 15. Estimation of currency crisis equation

**Appendix index**

Appendix 1.1. Capital Control evidences  
Appendix 1.2. IFCI and IFCG index  
Appendix 2.1. Market Pressure Indexes  
Appendix 2.2. Russian Case  
Appendix 2.3. Latvian and Polish cases  
Appendix 3.1. Empirical analysis of Currency Crisis and Capital Account Liberalization
APPENDIXES

Appendix 1.1. Capital Control Evidences

Table 1. The efficiency of capital control

<table>
<thead>
<tr>
<th>Source</th>
<th>Stability of interest rate</th>
<th>Volume of capital flows</th>
<th>Composition of capital flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathieson, Rojas-Suarez (1993) (developing countries)</td>
<td>●</td>
<td>●</td>
<td>~</td>
</tr>
<tr>
<td>Johnston, Ryan (1994)</td>
<td>●</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td>Montiel and Reinhart (1999) (15 developed and developing countries)</td>
<td>●</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td>Lopez-Meija (1999) (Chile, Colombia, Malaysia)</td>
<td>●</td>
<td>●</td>
<td>↑</td>
</tr>
<tr>
<td>Edison Warnoc (2003) (developing countries)</td>
<td>●</td>
<td>~</td>
<td></td>
</tr>
<tr>
<td>Campion and Neumann (2004) (Latina American countries)</td>
<td>●</td>
<td>●</td>
<td>↑↑</td>
</tr>
</tbody>
</table>

↑↑↑↑- 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)
~- not impact, ●-no analysing this effect

Tabela 1 Capital Controls in Chile

<table>
<thead>
<tr>
<th></th>
<th>Stability of interest rate</th>
<th>Volatility of real exchange rate</th>
<th>Volume of total capital inflows</th>
<th>Composition of capital inflows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cowan K et al (2005)</td>
<td>↑</td>
<td>●</td>
<td>↑↑</td>
<td>↑↑~~</td>
</tr>
<tr>
<td>Gallego et al (1999)</td>
<td>~</td>
<td>●</td>
<td>↑↑</td>
<td>↑↑~~</td>
</tr>
<tr>
<td>Le Fort and Lehman (2003)</td>
<td>●</td>
<td>●</td>
<td>↑↑</td>
<td>●</td>
</tr>
<tr>
<td>Lopez-Mejia (1999) (Chile, Colombia, Malaysia)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>↑</td>
</tr>
</tbody>
</table>

↑↑↑↑- strong up-way impact (rise of domestic 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)
~ - not impact, ~ ~ - unambiguously changes ● - paper does not analyse this effect

Appendix 1.2. IFCI and IFCG index

Fig. 1. IFCI and IFCG indexes

Appendix 2.1 Market Pressure Indexes

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

![Cerra and Saxena's (1998) index](image1)

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

![Ahluwalia's (2000) index](image2)

Note: The definition of speculative attack was defined the cut-off point as $\text{MPI}_x > \mu_{\text{MPI}} + 1.5 \times \sigma_{\text{MPI}}$, 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 $\text{MPI}_x > \mu_{\text{MPI}} + 3 \times \sigma_{\text{MPI}}$.

Source: My own calculations based on IFC CD.
Fig. 3. Cerra and Saxena's (1998) market pressure index for Poland

![Cerra and Saxena's (1998) market pressure index for Poland](image)

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

![Ahluwalia's (2000) Market Pressure Index for Poland](image)

Note: The definition of speculative attack was defined the cut-off point as $\text{MPI}_x > \mu_{\text{MPI}_x} + 1.5 \times \sigma_{\text{MPI}_x}$, 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 $\text{MPI}_x > \mu_{\text{MPI}_x} + 3 \times \sigma_{\text{MPI}_x}$.

Source: My own calculations based on IFC CD.
Fig. 5. Cerra and Saxena's (1998) market pressure index for Russia

Note: The definition of speculative attack was defined the cut-off point as $\text{MPI}_x > \mu_{\text{MPI}_x} + 1.5 \times \sigma_{\text{MPI}_x}$, 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 $\text{MPI}_x > \mu_{\text{MPI}_x} + 3 \times \sigma_{\text{MPI}_x}$.

Source: My own calculations based on IFC CD

Fig. 6. Ahluwalia's (2000) market pressure index for Russia
Fig. 7. Cerra and Saxena's (1998) market pressure index for Poland, Latvia and Russia

![Graph showing market pressure index for Poland, Latvia, and Russia from 1995 to 1999. The index values range from -15 to 15. The data points for each country are marked with different colors: blue for Latvia, green for Poland, and orange for 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

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>-</td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Hungary</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Poland</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Romania</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Russia</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Slovak</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Slovenia</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

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.

## Appendix 2.2 Russian Case

**Table 1. Events in Russia over period 1995-1999**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 1995</td>
<td>The autonomy of the Central Bank of the Federation of Russia.</td>
</tr>
<tr>
<td>1996</td>
<td>The capital liberalisation for non-residents. Negotiations with the Paris and London Clubs for repayment of Soviet debt begin.</td>
</tr>
<tr>
<td>September/October 1997</td>
<td>Negotiations with Paris and London Clubs completed.</td>
</tr>
<tr>
<td>November, 1997</td>
<td>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.</td>
</tr>
<tr>
<td>November 11, 1997</td>
<td>Asian crisis causes a speculative attack on the ruble CBR defends the ruble, losing $6 billion.</td>
</tr>
<tr>
<td>December 1997</td>
<td>Year ends with 0.8 percent growth. Prices of oil and nonferrous metal begin to drop.</td>
</tr>
<tr>
<td>April 1998</td>
<td>Another speculative attack on the ruble.</td>
</tr>
<tr>
<td>April 24, 1998</td>
<td>Duma finally confirms Kiriyenko’s appointment.</td>
</tr>
<tr>
<td>Early May 1998</td>
<td>Dubinin warns government ministers of impending debt crisis, with reporters in the audience. Kiriyenko calls the Russian government “quite poor.”</td>
</tr>
<tr>
<td>May 19, 1998</td>
<td>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.</td>
</tr>
<tr>
<td>May 23, 1998</td>
<td>IMF leaves Russia without agreement on austerity plan.</td>
</tr>
<tr>
<td>July 20, 1998</td>
<td>IMF approves an emergency aid package (first disbursement to be $4.8 billion).</td>
</tr>
<tr>
<td>August 13, 1998</td>
<td>Russian stock, bond, and currency markets weaken as a result of investor fears of devaluation; prices diminish.</td>
</tr>
<tr>
<td>August 17, 1998</td>
<td>Russian government devalues the ruble, defaults on domestic debt, and declares a moratorium on payment to foreign creditors.</td>
</tr>
<tr>
<td>August 23-24, 1998</td>
<td>Kiriyenko is fired.</td>
</tr>
<tr>
<td>September 2, 1998</td>
<td>The ruble is floated.</td>
</tr>
<tr>
<td>December 1998</td>
<td>Year ends with a decrease in real output of 4.9 percent.</td>
</tr>
</tbody>
</table>

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

![Graph showing foreign assets and liabilities from 1995M1 to 1998M8.]

*Source:* CD IFS.

Fig. 2. The interest rate in Russia

![Graph showing interest rates from 1995M1 to 1998M8.]

*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)

<table>
<thead>
<tr>
<th>Years</th>
<th>Capital Account Liberalization events</th>
</tr>
</thead>
</table>
| 1989  | Permission for buying/selling currencies.  
| 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 1st 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. |


149 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)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Czech Rep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lithuania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Russia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Slovak Rep.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Ukraine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Czech Rep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lithuania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Russia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Slovak Rep.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Ukraine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: My own calculations.
Table 3. Currency Crisis and Capital Account Liberalization (Chinn, Ito’s (2002) CAL index (3) and my own index of Currency Crisis)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Czech Rep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lithuania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Russia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Slovak Rep.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Ukraine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Czech Rep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lithuania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Russia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Slovak Rep.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Ukraine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: My own calculations.

Legend:
- 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)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Czech Rep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lithuania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Russia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Slovak Rep.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Ukraine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Czech Rep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lithuania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Russia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Slovak Rep.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Ukraine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Czech Rep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lithuania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Russia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Slovak Rep.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Ukraine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Czech Rep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lithuania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Russia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Slovak Rep.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Ukraine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: My own calculation.

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

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Czech Rep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lithuania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Russia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Slovak Rep.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Ukraine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: My own calculation.


<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Czech Rep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lithuania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Russia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Slovak Rep.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Ukraine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: My own calculation.

- non CAL   - CAL and currency crisis episodes
- CAL       - non CAL and currency crisis e
Table 11. Currency Crisis and Capital Account Liberalization (Glick, Guo and Hutchison’s (2004) CAL index and Ahluwalia’s (1996) index of Currency Crisis)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Czech Rep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lithuania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Russia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Slovak Rep.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Ukraine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*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)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Czech Rep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lithuania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Russia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Slovak Rep.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Ukraine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source:* My own calculation.

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