University of Sussex
Business, Management & Economics

Economics Department Working Paper Series

No. 51-2012

After Ten Years of the Russian Crisis, How Might IMF Intervention Be Evaluated?

Malgorzata Sulimierska
Department of Economics, University of Sussex, Falmer, UK
LICOS, Centre of Transition Economics, Economics Department, Katholieke Universiteit Leuven, Leuven, Belgium
E-mail: malgorzata.sulimierska@sussex.ac.uk

Abstract: The ongoing global financial crisis has become prominently visible since September 2008. This crisis affected the whole world and enhanced the importance of policy implementation to mitigate financial crises in future. Many academics blamed insufficient domestic regulation as the reason of crises, others pointed to the lack of overseas financial regulation and inappropriate actions by international organizations, such as the IMF and World Bank. This whole discussion encouraged to look back and analysed a previous crisis in smallest countries such as Russia. This paper evidently shows the inefficiency of IMF policy during the Russia Crisis in 1998 by implementing a new monetary balance of-payment model in Russian data. This model identified the role of macroeconomic fundamentals and international economic policy implications on the likelihood and the timing of the currency crisis in Russia. For the period from December 1995 to December 1998 it was found that, the increase in domestic credit growth gradually undermined confidence in the fixed exchange rate regime. The most dangerous point was at the end of 1998, when the collapse probability was above 90 percent. This result ambiguously questioned the IMF's July packet 1998 and proved the political aspects of this financial help.

JEL Classification: C58, G01, G02 and G17

Key Words: currency crisis, financial liberalization, sudden-stops, monetary balance-of-payment model, Russian crisis, IMF's policy

Acknowledgements
I would like to express my gratitude to Robert Eastwood (University of Sussex), Grzegorz Dobroczek (National Bank in Poland), Ryszard Kokoszczynski (National Bank in Poland) for their invaluable guidance and comments. I would especially like to thank participants of INFINITY conference in Dublin in 2009 and Phd Conference in Monetary and Financial Economics for their suggestions and remarks. I am also extremely grateful to and Aditya S. Math (University of Sussex) for his IT assistance.

1. Introduction

The ongoing global financial crisis affected the whole world. The failure, of several large United States-based financial firms caused intensive discussion about the future of international financial supervision and position of International Monetary Fund. Since 1944 the IMF has supported many countries though loans, research advisors and economic programs. However, critics highlight various examples in which democratized countries fell economically after receiving IMF programs. For instance, Russia in 1998 was one of example of IMF intervention. After the collapse of the Soviet Union, it was believed that Russia would soon be integrated into the global market. The two main international institutions such as the IMF and World Bank focused on Russia to implement the macroeconomic stability program. However, after six years of economic reform in Russia, privatisation and macroeconomic stabilisation had only limited success such as exchange rate stability in bands and low inflation rate. Especially a problem of high corruptions intensified the problem of moral hard and averse selection which limited the possibility of reforms success. On the other hand, in August 1998, Russia was forced to default on its sovereign debt, devalue the Rouble, and suspend payments by commercial banks to foreign creditors. Under these circumstances, basic common sense suggested Russia could be heading for a fundamental macroeconomic crisis (the hypothesis of the existing so-called first generation model). However, the global financial markets reacted with shock and surprise at Russia's default in August 1998 because it was widely believed that Russia was too politically important to default. In addition, through the 1990s, Russia had operated under the auspices and close scrutiny of a Fund-supported program. It is natural to pose the question: What did cause the Russian

economy to face a currency crisis after so much had been accomplished and what was the impact of IMF intervention on Russian crisis?

It seems natural to analyse in this paper the reasons for the Russian crisis and explain the IMF's impact on this crisis. In order to explain this, three aspects will need to be analysed. Firstly, how theoretical studies might explain the Russian currency crisis. Secondly, whether this crisis could have been predicted in theoretical terms or whether the crisis might have been inevitable, and lastly, but not least, how can the impact of difficult external intervention, especially by the IMF, on the crisis be understood? It is not possible to leave out of the account the impact of the IMF intervention on the Russian economy and investors' expectations.

This paper is divided into four parts. The first part describes the theoretical basis of the currency crisis though various generations of models. Then the second part presents the empirical literature review, especially the analysis of a single country. In the last part, the Russian case is described in order to adopt the empirical econometric model, in which I modified CVW's model (a monetary balance–of-payments model) (Cumby and Van Wijnbergen's model). This modification answers the question of whether the crisis could have been predicted. The section discusses the role of the IMF in the Russian crisis.

2. Theoretical models of currency crises

The theoretical discussion is mainly presented by three different currency crisis stories (Kamisky (2003), Sagib(2002) Sulimierska (2008 a,b)).

The first story was inspired by the Latin American currency crisis in the late 1960s and early 1970s- it is so-called "first generation models" (or "cannonical models"). These models stress that crises are caused by unsustainable fiscal and monetary expansion that cause a persistent loss of foreign reserves. Since

market agents start doubting the ability of the central bank to control the fixed exchange rates system. Then reserves fall to a critical threshold, the rational agents initiate speculative attacks on the foreign exchange which lead to the collapse of the exchange rate (see Krugman (1979), Salant and Henderson (1978), Dornbush (1987) and Flood and Garber (1984), Flood, Garber and Kramer (1996)).

After the EMS crises of the early 1990s, the second story developed on the base of imprecise irrational behaviours of investors on financial markets (so-called "second generation models"). The European countries did not have any problem of divergence between fiscal policy and exchange rate policy; in this case a crisis can happen without a significant change in macroeconomics fundaments. Generally, there are two main lines among second generation models: the self-fulfilling currency crisis models and the pure speculative models. The main difference between these two lines of models is that self-fulfilling models effects a crisis as a result of rational market respond to persistently conflicting internal and external macroeconomic targets. On the contrary, pure speculative models consider the crisis as the reflection of irrational private behaviour. The self-fulfilling models point that the core of the currency crisis is directly linked with the market agents' formation of expectation about future exchange rate policy (mainly investors' rumours). The government policy is a kind of trade-off between the benefits and costs of maintaining a credible exchange rate peg. Government faces two conflicting targets: reducing inflation and keeping economic activity. The peg exchange rates might allow achieving the first goal; however, there is possibility of the loss of competitiveness and a recession with sticky prices. On the other hand, devaluations of exchange rate might restore competitiveness and eliminate the unemployment. At the same time, the market agents create expectations about

this future government policy and then start the actions that affect some variables (e.g. interest rate) and wait for economic policies to respond. In that case, the level of reserve will mainly depend on the degree of commitment of authorities to hold the peg. The weaker the commitment of the authorities the higher the probability that the speculative attack will be successful (see Obstfeld (1986a,b, 1994) Ozkan and Sutherland (1995), Reisen (1998) and Krugman (1996)).

The pure speculation models have two interesting tales to be told. The first tale describes the speculation against the currency as the consequence of herding behaviour (Calvo and Mendoza (2000), Binkhchandani and Sharma(2000)). Then the second tale gives large attention to the contagion and sudden stops effects (Gerlach and Smets (1995), Eichenngreen, Rose, Wyplosz (1996), Masson (1998)).[1] There are two different ways to present the herding behaviours. Firstly, full information assumption does not hold, agents have different pieces of information due to the cost of information. In order to reduce this cost, individuals start to base their behaviours on the behaviours of others (so-called leaders). This might move financial market to an ineffective distribution and then to a crisis outcome (Calvo and Mendoza (2000)). Secondly, the manager's salary will not decrease so much if the other investors on the market make the same mistake. In that situation the cost of standing out against other portfolio managers' crowd is larger than followed wrong along with everyone. (Binkhchandani and Sharma(2000)).

The last story about crisis, the so-called third generation model of currency crisis, has been developed rapidly soon after the Asian crisis. This crisis could not be explained by previous theoretical models and moved

[1]The contagion and hedging effects is considered as the part of the second-generation models instead of being the special category of third generation models such as financial market in efficiencies. In theoretical analysis is followed by Kaminsky, Lizondo and Reihard (1997), Esquivel and Larrain (1998) and Sulimierska (2008 a,b).

attentions to micro fundamentals of an economy (see Krugman (1998, 1999 a,b) and Velasco (2001)). The third generation models consider three micro fundamentals of an economy as reasons of the currency crisis:

-fragility of banking system (McKinnon and Huw Pill(1996), Chang and Velasco (1998 a, b, c), Kaminsky and Reinhart (1999));

-financial market inefficiency (moral hazard or the problem of asymmetrical information) (see Stoker (1994), Mishkin (1996) Krugman (1998))

-companies' balance sheet and the effects of monetary policy (see Krugman (1999 a,b), Aghion, Bacchetta and Banerjee (2000,2001),Borensztеn and Lee (2000), Coulibaly and Millar (2008))

The first issue addressed in the development of third generation models were the fragility of the banking system and financial market inefficiency. The discussion might be started at the modern variants of the first generation model, the so-called twin banking-currency crisis model (Glick and Hutchison (2001)). This framework stresses the fact that currency crises are often part of broader financial crises, where the two elements interact with one another, giving life to what have been called the "twin crises".[2] These models suggest that when central banks finance the bailout of troubled financial institutions by printing money and open the economy with exchange rate peg, there is the classic story of a currency crash prompted by excessive money creation (see Stoker (1994), Mishkin (1996)) Krugman (1998, 1999a,b), Kaminsky and Reinhart (1999)). After that, Chang and Velasco (1998 a, b, c) investigated more intensely the aspects of the financial fragility and currency crisis. In opened economy

[2] The twin banking-currency crisis model relies on the Diamond and Dybvig's dilemma (1983). There are two possible outcomes of the market agents: first, agents have confidence in the solvency of financial intermediaries, and second there is a lack of confidence which leads to a run. Both equilibrium involve self-fulfilling expectations because banks fail. The poor supervision of monetary authorities and 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 making them the crash of the banking system (see Mishkin (1996))

models, the banks play active role, not only as distributor of deposits, but also generating large capital inflows to the economy though borrowing money from aboard at a low interest rate and then reinvest in the domestic market. But at the same time it creates the risk of a sudden reversal of capital flows and international illiquidity[3] of the domestic financial system. For instance, if depositors will attempt to withdraw funds in the short run and then foreign creditors will not roll over initial credit in the short run. In that case, the bank will not be able to honour all of its commitments. The domestic banks do not have enough domestic deposits in liquid form. Long-term investments of the domestic bank will yield little if they have to be liquidated prematurely. The central bank plays the role of a lender of the resort in the opened economy with a fixed exchange rate. However, the stability of banking system is depended on the size of the central bank's reserves and the exchange rate regime strength. On the other hand, to support domestic banks, the central bank might pursue an expansionary policy and keep interest rates from rising. But still, private agents use the additional domestic currency to deplete the central bank's reserves. Therefore with limited international reserves, eventually, the central bank will abandon the peg. This shows how a financial crisis can transfer to a balance of payments crisis and caused boom-bust cycles. The further expansion of borrowing abroad by domestic banks creates the lending expansion and investing-consumption booms in the domestic economy. These booms might continue to widen the current account deficit and then financial markets will need more foreign capital to feed the trade deficit (Kaminsky and Reinhart (1999:475). Moreover, the lending boom converge levels gradually in inflation and then cumulative real exchange rate appreciation (see

[3]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 and Velasco (1998c)).

Dornbusch(1976,1987)'s overshooting model). Cumulative real exchange rate appreciation generates the expectation of exchange rate depreciation on the market. Change and Velasco's model point out that the capital inflows become outflows and cause the collapse of the banking system causing currency crisis.[4] Finally, the last branch of the third generation models concentred on a problem appears in balance sheet firms as the primary source of crises. Especially, Krugman (1999 a, b) and Aghion, Bacchetta and Banerjee (1999, 2001) intensively investigated this topic though its connection to other microeconomics aspects such as fragility of the banking system and asymmetrical information (moral hazard). In the models, the crisis might happen under different exchange rate regime. The entrepreneurs obtained credits from two sources: domestic or foreign markets. It allowed them to mix short-term debt, denominated in domestic currency and long-term debt denominated in foreign currency. The credits amount to finance investment depends on firms' wealth. And on the other hand, the firms' wealth primarily determines investment and output (Bernanke and Gertler (1989). In the case of any economic shock, the sudden capital inflows cause an explosion in the domestic currency value of dollar debt and in this manner increased in foreign currency repayments and reduce their ability to borrow for further investments. Moreover the decline of investment and output implied a credit-constrain in economy. Further reduction of capital inflows decreases the demand for the domestic currency and leads to depreciation. Thus, the financial crisis cycles started to close circle (Aghion, Bacchetta and Banerjee (2001).

In the end, it is worth talking about Sudden –Stop Models (see Calvo (1998), Mendoza (2001), Mendoza and Smith (2002) and Hutchison and Noy

[4] To provide unambiguous evidence to support the theory on the causal links between currency and banking crises were provided in the following studies: Kaminsky and Reinhart 1999,Glick, Go and Hutchison (2006), Shehzad and De Haan (2008), Sulimierska (2008b).

(2002), Calvo, Izquierdo and Mejia (2004), Valdes (2008)). These models analysed a phenomenon of abrupt reduction of the capital inflows into a country. Before the moment of abrupt reduction it has been receiving large volumes of foreign capital. But they focused on micro and macro perspective so they are in the middle between second and third generation models.

3. Overview of empirical literature

A large number of empirical studies have examined the determinants of currency crises, but the empirical evidence is far from conclusive inference. In general, two lines of analysis can be distinguished: single-country or multi-country. The number of multi-countries has grown rapidly since the beginning of 1990s (see Sulimierska (2008b)). However, these multi-country analyses have some limitations due to attempt to exploit the higher variability associated with cross-country information. In that way, the evidence from multi-country studies is mixed and not very robust contrast to single-country studies (Esquivel and Larrain (1998:9)). On the other hand, the most of single-country studies were developed before 1990s. However, after the Asian Crisis academic attention moved back to single country analysis by investigating microeconomic fundaments such as company's debts, performance of financial institutions (see Borensztеn and Jong-Wha (2000)).

In this case it is sensible to follow the first line of empirical paper due to this paper will examine the IMF intervention in the context of the possibility that this crisis was caused by the inconsistency between the exchange rate policy and fiscal policy. The single-country analysis developed in the beginning of 1990s. This analysis focused on the determinants of crises in a single country during periods of economic turbulence and usually tried to explain the timing of

devaluation in a specific country based on the behaviour of several macroeconomic indicators (the linear discrete time models). Most of them have generally found strong evidence suggesting that domestic macroeconomic indicators play a key role in determining currency crises. Nevertheless, these results might be suggestive, are sometimes limited since they are obtained from a small number of countries during very specific situations.[5]

However, both studies above provide evidence for qualitative success of applying first generation model (the linear discrete time models) although these results can be broadly discussed since the restrictive assumptions including the purchasing power parity (PPP), interest rate parity, and the unresponsiveness of the demand for real balance to currency substitution motives (see CVW (1989), Blanco and Garber (1986), Goldberg (1994). Both models state that domestic credit shocks are still expected to be the dominant force in triggering speculative attacks on currency.

In briefly summarizing the first generation empirical literature is necessary to start with the classic representation Blanco and Garber (1986) model. This model analysed the movement from one fixed exchange rate to another and computed the one-period ahead collapse probability for the fixed Mexican peso exchange rate from 1973-1982. To obtain these results they produced the devaluation models and used the time-series estimates of the one-period -ahead probability of devaluation that allowed them to predict the timing, probability of speculative attacks and forecast lower bounds for the post-collapse exchange rates. Blanco and Garber's model is a version of Krugman –Flood-Garber model. In this model, Blanko and Garber took the forward exchange rate as the shadow exchange, fixed exchange rate and calculation of the economic

[5] This overview neglects the empirical models of currency crisis which consider different aspect of another generation models: Puri, Kuan, and Maskooki (2001), Sachs, Velasco, Tornell (1996), Burnside, Eichenbaum and Rebelo (2001), Kibritcioglu, Kose and Ugur (1999), Sulimierska(2008a,b).

fundamental from the bubble model and to construct new regime of fixed exchange rate after currency crisis. The results of this paper showed that large exchange rate adjustments in Mexico were preceded by substantial increases in the ex-ante probability of devaluation. It is strong evidence of the first generation views of currency crisis; however their model replicates some aspects of the relatively high values prior to actual devaluation. This causes some critics that exchange rate policy could not acknowledge an eventual devaluation ,and then a crawling peg will be though be equivalent to a fixed exchange rate regime after speculative attack because (see Reynoso (2002b)).

A subsequent study along this line is CVW's paper (1989). It is a similar model to Blanco and Garber's (1986) model with crawling exchange regime. On the contrary to Blanco and Garber 's (1986), the domestic credit is not followed the stochastic process. Furthermore, the central bank does not know the critical level of international reserve at which the exchange rate regime will abandon before the speculative attacks. Because of this, authorise assumed the reserve floor was describe by a uniform distribution with an upper bound as the current level of reserves and the lower bound as minus the central bank's gross foreign liabilities. The final conclusion from model is that the domestic credit growth strategy pursued by the Argentine government almost completely undermined the announced crawling peg exchange rate

Then, Goldberg's analysis (1994) presents the devaluation model of Mexican peso for fixed or crawling exchange rate regime, but it has some deviation from these restricted assumptions of previous papers. The author calculated ex-ante probability of currency crises. He attempted to predict the sizes of expected devaluation of Mexican peso for the period 1980 and 1986 by generating the forecasts of lower bounds for sustainable post-collapse exchange rates between the Mexican peso and United States dollar.

Nevertheless there are some modifications compare with previous papers due to the author used the Goldberg (1991) version of Flood and Garber's model (1984) as the base of estimation model (1995). As before the domestic credit creation and domestic spending excess are viewed as the primary reasons for reserve depletion. If, in any period, expansion of domestic credit is too large to be absorbed by the demand for real balance, equilibrium in the money market is achieved in tow way. The first way is though adjustment of the exchange rate in a flexible exchange rate system. The way is by offsetting movements in central bank foreign exchange reserve stocks in controlled exchange rate system. In order that the discrete -time collapsing exchange rate model relies in a money market equilibrium condition which determines either the equilibrium exchange rate under a flexible exchange rate system or the endogenous path of central bank reserve under a controlled exchange rate system. In accordance with the paper's results domestic fiscal and monetary shocks were the main forces contributing to speculative attacks on the Mexican peso. Furthermore, the result suggested that the external credit shocks played a relatively minor role in the onset of Mexico's currency crises during the 1980s. Moreover, a reduction of domestic credit growth increases the uncertainty surrounding this growth. Then, there will be reduction of the size and perhaps increase the frequency of currency realignments which might have greatly reduced the amount of currency speculation against the peso between 1980 and 1986.

Another paper is similar line such as Blanco, Garber (1986) and Goldberg (1994), is Pazarbaşioğlu and Ötker's (1997). This paper examines the potential currency crisis in Mexico's exchange rate regime during October 1982- December 1994. Goldberg (1991, 1994)'s speculative attack models was implemented with a stochastic version of the monetary approach to exchange rate determination. In this model, the government and monetary authority are

committed to maintaining the exchange rate within some form of crawling exchange rate regime in of a small open country. This model estimates the probability of devaluation to capture the systematic relationship between the realised regime changes and economic fundamentals. This probability evaluates whether speculative pressures on the currency can be accounted for by economic fundamentals. Formally, the one-step-ahead probability of a regime change can be approximated by computing the probability that the floating exchange rate next period will exceed the prevailing fixed exchange rate. In order to distinguish the determinants of the likelihood of a currency crisis or the timing of crisis they used the survival model. In accordance with the empirical findings the probability associated with all regime changes in the sample period can be attributed to speculative pressures in light of some deterioration in economic fundamentals. In addition these results suggested that the decline in foreign reserves, the increase in the share of short-term foreign currency-indexed debt, and /or expansionary monetary and fiscal policies seem to be the main factors which determined the timing of speculative attacks Pazarbaşioğlu and Ötker (1997:841-845).

In summary, most of the studies used monthly data, except for Blanco, Garber's (1986). Additionally finding results from these models led to unequivocal conclusion-domestic macroeconomic indicators play a key role in determining currency crises especially the fiscal deficit and inconsistency with exchange rate policy.

4. Empirical part: The Russia Econometric model

4.1. The Russian Case study

This section provides a brief review of the Russia economic and political situation in the late 1990s (Appendix A Table 1) that prompts some of the questions addressed in the theoretical model in the next section.

The collapse of the Soviet Union in 1992 held the promise of a peaceful and affluent Russia. It was believed that Russia would rapidly become integrated into the global market place and never again be a threat to 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, Russia's transformation challenged IMF and World Bank policies and planning. In order to avoid a return to the communist system, these institutions advocated a shock therapy. This therapy had three main pillars: liberalisation, stabilisation and privatisation Shleifer and Treisman (2000:100-132). The liberalisation program was intended to allow integration with a market economy so most prices were freed overnight in 1992, setting in motion hyperinflation, and creating the problem of macroeconomic instability. In addition, at this time Gregory Matushin, the President of the central bank of Russia, explained that inflation was rising because demand exceeded supply: firms were unable to produce, because they did not have sufficient working capital. The central bank considered that its role was to fill the gap left by the central planning bureau, to provide firms with cash ("supply-sider" support for firms through virtually unlimited cash injections). The second rounds of reforms were stabilisation programs to build market institutions and bring inflation down.

However, this was a period of significant political instability. Government offices were taken over by the young reformers, medium-level Communist Party members who were promoted to high level government positions, but who knew little about politics and economics Ivanova and Wyplosz (2000:15-16). They were unable to create new democratic and economic institutions within the framework of the old communist and corrupt Russian environment. The last pillar was massive privatisation to create a new capitalist class to protect the new democratic capitalist structure, but, instead, it created an oligarchy.[6] Within a year of its rebirth, Russia was in complete disarray. Inflation was out of control, the federal budget was quickly contracting, damaging basic public services. The standard of living sharply declined, and Mafia of all sorts had established themselves. The threat of the return of communism increased due to Yeltsin's waning popularity and the rebuilding of the communist party in a new form under Genna (Ivanova and Wyplosz (2000:16).) To an extent, all these negative economic and political events culminated in the currency crisis of ''Black Tuesday'', on 11th October 1994. However, the collapse of the economy allowed the start of a new program of mass privatisation and a successful disinflation program partly based on anchoring the rouble to the dollar though a crawling peg

[6] The majority of Soviet economy was thus promptly"privatized" by uncontrolled bosses whose sole allegiance had been to the Communist Party. The"connections", a word synonymous with power and influence in the previous regimes, become a tool for private wealth accumulation. Most of the latter-day oligarchs started that way in these early hours of transformation. By late 1992, anti-market forces had regrouped around the Association of Industrialists. This association mobilized the managers of the huge Soviet –era conglomerates who used to be the regime's backbone and beneficiaries. They were fighting back and trying to reverse the market-oriented measures introduced by reformers. With the active support of the Central Bank of Russia, they were the most dangerous force. Mass privatization shrewdly co-opted them: they were given for 51 percentages of the shares and the possibility of buying the rest. More precisely, the personnel were given 51 percentages of the shares, but the managers received a significant portion of it and easily convinced lower rank of employees to sell theirs at "nice price". Once their wealth, until then only the notional present value of expected privileges, was transformed into effective ownership, their interest for a reveal of market reforms disappeared and Yeltsin's power was consolidated. During 1993 alone, leaving aside the oil and mineral extraction industries not yet up for sale, 40 percentage of Russian industry (measured in terms of employees) was privatized Stiglitz (2002:144-145), Ivanova and Wyplosz(2000:15-19)

arrangement, the corridor. In July 1995, this disinflation program was adopted by tightening monetary policy by giving autonomy to the Central Bank of Russia (Sutale (1999:7), Małecki, Sławiński, Piasecki and Żuławska (2001:137-153)). In addition, after Yeltsin's re-election in 1996, international optimism increased. 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.[7] 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.[8] However, there were many positive signals. Inflation was no longer a debilitating factor. The inflation rate for 1997 stood at 11 percentages, down from 2500 percentage in 1992. Monetary policy was entirely dedicated to the pursuit of disinflation, aiming at a rate of 5 percentages by the end of 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 (Appendix A Figure 3). The trade balance never posed

[7] The World Bank was prepared to provide expanded assistance of $2 to $3 billion per year. The International Monetary Fund (IMF) continued to meet with Russian officials and provided 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. Moreover, Russian government singed another agreement for debt repayment with the London Club. However, the improvement of international credit rating can be very questionable. For example, the Paris Club's recognition of Russia as a creditor nation was based upon discussible 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. The 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 improved credit ratings Russia received from its Paris Club recognition were not based on an improved balance sheet (Chiodo and Owyang (2002 :11), Stiglitz (2000:15-19)

[8] In 1997, 69 percentages of enterprises were private (including foreign ownership), 9 percentages 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 (Ivanova, and Wyplosz (2000:17-18)).

any threat (Appendix A 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 (Chiodo and Owyang (2002: 11), Ivanova and Wyplosz (2000:17-19)).

Some economic 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 1996 president 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 percent of GDP, the deficit was not unbearable since the domestic public debt was at zero to start with, in 1992 (Appendix A Figure 3) (Ivanova and Wyplosz (2000:16-17). However, the biggest weakness in the Russian economy was low tax collection. Many firms did not pay taxes and the government did not pay for its purchases, which permitted barter transactions, especially at the regional government level Stiglitz (2002:152). The quantitative decline in tax revenue went hand in hand with a qualitative deterioration, as non-cash tax receipts (in the form of promissory notes –*vekselya*- or other non-monetary payments) reached 26 percent of taxes in 1996 and 20 percent in 1997 Chapman and Mulino (2001:7). 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 (Desai, (2000:49), Shleifer and Treisman (2000:100-149)).

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), in the process attracting domestic and foreign investors to have access to the government securities market. The first debt instruments, short-term GKO, 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 percents, far higher than comparable rates abroad (Buchs (1999:688); Shleifer and Treisman (2000:100-149), Chiodo and Owyang (2002: 11), Desai, (2000:48)). The high real returns of this instrument made it very appealing to Russian and foreign investors, even though the later 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 (Desai, (2000:49), Chiodo and Owyang, (2002:12)).Under these conditions, at the beginning of 1996, the government had 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 Russian. 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. Of the CBR and Sberbank (the largest State Saving Bank), which held about 50 percent of GKOs, assisted the government by purchasing new GKO issues at the primary auctions. The remaining GKOs were held by the domestic commercial banks, owned by the oligarchs. The OFZ's market did not develop so dynamically because of investor uncertainty (Ivanova and Wyplosz (2000:33)).

Secondly, there was some 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, apart from the Sbenrbank (Savings Bank of the Russian Federation). From 1995 to 1997, deposits fell by some 11 percent, reaching 49 percent of overall liabilities. Without households' deposits going to the Sberbank, which absorbed some 75 percent of households' deposits, the ratio of deposits to liabilities would have been much lower, 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 (Chapman and Mulino (2001:11)). However, in 1996, capital liberalisation allowed Russian banks to borrow more from foreign markets. Most of these transactions were secured by 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 (Desai (2000:49)).

But the glimpse of recovery 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, was not to 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 rouble came under speculative attack. 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 forward) (see Małecki, Sławiński, Piasecki and Żuławska (2001: 137-153), Chiodo and Owyang (2002:12)). 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 (Desai (2000: 49), Chiodo and Owyang (2002:12)).

The East Asian crisis created an enormous additional strain in contrast to the expectation that the oil demand would not fall but, rather, increase. The resulting imbalance between the demand and supply of oil created a dramatic fall in crude oil prices, to a reduction of over 40 percent in the fist 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 (Stiglitz (2002:145)). So, this other external shock hurt the Russian economy, especially the balance of trade and Russia's ability to generate tax revenue. According to Alexashenko (1999, 2010) and Stiglitz (2002), the balance of trade deficit shrank five times between 1995 and mid-1998.

At the beginning of 1998, the Russian situation began to deteriorate due to increasing uncertainty as investors turned their attention towards 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 by submitting 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. Even though the interest rate was lower than it might otherwise have been many investors believed that Russia was too politically important to fail. The investment banks made loans to Russian, they whispered about how big the IMF bailout would have to be (see Chiodo and Owyang (2002: 12-14), Stiglitz (2002:146).

However, by late March 1998, the political environment became worse. On March 23 1998, President Yeltsin fired his entire government, including Prime Minister Viktor Chernomyrdin, and appointed Sergei Kiriyenko. At the same time, there was conflict between the executive branch, the Duma, and the CBR. Prompted by threats from Yeltsin to dissolve Parliament, the Duma confirmed Kiriyenko's appointment on April 24 1998, after a month of struggling (Chiodo and Owyang (2002 :13)).

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 have restored 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 debt becoming due (Appendix A 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 (Chapman and Mulino (2001: 23) Central Bank of the Russian Federation (1998:61)). The remaining GKOs were held by the domestic commercial banks, owned by the oligarchs, with considerable influence. These oligarchs' interests were mostly in the oil and gas sector, publicly called for devaluation. The others, however, were mostly concerned by the dollar liabilities of the bank that they controlled, and they opposed devaluation, calling instead for an IMF bailout (Chapman and Mulino (2001:9-10)).

By May, and certainly 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) (Appendix A Figure 2). In 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 GKO's. At the same time, the CBR lost its

reserves to defend the exchange rate peg. In spite of all of the government's efforts, there was widespread knowledge that loans from foreign investors to Russian corporations and banks were to come due by the end of September (Stiglitz(2002:146)).

By mid- June, it was becoming increasingly clear that the storm would hit. 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 (Stiglitz (2002:147)). 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, this rescue packet disappeared during the following two weeks (Stiglitz (2002: 146). After losing so much liquidity, the IMF assistance did not provide much relief. The Duma eliminated 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 (Appendix A 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 (see Ivanova and Wyplosz (2000:35)).

4.2. Motivation for the monetary balance–of-payments model's implementation

The evidence from the above case study suggests of needs to re-think how this currency crisis could be predictable. Maybe the reason of crisis was simply predictable because of the wrong macroeconomic fundament typical first generation crisis according to Krugman's (1999), Ivanova and Wyplosz (2000) and Süppel (2002). Certainly situation could be more complicated as many authors suggest. According to Chapman and Mulino (2001), Russian episode lies between ''first generation model '' and twin crises'' models. In contrast Buchs (1999) and Desai (2000) said that the Russian financial disaster is a typical example of crisis contagion, although the underlying vulnerability of the economy was a problem which no investor could ignore like fiscal deficit or the vulnerability if the banking system. Similar opinion is represented by Stiglitz (2002), but he emphasises that the Russian crisis was a result of an overvalued exchange rate, which was result of wrong IMF stabilisation program and contagion from the East Asian crisis. He also suggests the sharp decline in oil prices on which the Russian government revenue depended heavily. The most interesting view is presented by Gurvich and Andryakov (2002). They suggested of existing the ''hostage effect''[9] in the Russia case. Their model suggests that the more reserved the government was, the stronger its adverse effect of the crisis. This effect incorporates the problem of coronation, as do most second-generation models. Gaidar (1999) pointed to the political hopeless and corruption as the main reason of currency crisis. In contrast, Sutela (1999) suggested that it was the third model generation of currency crisis, which was the mostly typical financial crisis combination with the currency crisis. Additionally, Chiodo and Owyang (2002) pressed that different aspects of all models of currency crisis could be found.

[9] It is a situation when a few large players dominated the capital market. The government has lack of a liquidity to withstand temporary deterioration of the external environment or a speculative attack. The key point is the moment when the crisis hazard with the private sector. The government forces investors to bail out government assets, the effect under consideration maybe important only in the most severe crisis cases.

As we can see, there was a very dynamic debate among the economists as to what were the reasons of Russian currency crisis were. It can suggest to set the hypothesis whether the Russian episode was the typical bad macroeconomic fundament crisis (first generation crisis), or maybe it was more complicated case. This way of analyse allows to better understand the implications of IMF stabilisation program in the context of Russian currency crisis. In this case it is correct to use the Cumby and van Wijnbergen's (1989) monetary model of a balance–of-payments that had a similar length period, characteristic of date (monthly date) and estimates for the crawling exchange rate regime (Russia had the crawling band of exchange rate from July 1996 to November 1997) (Buchs (1999:694-696)).

4.3. Empirical methodology

In almost all the derivations, the empirical methodology is followed Cumby and Van Wijnbergen's (1989) model (CVW model). However, the exchange regime was implemented in the model (from the crawling exchange rate to fixed exchange rate). As the result that the exchange rate was in a very narrow band in Russia (almost fixed rate) in the period under consideration (Appendix A Figure 3).

4.3.1. The model of assumptions

1. Equilibrium of money stock that at the end of each period agents change their holdings of real cash balances according to the money demand function (Appendix B -1):

$m_t - q_t = a - bi_t + n_t$ **(1)** where $n_t \sim N(0, \sigma_n)$

2. Uncovered interest parity:

$i_t = i_t^* + Ee_{t+1} - e_t$ **(2)**, where Ee_{t+1} is the exchange rate agents expected to prevail at the end of period t+1 given information available at the end of period t.

3. Foreign interest rate is exogenous: $i_t^* = i_{t-1}^* + u_t$ **(3)** where $u_t \sim N(0, \sigma_n^2)$

4. Purchasing power parity:

$p_t = e_t$ **(4)** where p_t^* is exogenous and exchange rate is in the form of log, constant and equal to 1 (Appendix B -2).

5. They assumed that all money is high-powered money (Appendix B-3) and stable balance sheet of central bank (the net worth and government deposit are neglected) result that:

$m_t = \ln(R_t + D_t)$ **(5)** where R_t foreign assets of central bank (for e.g. foreign Treasuries or bonds), and D_t domestic assets of central bank (for e.g. government securities, loans to commercial banks). The foreign asset is presents in Russian rubbles (domestic currency).

The domestic currency value of the central bank‘s foreign assets is affected by exchange rate fluctuations and foreign exchange market interventions. The domestic currency changes (e.g. $e_t \uparrow$) will change the value of assets denominated in foreign currency ($R_t \uparrow$). This gain from foreign assets as a result of devaluation can be used discretely to cover the government deficit (increasing the value of foreign assets allows an increase in the purchasing power of home treasury bills through the operation of the open market -↑ domestic assets of central bank- therefore, the assets in balance will not change). Additionally, in this case, the devaluation will not allow increase in the high-money stock. Monetization thus indicates an increase in the domestic assets of the central bank, although it implies a rise in the currency value of the bank’s foreign assets. For

that reason it is included when calculating domestic credit changes and excluded when estimating reserve changes. So, in this model, R_t is the measure of central bank foreign assets and F_t is the foreign currency value of central bank foreign assets ($F_t = R_t / e_o$ where e_o is the exchange rate in some base period).

6. Domestic credit growth is exogenously given and it is necessary to finance the finance deficit:

$D_{t+1} = D_t(1 + g_{t+1})$ **(6)** where g_{t+1} is the rate of domestic credit growth between the end of t and the end of t+1.

The financial deficit and exchange policy are independent. This assumption allows to examining the first generation model (linear rules in policy makers). If this assumption does not pass, then the multiple outcomes should be analysed (see Obstfeld's (1986 a,b, 1994) model). In addition, the future domestic credit growth is unknown to market investors at every point in time and depends on two kinds of disturbances: permanent ($\pi_{t+1} = \pi_t + \varepsilon_t$ where $\varepsilon_t \sim N(0, \sigma_\varepsilon)$) and transitory stochastic ($\delta_t \sim N(0, \sigma_\delta)$) and ε_t and δ_t are independent. Hence

$g_{t+1} = \pi_{t+1} + \delta_{t+1}$ **(7)**

7. The central bank is assumed to have established a fixed exchange ($\bar{e}_t$) rate under which the exchange rate develops as $e_{t+1} = e_t$. Market investors assume that the fixed exchange rate will not be held by the central bank in all circumstances. They form some expectation about the next period's exchange rate; agents have to assess the credibility of the monetary and exchange rate policy. The ability and willingness of the authorities to maintain a fixed exchange rate will depend decisively on whether that exchange rate policy is consistent with the goals of the authorities' monetary and fiscal policy. Nevertheless, the fiscal policy is strongly determined by political and social impacts (Chapter 4.1.).

8. A worsening public sector deficit increases the probability of an unstable fixed exchange rate, so we can assume that the authorities will abandon the fixed exchange rate and move to a floating one. The probability at the end of time t is that the central bank will abandon the fixed exchange rate at the end of time t+1, denoted as Pt. Then the probability of holding the fixed exchange rate is $(1-P_t)$. Market investors can form their expectations of future exchange rates from the average of the current fixed exchange rate and the rate expected to materialise conditional on a floating exchange rate and weighted by the respective probability of occurrence:

$Ee_{t+1} = P_t * Ee_t^f + (1-P_t) * \bar{e}_t$ **(8)** where Ee_t^f is the exchange rate agents expect to prevail if the central bank allows the exchange rate to float at the end of period t+1.

Certainly, with the uncovered interest parity assumption and formation of market investor expectation differences between the domestic and foreign interest rate will increase when the credibility of the fixed exchange rate decreases $(P_t \uparrow)$ and when the size of the depreciation expected, given that a collapse occurs, increases (Appendix B-4).

9. In the terms of central bank policy, some simple criteria are employed in deciding whether to hold the fixed exchange rate or not. The central bank will fix the exchange rate as long as reserve losses do not fall to critical level $\underline{R}$. Whenever reserves fall to $\underline{R}$, then the exchange rate will be allowed to float (Appendix B-5). In addition, it is assumed that agents do not know $\underline{R}$ with certainty so that they only estimate the prior probability in each period the possible value that $\underline{R}$ may have. Thus the critical level of net foreign reserve has some interval. Certainly, $\underline{R}$ cannot exceed the current reserve level if there is no currency crisis, with the aim that the upper limit is the currency level of reserve

(R_t^U). On the other hand, the lower limit for the critical level of net foreign reserves is much more difficult to pinpoint. In this model, CVW's assumption of a lower critical level of foreign reserves as CVW (1989) was incorporated. This assumption allows that the central bank might have negative net foreign reserves which were a case of Russia. Foreign assets exceeded foreign liabilities throughout most of the period (June 1995 to October 1998). After the crisis, negative levels of net foreign reserves were notable, so that the assumption is reasonable (Appendix A Figure 1). In addition, CVW assume that additional foreign credit will not available during a crisis and only become available after a policy reform. The lower limit on the possible critical value for net reserves will be minus the central bank's currency gross foreign liabilities (R_t^L).

Apart from other factors on which the central bank's decisions may depend and which can be considered more complex than only assuming some critical reserve level (Appendix B-6). In the monetary balance model, the most important matter for market investors is the money supply. Therefore, money supply mainly impacts on real exchange rates (which can indicate the pressure on the exchange rate policy via domestic prices) and the change in domestic credit is exogenous so that the market agents only worry about the level of reserves. As only reserve levels can help to hold the fixed exchange rate, the result is that agents do not care about other factors that can impact on the central bank's decisions. Obviously, the uncertainty about the level of reserve at which central bank makes the decision of changing the exchange rate policy purpose, is some way of modelling uncertainty about monetary policy the decision rules.

4.3.2. Devaluation model

Firstly, this combination of eq. **(1)**, **(2)**, **(4)**, **(8)** allows the formation of market investor expectations to be taken into consideration assuming equilibrium in the money market, thus giving (Appendix B-7):

$$m_t - e_t = a - b * i_t^* + b * P_t * [Ee_t^f - \bar{e}_t] + n_t \quad \textbf{(11)}$$

In accordance with eq.**(11),** money demand depends essentially on three economic components: the credibility of holding a fixed exchange rate ($a - b * i_t^*$), the probability of a floating exchange rate(P_t) and the size of the loss by domestic currency holders due to devaluation ($Ee_t^f - \bar{e}_t$). The equation **(11)** is the result of using the international parity condition under uncertainty where the probability of the existing floats exchange (P_t) is the main measure of this uncertainty.

Secondly, the central bank can control the level of commercial bank reserves through its instruments (like required reserves and reserve requirement) so the amount of money in circulation depends on the domestic and foreign assets of the central bank. Certainly the central bank does not want to lose its foreign reserves to the same extent that the model of collapse probability requires for only concentrating on the growth of domestic credit (g_{t+1}). In other words, the probability (P_t) is at the end of the period when the central bank will abandon the fixed exchange rate, at the end of time t+1, depends on the probability that the financial deficit will increase sufficiently (thereby domestic credit). While $\hat{g}_{t+1}$ is defined as the smallest realisation of domestic credit growth that causes reserve to fall to $\underline{R}$ at the end of period t+1 (CVW (1989:119)), where $\hat{g}_{t+1}$ is held and the central bank keeps the policy of fixed exchange rates depends on the authorities noting that reserves have met the critical value and, so will announce at the end of t+1 that the exchange rate will float in the next period t+2. In this case, P_t =1, and in this manner, money equilibrium given by the eq**.(10)** (Appendix B-8,9):

$$\hat{m}_{t+1} - \bar{e}_{t+1} = a - b * i_{t+1}^* - b * (E\hat{e}_{t+2} - \bar{e}_{t+1}) + n_{t+1} \quad \textbf{(12)}$$

where $\hat{m}_{t+1} = \ln(\underline{R} + D_{t+1} * (1 + \hat{g}_{t+1}))$ is the log of the money supply at the end of period t+1 given that collapse of the fixed exchange rate occurred at the end of period t+1 and given that $\hat{g}_{t+1}$ is continued, $E\hat{e}_{t+2}$ is the expected floating exchange rate at period t+2 after the currency collapse and $\bar{e}_{t+1} = e_{t+1} = e_t$.

In order to calculate the probability of the collapse of the fixed exchange rate, I have to provide a model for $\hat{g}_{t+1}$ by specifying $E\hat{e}_{t+2}$.

The rational expectation of agents was assumed and exchange rate is floating, the money demand function was used eq. **(12)** to obtain $E\hat{e}_{t+2}$:

$$E\hat{e}_{t+2} = \frac{1}{1+b}\sum_{i=0}^{\infty}\left(\frac{b}{1+b}\right)^{i}{}_{t+1}\hat{y}_{t+2+i} \quad \textbf{(13)}, \text{ where } \quad \hat{y}_{t+i} = \hat{m}_{t+i} - a + b * i^{*}_{t+i} - n_{t+i} \quad \textbf{(14)}$$

From assumption (3) we can see that $E_{t+1} i^{*}_{t+i} = i^{*}_{t+1}$ for $i^{*}_{t} > 0$ **(15)**, then we get:

$$E_{t+1}\hat{e}_{t+2} = -a + b * i^{*}_{t+1} + \frac{1}{1+b}\sum_{i=0}^{\infty}\left(\frac{b}{1+b}\right)^{i} E_{t+1}\hat{m}_{t+i+2} \quad \textbf{(16)}$$

Equation (16) is different from the adequate equation in CVW's results (eq.6). According to these mathematical calculations, it seems that CVW's model required additional amends the differences between the models are the lack of random error terms in my model (Appendix B-10).

Taking Muth's (1960) assumption of the stochastic structure of domestic credit growth (g_t), the optimal forecast of future domestic credit growth is obtained by:

$E_t g_{t+1} = (1-\lambda)\sum_{i=0}^{\infty}\lambda^{i} g_{t-i}$ **(17)** where λ relies on the constant variance of the permanent and transitory stochastic disturbance of domestic credit growth (from assumption (7) of the model). Furthermore, equation **(17)** is given for

$E_t g_{t+T}$ where T$\in(1, +\infty)$ but in order to simplify the notation, we can use: $E_t g_{t+T} = \overline{g_t}$

To compute eq. **(16)**, its last term has to be calculated. In addition from assumption **(6)** there is: $E_{t+1}\hat{m}_{t+i+2} = E_{t+1}\ln(R_{t+i+2} + D_{t+i+2})$

We know that after the collapse of the fixed peg, the exchange rate will float freely, with the result that reserves will stay constant at $\underline{R}$. In that way, I can compute:

$$E_{t+1}\hat{m}_{t+i+2} = E_{t+1}\ln[\underline{R} + D_{t+1}(1+\hat{g}_{t+1})(1+g_{t+2})(1+g_{t+3})...(1+g_{t+i+2})] \quad \textbf{(18)}$$

Then, by using the first-order approximation of the Taylor series, I can calculate

$$\hat{m}_{t+2+i} = \hat{m}_{t+1} + \frac{D_t(1+\hat{g}_{t+1})}{\underline{R} + D_t(1+\hat{g}_{t+1})} * \sum_{j=1}^{i}\hat{g}_{t+j+1} \quad \textbf{(19).}$$

If we assume that $\hat{g}_{t+1}$ is the smallest increase in domestic credit to cause the collapse of the fixed exchange rate, to the same extent, by taking the expectations conditions of $\hat{g}_{t+1}$,we get the weighted average of expectation based on information from the last period of domestic credit growth and drawn domestic credit growth $\hat{g}_{t+1}$: $\overline{g_{t+1}} = \lambda * \overline{g_t} + (1-\lambda) * \hat{g}_{t+1}$. From eq.**(19)**, we obtain

$$\hat{m}_{t+2+i} = \hat{m}_{t+1} + \frac{D_t(1+\hat{g}_{t+1})}{\underline{R} + D_t(1+\hat{g}_{t+1})} * \left(i\left[\lambda * \overline{g_t} + (1-\lambda) * \hat{g}_{t+1}\right]\right) \textbf{(20).}$$

Afterwards, I can use the expression above to compute the unknown terms in eq.**(16)**. Thus we can obtain:

$$\frac{1}{1+b}\sum_{i=0}^{\infty}\left(\frac{b}{1+b}\right)^i E_{t+1}\hat{m}_{t+i+2} = \hat{m}_{t+1} + \frac{D_t(1+\hat{g}_{t+1})}{\underline{R} + D_t(1+\hat{g}_{t+1})} * \left(\left[\lambda * \overline{g_t} + (1-\lambda) * \hat{g}_{t+1}\right]\right) \quad \textbf{(21)}$$

Combining eq. **(16)**, **(12)** and **(21)** gives (Appendix B-11):

$$\hat{m}_{t+1} - \bar{e}_{t+1} = a - bi^{*}_{t+1} - \frac{b^2}{1-b} * \frac{D_t(1+\hat{g}_{t+1})}{\underline{R} + D_t(1+\hat{g}_{t+1})} * \left(\lambda * \overline{g_t} + (1-\lambda) * \hat{g}_{t+1}\right) + \frac{1}{1+b} n_{t+1}$$

(22)

Compare to CVW's model, (eq.(8)) the sign before the a and bi^{*}_{t+1} is the opposite in my calculations but this sign is consistent with economic theory (the international interest rate has to have a negative impact on the demand for money). As can be seen from the equation above, $\hat{g}_{t+1}$ cannot be directly computed, therefore $\hat{g}_{t+1}$ depends on unknown parameters for agents at time t+1 like: i^{*}_{t+1} and the money demand disturbance n_{t+1}. The aim of directly computing $\hat{g}_{t+1}$ numerically requires finding the value probability P_t at the end of t of the collapse at the end of period t+1:

$P_t(g_{t+1} \geq \hat{g}_{t+1})$ **(23)**

From assumption (7) $g_{t+1} \sim IID\ (\overline{g}_{t+1}, \sigma^2)$ it can obtained $\sigma^2 = \sigma^2_{\pi} + \sigma^2_{\delta}$ **(24)**. In whatever manner, $\underline{R}$ is unknown and g_{t+1} is a function of it, so to the same extent the collapse probability cannot be computed by integrating the density for g_{t+1} but we can firstly reckon the probability of collapse conditional on $\underline{R}$ and then integrate the possible value that $\underline{R}$ may take on (CVW (1989:121)). Hence we obtain:

$$P_t = (R^L_t - R^U_t)^{-1} * \int_{R^L_t}^{R^U_t} (1 - \Phi(\left[\hat{g}_{t+1} - \overline{g}_{t+1}\right] / \sigma)) d\underline{R} \quad \textbf{(25)}$$

The combining of eq.**(25)** and eq. **(22)** will enable the collapse probability to be computed and give a full solution for the model.

4.3.3 General description of the estimate procedure.

In order to reckon the probability of the collapse of the fixed exchange rate, the estimating procedure was divided into two parts. Firstly, the calculation of the value of parameters will be made such as parameters of money demand functions: a, b and σ_n eq**. (1)** with assumption **(4)** that $p_t = e_t$, the parameters in the money forecasting rule: λ and σ^2 eq**. (17)**, and the variance of the changes in the foreign interest rate (Appendix B Table 2). The computation of the parameters of monetary demand (eq. **10**) required that it was sensible to use instrumental variables to eliminate the potential endogenous effect of the domestic interest rate. According to CVW's paper, there were two instrumental variables: foreign interest rates (eq. **3**) and constant. (see CVW (1989:121)). The residuals from the monetary demand equations were investigated to examine the phenomenon of autocorrelation or heteroscedasticity between them. For instance, in CVW's model, they examine the hypothesis of autocorrelation by using tests based on MA(n) process. In this model the process AR(n) was investigated instead of MA(n). The reason is that MA(n) can be converted to the AR(n) and MA(n) as the finished process of AR(n). The hypothesis of autocorrelation was estimated by using the test based on AR(n) process. Then an assumption (3) in the theoretical model (eq. (**3)**) was analyzed by using the Dickey- Fuller test. If the null hypothesis is rejected, this means that the foreign interest rate followed a random path (Appendix B Table 3): $i_t^* = i_{t-1}^* + u_t$ where $u_t \sim N(0, \sigma_n^{\,2})$

Lastly, the parameter of the forecasting rule for domestic credit growth λ was calculated. CVW simplified the calculation by introducing the definition of v_{t+1} as a one-period forecast error for domestic credit growth realisation at the end

of period t+1. υ_{t+1} is from $g_{t+1} = Eg_{t+1} + \upsilon_{t+1}$ **(26),** and with the forecasting rule for domestic credit growth (**17**), they obtained $E_t g_{t+1} = \lambda * E_{t-1} g_t + (1-\lambda) * g_t$ **(27)**.

The first part of equation **(27)** $\lambda * E_{t-1} g_t$ came from the formation of rules of expectation where past expectation formation has an impact on future expectation. The second part $(1-\lambda) * g_t$ comes from the eq. **(17)** when i=0. From eq. **(27)** and **(26)** they derived: $g_{t+1} - g_t = \upsilon_{t+1} - \lambda * \upsilon_t$ **(28).**

By assuming that all information is available to market investors and market agents are rational, they calculated the forecast for domestic credit realisation which contained past forecast errors, so all one-period-ahead forecast errors are uncorrelated. In accordance with eq. **(28)** the variance and first auto-covariance of the first difference in the growth rate of domestic credit was calculated: $g_{t+1} - g_t$ as $(1-\lambda^2)\sigma_\upsilon^2$ and $-\lambda\sigma_\upsilon^2$, respectively. However, the variance formula was different compare to CVW's model (Appendix B-12). By using the sample estimates of variance and the auto-covariance of the first difference in domestic credit, I computed the λ by using the combination of these formulae.

When I obtained all the necessary parameters to calculate $\hat{g}_{t+1}$ in eq. **(22**), I could derive the formula for $\hat{g}_{t+1}$ by transformations of eq**.(22)** which depended only on the unknown $\underline{R}$. Then, by using this formula, I computed the integer of eq. (**25**) with respect to the level of foreign reserve and in that way, obtained the probability of the collapse of the fixed exchange rate.

4.4. The data and explanatory variables

Application of this model to the Russian experience in the late 1990s requires estimates from the money demand equation, followed by those for

domestic credit, foreign capital shocks. The description of the specific data series used for the calculations is in Appendix C Table 1. In my analysis, two different data sources were implemented in this analysis: IMF statistics (IFS- International Financial Statistics) and the Monthly Bulletin of the Central Bank of Russia (Central Bank of Russia: Monthly Bulletin). Since both datasets have their strengths and weaknesses, both were used in my empirical analysis in order to check the robustness of the results. My model consisted of monthly observations from December 1995, to December 1998. The choice of this period was due to it being one of the most stable in political and economic terms - after the establishment of the autonomy of the Central Russian Bank, incorporating the disinflation program, and several official confiscations of population cash holdings in January 1991, July 1993 (see Appendix A Table 1 and section 3.1). Unfortunately, the monetary base in the Russian case was no recorded in this date. Approximations were implemented - M1 and M2. As a result, the method of calculation in comparison with CVW (1989)'s paper was changed. Moreover, data from the consolidation balance sheet of the banking system (the monetary authorities -central bank- plus the commercial banks) was implemented.

4.5. Empirical implementation and results

In this section, the discussion is about an estimation of the time series of the collapse probability for the Russian fixed exchange rate that lasted from December 1995 to January 1998. Firstly, the estimations of the money demand function, assumptions about the random path of interest rates were presented and then calculations of the parameter in the forecasting rules for domestic credit growth, and then the results of probability calculations were discussed. There are two different set of approximations for the monetary base (M1 and M2) from two

data sources (IFS and CBR). Because of that four sets of probability result were analysed (Appendix C Figure 1-4).

All the estimates for money demand looked reasonable (Appendix C Table1), the sign and size of parameters were consistent with economy theory and the empirical analysis of money demand (Gerlach-Kristen (2001:55-554)). However, for the IFS data, there was the problem of heteroshedasticity, but an examination of the residuals did not show any problem with the autocorrelation (Appendix C: Table 1). To reduce the problem of heteroshedascitic, White's matrix was used. In estimating the base money demand parameters in equation **(1)** with assumption **(4)** any technique with instrumental variables were not employed due to the Hausman –Wu tests for the two instruments (constant term and foreign interest rate) and one instrument (foreign interest rate) rejected the null hypothesis. In the case of the IFS data, it seemed that it did not have to take account of potential endogeneity problems.

On the other hand, these estimates of the CBR data (Appendix C: Table 1) suggest some problems with autocorrelation and heteroshedasticity. Firstly, the instrumental variables were implemented because of a potential endogeneity problem. A wrong sign for the coefficient before the interest rate was obtained. This suggests that there is problem with the omitted variables such as income or approximations of inflation, or there is a problem with the default risk. However, to obtain a more detailed picture of the Russian crisis and to simplify the analysis, the assumption was implemented that these results are as good as the results from using the IFS data. In addition, the residuals from the money demand function were calculated so that assumption $n_t \sim N(0,\sigma_n)$ in eq**. (1)** is correct.

According to the results of the estimates for IFS, any problems with autocorrelation by using the Durbin-Watson d-statistic and Durbin's alternative test for autocorrelation were not discovered. The interesting and useful aspects of

these tests is that although the null hypothesis was originally derived for an AR(p) process (for Durbin-Watson test it is AR(1)), these tests are powerful against MA(p) processes as well. Due to this serendipitous result, the MA(p) and AR(p) are locally equivalent alternatives under the null hypothesis. The only problem was heteroscedasticity, but the correlation using White's matrix allows the assumption about the residual from the money demand equation $n_t \sim N(0, \sigma_n)$ to be upheld.

The next step was to investigate the assumption about the random path of interest rates. The modified Dickey-fuller t test proposed by Graham, Rothenberg, and Stock (1996) was implemented. This Dickey-Fuller unit root test allowed finding that the coefficient of i^*_{t-1} is equal to one (the null hypothesis: it is not a static process). The null hypothesis of the unit root in the foreign interest rate is not rejected at a reasonably significant level of 5 percentages, the same extent at which the foreign interest rate is assumed to be correct (Appendix C, Table 2). Additionally, both tests of autocorrelation for the first difference of i* were also carried out and yielded no evidence of autocorrelation.

The last thing before computing the integral of eq**. (25),** was the computation of λ. Using the sample estimate of variance and the first auto-covariance of the first difference in domestic credit (Table 1) obtained $\lambda =$ 0.43946 for IFS data and respectively for CBR data $\lambda =$ 0.43845. In order to simplify all the calculations, one value of $\lambda =$ 0.44 for both sets of data was used.[10]

[10] The root of the quadratic was chosen that is less than one in absolute value in order to insure stability of eq. (17).

Table 1

Date Source	The sample variance of the first difference in domestic credit $(1-\lambda^2)\sigma_v^2$	First auto-covariance of the first difference in domestic credit $-\lambda\sigma_v^2$
IFS	**33.7447**	**-18.3174**
CBR	**33.744**	**-18.3162**

Source: My own calculations based on Table 2 and 3 from Appendix C.

The series of one-step devaluation probabilities for the Russian fixed exchange rate was calculated in the followed way. In estimating the collapse probabilities, the equation was solved by substituting the parameter estimates above and the data associated with each observation for four different sets of data to obtain an estimate of the critical values for domestic credit growth in each period. The residuals parameters were ignored, which appeared in eq. **(22)** because this residual behaviour is treated as white noise. Then eq. **(25)** was integrated to get the probability. As this integration from eq**. (25)** could only be computed by using the numerical integration, CVW used the Simpson's rule- the trapezoidal rule. In this paper eq**.(25)** was also computed by using the trapezoidal rule (Appendix B-13*)*.

The probability estimates (Appendix C: Figure 1-4*)* look quite reasonable, both in the estimated magnitude of the probability (interval 0-1) and in their behaviour over time (Appendix A, Chapter 3.1) Estimates for the collapse probability were also found, along with domestic credit growth (cumulative growth since the end of 1995) (Appendix C: Figure 1-4*)*. These tables suggest that the permanent increase in domestic credit growth brought about the loss of confidence in the fixed exchange rate (Chapter 3.3 eq. **(22)** and **(25)**). In other

words, the credibility of the policy for a fixed exchange rate was undermined even when the authorities said that the fiscal and domestic credit policies were consistent with the exchange rate. In addition, these results also indicate that confidence was never fully restored and that just prior to the collapse of the fixed exchange rate in 1998, the credibility of the fixed exchange regime was extremely low. The estimated probability was quite high through all the period except at the beginning and middle of 1996. During this period there was a strong disturbance in the probability, which could have been caused by changes in the fiscal and monetary policy (changes in the exchange corridor between January and June)(Buchs (1999:694-696)). In the middle of 1997, domestic credit growth exceeded 50 percent (according to IFS data, and 29 percent in CBR data) and the collapse probability started to permanently increase. The cumulative point was at the end of 1998, when 78 percent (according to IFS, and 65 percent in CBR data) expansion in domestic credit growth undermined the credibility of the announced fixed exchange rate mechanism and the collapse probability rose above 90 percent in August 1998, for all four figures. To the same extent, the empirical findings suggest that the probability associated with regime changes in August 1998 was mainly attributable to the speculative pressure in the light of deterioration in economic fundamentals (the first generation model). In line with expectations, the probability of devaluation was found to be in the increased levels of central bank credit to the banking system. The increase fiscal deficit and the reduction in foreign exchange reserves were also linked to the probability of devaluation.

5. Implication of IMF's intervention

After the devaluation of the rouble in 1998, the economy experienced its first significant growth, which was very surprising. This was because Russia is an exporter of natural resources and the devaluation of the exchange rate improved export conditions and economic growth (Appendix A Figure 4.). Certainly, this

effect was in the short term. However, it can illustrate the issue about the importance of the IMF program. Throughout the 1990s, Russia operated under the auspices and close scrutiny of a Fund (support and stabilisation program). Another question is how it could happen that the IMF did not recognise that Russia was almost typical of a first generation crisis through some aspect of other generation models (Chapter 4.1. and 4.5).

At the beginning of the 1990s, Russia was under 'shock therapy', which was strongly promoted by IMF advisors. According to this plan, it was reasonable to remove the central plan with the decentralisation market system, and secondly, to replace public ownership with private property, and eliminate or at least reduce the distortions by the liberalisation of trade. To the same extent, liberalisation and stabilisation were two of the pillars of the radical reforms strategy. The rapid privatisation was the third pillar. In addition, the IMF supported international loans to Russia (Stiglitz (2002:136-140)). The SDR loaned 2.8 billion dollars since 1992 up to 1994 but, as the first tranche of loans, they did not carry mandatory programs. Then, after the economic problem in 1994, the IMF gave standby credit of $ 6.8 billion to improve the reforms of the monetary policy and improve fiscal policy tightness. However, the IMF did not even suggest using the exchange rate as an anchor; it merely supported the Russian decision to adopt the 'corridor', the crawling peg. The IMF's second large-scale program came in the run up to 1996 election. However, the conditions after the reforms were quite vague and, as matters grew worse, the government did not seem to realise the seriousness of the situation. It concentrated its efforts on improving the budget, with no positive results. A new program was agreed upon in July 1998 when the crisis was already under way (Ivanovo and Wyplosz (2000:4)). The government's publicly stated strategy, the July Package, contained three main elements: a radical tightening of the federal budget intended to solve once and for all

persistent fiscal imbalances, an increase in international reserves, the lengthening of the debt maturity to reduce vulnerability arising from the short-term structure of domestic debt. The fiscal part of the package aimed at improving tax collection, reducing tax arrears, establishing treasury control on budgetary expenditure and cutting federal expenditure commitments. In addition, the government pledged to submit to the 'Duma' wishes. The IMF decided to increase its financial support in 1998 by $ 11.2 billion, $ 4.8 billion of which were immediately disbursed with the explicitly stated aim of increasing foreign reserves. Another part of the July package was the GKO swap (Ivanova and Wyplosz(2000:29)). All these procedures, however, did not bring improvement to the Russian situation. Certainly, it suggests some errors within the IMF program.

One of the most discussed reforms is Russia's adoption of the principle of mass privatisation (Chapter 4.1). Speed was seen as essential for the reform process to establish a new architecture for the market so that it ignored many important aspects. The high inflation after freeing prices in 1992, wiped out the savings of most Russians. There were not enough people in the country that had the money to buy the enterprises being privatised. Even if they could have afforded to buy the enterprises, it would have been difficult to revitalise them, given the high interest rates and lack of financial institutions to provide capital (see Shleifer and Treisman (2000)). So, privatisation was carried between the old communist political friends who used their influence to garner assets worth billions, after paying only a pittance. Also, most of the new owners of firms were the old managers. They did not know how to operate in the new environment so that they focused on what they could get out of the firm in the next few years. In addition, the IMF concentrated mainly on privatisation, giving short shrift to competition law (Stiglitz (2002:155)).

Another issue was the lack of market institutions to control the legal and regulatory frameworks. In soviet Russia, everything was organised according to the central plan, although this system allowed for co-operation between the managers of firms and central and local politicians in some respects. These activities were necessary for the functioning of the Social economy. Therefore, in communist Russia circumvention of the law, if not breaking it outright, became part of the way of life, a precursor to the breakdown of the rule of law, which was to mark the transition. Nevertheless, the market economy led to corruption in Russia (Stiglitz (2002:138-139)).

Thirdly, the IMF focused mostly on macroeconomic aspects, and disregarded issues of poverty, inequality, and social capital. The erosion of social capital (e.g. corruption) created an environment, which was not conducive to investment, economic growth and fiscal revenues (Stiglitz (2002:160-161)).

Fourthly, the core criticism of the IMF's program was the repeated support for the overvalued fixed exchange rate policy and it never recommended the flotation of the ruble. However, the IMF worried that the devaluation of the rouble would set off a round of inflation (see IMF(1998)). One view was that the rubble was overvalued, the result of an excessively tight monetary policy which was strangling Russian firms (Chapman, Mulino (2001:24)). Another view was that the rubble was at about its equilibrium value and that Russian firms would only be able to compete when they retooled. The current account was never in deficit because Russia was a victim of the Dutch disease, but that does imply overvaluation (Wyplosz, Halpern(1997:430-461), Ivanova and Wyplosz (2000:23)). Hence, the July packet came under heavy discussion, especially the GKO-swap (Stiglitz (2002), Ivanova and Wyplosz (2001), Gurvich, Andryakov(2002)). This was exactly what the Mexican authorities did in 1994, a

move fully recognized as deeply mistaken, possibly the main reason for the Mexican crisis a few weeks later (Wyplosz,Yudaeva (1998)).

In May 1998, speculators could see how much reserve 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 (Stiglitz(2002: 147)). After the impact of the Asian crisis, it was obvious that the IMF rescue had caused the multi-billion dollar gamble. The IMF could not ignore the fact that its actions were technically wrong and practically hopeless. The most plausible answer is that the IMF acted under intense political pressure. When in late May 1998, President Yeltsin personally asked his Western counterparts (Clinton, Kohl and Blair) for emergency financial aid, President Clinton publicly promised his support for IMF and World Bank loans, but in the following G-7 finance ministers meeting in early June, did not make any firm commitment (Ivanova, Wyplosz (2000:31-32)).

6. Conclusion

This paper investigated the events in Russia that led up to a currency crisis and debt default and the IMF policies intended to avert them. There are three generations of currency crises model. The first generation model said that the currency crisis happened due to inconsistencies between government policy (fiscal and monetary policy) and the exchange rate regime. To some extent, the moment of currency crisis can be predicted. The second group of models prove that crisis can happen even if the macroeconomic fundamentals are correct. These models point to different reasons for the crisis like investors' expectations of the future government policy (the second generation model) or the wrong microeconomic fundamentals (the third generation model).

As suggested in this paper, the hypothesis that Russia crisis was like a typical first generation model, the underlying vulnerability of the economy was a problem, which no investor could possibly ignore. In order to analysis this, CVW's (1989) Argentinean monetary model of the balance –of-payments was adopted. In this model, agents observe the domestic credit policies of the authorities and forecast future domestic credit policies on the basis of observations (Chapter 4.3.1 eq. (12)). The model can provide each period with the degree of probability that in the next period the authorities will abandon the fixed exchange rate regime. Once this equation was obtained, the model was applied to the Russian fixed exchange rate from the end of 1995 to the end of 1998. The empirical results were quite plausible. It was found that since 1997, the domestic credit growth increase had gradually undermined confidence in the fixed exchange rate. Eventually, the cumulative point was at the end of 1998, when the collapse probability was above 90 percent, so this crisis could have been predicted by the theory.

These results focused attention on the IMF's intervention in the context of this crisis. If the Russian episode reflected the so-called first generation model, the problem could have been solved only by deep changes in fiscal structure. It could not have helped, in this situation, to add another tranche of international loans. These loans could only have postponed the time of the crisis by few weeks or months, which are exactly what, happened. In addition, it suggests that the fiscal and monetary reforms which were imposed in 1995 and earlier, were only so in appearance. The financing of the government deficit and public debt was not directly though the CBR, as in 1994, but through the banking system and financial foreign market (e.g. NDF contract). There were intense political concerns in the Russian situation that spread well beyond the economic and financial spheres. The July package, in particular, can be considered as a typically political decision.

Certainly, the transition from communism to a market economy was not easy but extremely difficult if there was no strong domestic political support for the new reforms. In this context, the IMF policy in Russia was very difficult to carry out.

Abbreviations

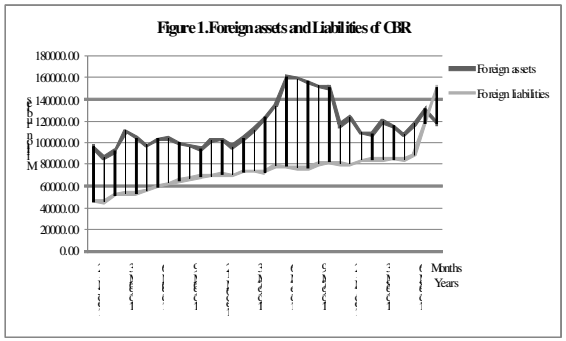
IMF-International Monetary Fund
CBR-The Central Bank of the Russian Federation
IFS- IMF statistics (IFS- International Financial Statistics)
EMS-European Monetatry System
CVW-Cumby and Van Wijnbergen (1989)
GKO- government short –term bill
OFZ- long-term bond

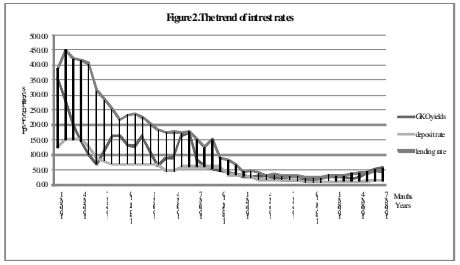
Appendix A-Case study

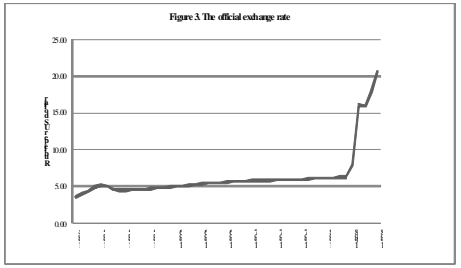
Table 1. The description of Russian economic and political situation (July 1995 to December 1998)

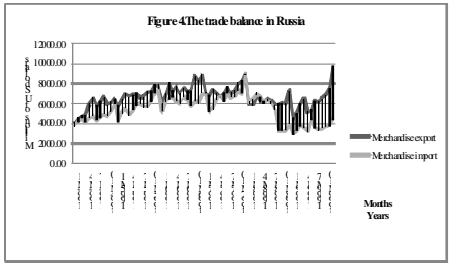
July 1995	The autonomy of the Central Bank of Federation Russia.
1996	The capital liberalisation for non-residents. Negotiations with the Paris and London Clubs for repayment of Soviet debt begin.
1997	Trade surplus moving toward balance. Inflation around 11 percent. Oil selling at $23/barrel. Analysts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

Sources: Stiglitz (2002) , Shleifer and Treisman (2000), Desai, (2000), Chapman and Mulini (2001), Abbigail Chiodo and Owyang (2002), Ivanova and Wyplosz(2000), Sutale (1999), Małecki, Sławiński, Piasecki and Żuławska (2001), Shleifer and Treisman (2000:100-149)), Sulimierska (2008b)









Source IMF's IFS

Appendix B –Methodology

1. The money demand function (Md) like that:

$$Md = f(y, i)$$

where y (the real income) and i (one or more nominal interest rates). I use the nominal interest rate because return on bonds (or deposits) is equal to i - π where π - rate of inflation, i nominal interest rate on bonds (or on deposits), return of holding money is 0 - π so the total cost of holding the money is –i. Money market is in the equilibrium then:

$$Ms / Q_t = Md$$

where Q_t level of prices, Ms money supply . On the whole the long-run level of real money balances (demand for money model) is specified by two above equations. Furthermore log form was used in order to simplified the form and integration, to the extent the long-run money demand can be estimated in this manner

$$\ln(Ms / Q_t) = \beta_0 + \beta_1 \ln(y_t) + \beta_2 + n_t$$

where y_t - real income and i_t - a short-term interest rate. The log form has been used except for the interest rate (semilog form) therefore is better approximation simply to use the level of the interest rate in an equation instead of the log of the rate. In additional in this model there is assumption about the full employment, so that I neglected the output in the estimation model. Of course this assumption can be very strong, especially in the case of transition country like Russia. In order to estimate the long run demand for money I can use

$$m_t - q_t = a - bi_t + n_t \quad (1),$$

where all variables are in log expect for interest rate (small letter means log form of variables).

2. The theory of absolute purchasing power parity states that the nominal exchange rate between different currencies is equal the ratio of the different countries' price levels ($e_t = p_t^* / p_t$). This equation is not result of unchangeable of real factor (for e.g. tastes, relative productivity, accumulated external net asset position, nation's budget constraint) in long run equilibrium of constant real exchange rate like relative PPP but this asserts that price levels are equalised across countries once they are converted in the same currency (This assumption is much more stronger). In this way the PPP theory indicates that a fall in a currency's domestic purchasing power (level of domestic price will increase) will be connected with a proportional currency depreciation in the foreign exchange market. PPP thus asserts that all countries' price level is equal when measured in terms of the same currency. A key ingredient in the logic behind absolute PPP is the law of one price (Krugman and Obstfeld (2009:389-395), Burda and Wyplosz (1997:206-208).

3. High-powered money (monetary base, central bank money) is the sum of currency held by the non-bank public (currency in circulation) and bank reserve (commercial bank reserve: represents the fraction of deposits that commercial banks decide to hold as reserve) (see Gordon (1990:514), Burda and Wyplosz(1997: 219-220)

4. From eq. **(8)** and eq. **(2)** we obtain:

$$i_t^* - i_t = P_t E e_t^f + (1 - P_t) * \bar{e}_t - \bar{e}_t = P_t * (E e_t^f - \bar{e}_t) \quad \textbf{(9)}$$

5. This assumption, comes from Krugman (1978), Flood and Garber(1984)'s papers, is that the central bank will abandon fixed exchange rate when reserves fall zero. In addition Dornbush (1987) assumed some positive critical level of reserve but Buiter (1986) and Obstfelt (1986) allowed to exist the negative net reserve due to the foreign lends. However, I decided to use the Dornbush's assumption in modelling currency crisis in Russia. According to IFS Russian date (Appendix A Figure 1), almost all estimation period (June 1995to October 1998) the foreign assets to exceed the foreign liabilities.

6. This model does not consider the aspect of game between the authorities and market agents (Obsfeld (1986), (1996), Eichengreen, Wyplosz and Rose(1997)) and problem of the moral hazard and asymmetrical information in banking system (Krugman (1999), Aghion,Bachetta and Banarjee (2000, 2001)).

7. From eq. **(1),** eq. **(2)** and eq.**(4)** we get:

$$m_t - e_t = a - b * [i_t^* + E e_t - \bar{e}_t] + n_t \quad \textbf{(10)}.$$

Then eq. **(10)** and eq.**(9)** will give:

$$m_t - e_t = a - b*[i_t^* + P_t * Ee_t^f + (1-P_t)*\bar{e}_t - \bar{e}_t] + n_t = a - b\left[i_t^* + P_t^*\left(Ee_t^f - \bar{e}_t\right)\right] + n_t$$
(11)

8. In this model $\hat{x}$ means the value of some variables x given that a collapse has happened and given that the critical value for domestic credit growth is realised. Moreover, the date from balance sheet of Central Bank provide that foreign and domestic assets $R_t + D_t$ have to be equal to Central Bank liabilities (High-powered money $= C_t + Dc_t$ where C_t currency held by the non-bank public (currency in circulation), Dc_t - bank reserve (commercial bank reserve). When g_t increase so $D_t \uparrow$(from eq.**(6)**), than monetary base will increase, Central Bank, in order to allow not increase money in circle(in other worlds increase the pressure on exchange rate), will pull the domestic credit by decreasing the foreign reserve (e.g. open market transaction).

9. $E_{t+1}v_t = Ev_t$ is the expectation operator which base on the given information at the period t+1 (on other words on the given information at the previous period than variable v_t), on the other hand $E_{t+2}v_t$ is the expectation operator which base on the given information at the period t+2.

10. By using eq. **(13)** and **(14)** there is:

$$= \frac{1}{1+b}\left[\begin{array}{l}\left(E_{t+1}\hat{m}_{t+2} - a + bE_{t+1}i_{t+2}^* - E_{t+1}n_{t+2}\right) + ... + \\ \left(\frac{b}{1+b}\right)^i * \left(E_{t+1}\hat{m}_{t++i} - a + bE_{t+1}i_{t+i+2}^* - E_{t+1}n_{t+2+i}\right)\end{array}\right]$$

From eq **(15)** $E_{t+1}i_{t+i}^* = i_{t+1}^*$ for $i_t^* > 0$ we can obtain:

$$E_{t+1}\hat{e}_{t+2} = \frac{1}{1+b}\left[\left(E_{t+1}\hat{m}_{t+2} - a + bE_{t+1}i_{t+1}^* - E_{t+1}n_{t+2}\right) + ... + \left(\frac{b}{1+b}\right)^i * \left(E_{t+1}\hat{m}_{t++i} - a + bE_{t+1}i_{t+1}^* - E_{t+1}n_{t+2+i}\right)\right]$$

$$= \frac{1}{1+b}\sum_{i=0}^{\infty}\left(\frac{b}{1+b}\right)^i E_{t+1}\hat{m}_{t+i+2} - a * \frac{1}{1+b}\sum_{i=0}^{\infty}\left(\frac{b}{1+b}\right)^i + bi_{t+1}^*$$

$$* \frac{1}{1+b}\sum_{i=0}^{\infty}\left(\frac{b}{1+b}\right)^i - \frac{1}{1+b}\sum_{i=0}^{\infty}\left(\frac{b}{1+b}\right)^i E_{t+1}n_{t+2+i} =$$

Because $\sum_{i=0}^{\infty}\left(\frac{b}{1+b}\right)^{i}$ is the finite geometric series hence

$$\frac{1}{1+b}\sum_{i=0}^{\infty}\left(\frac{b}{1+b}\right)^{i}=\frac{1}{1+b}*(b+1)=1$$

and from assumption (1) $n_t \sim N(0,\sigma_n)$, thus we have:

$$E_{t+1}\hat{e}_{t+2}=\frac{1}{1+b}\sum_{i=0}^{\infty}\left(\frac{b}{1+b}\right)^{i}E_{t+1}\hat{m}_{t+i+2}-a+bi_{t+1}^{*}-\frac{1}{1+b}\sum_{i=0}^{\infty}\left(\frac{b}{1+b}\right)^{i}E_{t+1}n_{t+2+i}$$

$$=\frac{1}{1+b}\sum_{i=0}^{\infty}\left(\frac{b}{1+b}\right)^{i}E_{t+1}\hat{m}_{t+i+2}-a+bi_{t+1}^{*}$$

10. Eq.(16) was corrected in eq.(22) (in Cumby and van Wiinbergen' model, eq. 6 is corrected by eq.(8).

$$\hat{m}_{t+1}-\bar{e}_{t+1}=a-bi_{t+1}^{*}-b*\left[-a+b*i_{t+1}^{*}+\hat{m}_{t+1}+b*\frac{D_t(1+\hat{g}_{t+1})}{\underline{R}+D_t(1+\hat{g}_{t+1})}*\left(\lambda*\overline{g_t}+(1-\lambda)*\hat{g}_{t+1}\right)\right]$$

$$+n_{t+1}-\bar{e}_{t+1}\Leftrightarrow$$

$$(1+b)\hat{m}_{t+1}-(1+b)\bar{e}_{t+1}=a(b+1)-bi_{t+1}^{*}(b+1)-b^{2}*\left[\frac{D_t(1+\hat{g}_{t+1})}{\underline{R}+D_t(1+\hat{g}_{t+1})}*\left(\lambda*\overline{g_t}+(1-\lambda)*\hat{g}_{t+1}\right)\right]$$

$$+n_{t+1}\Leftrightarrow$$

eq(**22**).

12. According to Cumby and Van Wijnbergen's model, the definition of variance was:

$$Var(y_t)=E[(y_t-Ey)(y_t-Ey)=E(y_t^{\,2})-\left[E(y_t)\right]^{2}.$$

In this model, the variance was calculated: $y_t = g_{t+1}-g_t=\upsilon_{t+1}-\lambda*\upsilon_t$, $Var(\upsilon_t)=\sigma_\upsilon$ and $E(\upsilon_t\upsilon_{t+1})=0$

Hence, $Var(g_{t+1}-g_t)=E(\upsilon_{t+1}^{2}-2\lambda\upsilon_t\upsilon_{t+1}+\lambda^{2}\upsilon_t^{2})-\left[E(\upsilon_{t+1}-\lambda\upsilon_t)\right]^{2}=\left(E(\upsilon_{t+1}^{2})-\left[E(\upsilon_{t+1})\right]^{2}\right)$
$-\lambda^{2}*\left(E(\upsilon_t^{2})-\left[E(\upsilon_t)\right]^{2}\right)=(1-\lambda^{2})*\sigma_\upsilon^{2}$

13. Trapezoidal rule: $\int_a^b f(x)\,dx = h\left(y_0+2y_1+2y_2+\ldots+2y_{n-1}+y_n\right)$ where $h=\frac{b-a}{2n}$

(Thomas and Finney (1985: 305-309) . In the calculation program, it was used the file called the integrate Java written in Java to calculate value of integral form eq.(25) for each observation. Then I took all necessary parameters which I calculated from eq.(22) in STATA to Java program to compute the integral. In this program the numerical integration was done by the trapezoidal rule where h≈0.5 (ie. number of divisions $\left(\frac{R_t^L - R_t^U}{0.5}\right)$ and the exponential term calculated separately). After it, the whole valued of probability was calculated separately in Excel where the results from the Java were divided by $R_t^L - R_t^U$ for each observation.

Appendix C Econometrics model

Table 1. The description of variables

Variables	Definition
Exchange rate- e_t Source: IFS	Official exchange in rubbles per dollars at the end of month. Central Bank of Russia based on the Moscow Interbank Currency Exchange (MICEX) rate. The post –January 1, 1998 rubble is equal to 1.000 of the pre-January 1, 1998 rubbles.
Exchange rate- e_t^r Source: CRB	Official US dollar to rubble rate (rubbles per dollars) is set daily and enacted from the following calendar day at the end of month.
Foreign assets of the central bank- R_t Source: IFS	Foreign assets and foreign liabilities comprise claims and liabilities in rubbles and other currencies: General government comprises central and local government units and their extra budgetary funds. This statistic is calculated as the sum of the foreign assets of Monetary Authorities and Deposit money banks minus the sum of foreign liabilities of Monetary Authorities and Deposit money banks. Foreign assets are dominated in domestic currency.
Foreign assets of the central bank- R_t^r Source: CBR	Foreign assets- balances on Bank of Russia's and credit institutions' accounts recording transactions made with non-residents in foreign currency, the Russian currency and precious metals(balances on correspondent accounts, deposits and other funds placed in non-resident banks, credits extended to non-resident banks, non-resident legal entities and individuals, debt liabilities, and bill acquired from foreign governments, banks and other non-residents, investment into foreign companies' and banks' shares of stock) as well as foreign currency cash in credit institutions' vault. Foreign assets are dominated in domestic currency.
M1 - m_t^1 Source: IFS	It measures the stock of narrow money, which comprises transferable deposits and currency outside deposit money banks and demand deposits other than those of the central government. This variable is in log form.
M1 - m_t^{1r} Source: CBR	It measures the stock of narrow money, which comprises transferable deposits and currency outside deposit money banks and demand deposits other than those of the central government. This variable is in log form
M2 - m_t^2 Source: IFS*	It is the broader measure of money, is equal to M1 plus liabilities of these institution, which comprise time, saving and foreign currency deposits of resident sectors other than central government. This variable is in the log form
M2 - m_t^{2r} Source: CBR	It is the broader measure of money, is equal to M1 plus liabilities of these institution, which comprise time, saving and foreign currency deposits of resident sectors other than central government. This variable is in the log form
Gross Foreign Liabilities- R_t^l Source IFS	The sum of the foreign liabilities of Monetary Authorities and Deposit money banks
Gross Foreign Liabilities-	The sum of the Monetary Authorities' foreign liabilities and the foreign liabilities borrowing by banking sector from non-

R_t^{lr} Source: IFS, CBR	residents: balances on LIBOR accounts, credits contracted, deposits, and other funds denominated in foreign currency, in the Russian Federation currency, and precious metal as well as IMF loans extended to Minfin and the CBR.
Domestic Deposit Rates- i_t Source: IFS	This rate usually refers to rates offered to resident customers for demand, time, or saving deposits. Frequently, rates for time and saving deposits are classified according to maturity and amounts deposited; in additional, deposit money banks and similar deposit –taking institutions may offer short- and medium-term instruments at specific amounts and maturities; these are frequently termed '' certificates of deposit''. Prevailing rate for one-month time deposits in denominations of more than Rub 300,000. Beginning in January 1997, weighted average rate offered by commercial banks on time deposits of households in national currency with remaining maturity of up to one year. The rate id weighted by deposit amounts.
Domestic Deposit Rates- i_t^r Source: CBR	Interest rates on resident credit institutions 'funds attracted into the CBR's deposit accounts using Reuters Dealing System, on standard terms determined by the CBR provision 67-P 13.01.1999. For 1995 and 1995 deposit interest rate was a prevailing rate on the time deposit with monthly interest payment for amounts of RUR 300,000. But since 1997 up to now deposit rate is an average-weighted rate on deposits of private individuals in commercial banks (including Sberbank) for a term of up one year.
Foreign interest rate i_t^* Source: IFS	United States one month Treasury Bill rate
Domestic Credits Source: IFS	The sums of the claims on central government, the claims on State and Local Governments, the Claims on Local government, the Claims on Non-financial Public enterprises, the claims on the other financial institutions which is computed as the sum of Monetary Authorities' claims and Deposit money banks' claims

Notes: CBR-date Bulletin of Banking Statistics and Monetary Survey of Central Bank of Russia (www.cbr.ru), IFS-date for IMF statistics of International Financial Statistics (IFS) -Monetary Survey and Monetary authorities' data, Monetary Survey- Monetary authorities' data in IFS generally consolidate the accounts of the central bank with the accounts arising from the monetary functions undertaken by other institutions. These functions include the issuance of currency, the holding of international reserves, and the conducting of Fund account transactions. Monetary Authorities: consolidates the accounts of the Central Bank of Russia and monetary authority functions conducted by the central government. All date include both ruble- and foreign –currency denominated accounts. Date before June 1995 were compiled by the IMF using basic accounting data and other information provided by authorities prior to establish of regular data reporting., M1 and M2-approximation of money supply), domestic credits was an approximation of domestic assets.

Table 2.The money demand estimation.

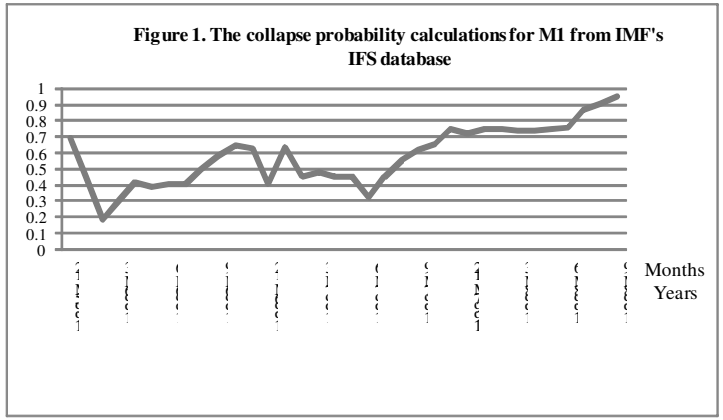
Data sources Monetary Base **Independent variable**	**1** Monthly Data IMF's IFS M1 Coefficient (p-value)	**2** Monthly Data CBR M1	**3** Monthly Data IMF's IFS M2	**4** Monthly Data CBR M2
Constant	10.43 (0.0493)	10.41 (0.052)	10.27 (0.047)	11.02 (0.057)
Domestic Interest rate	-0.0032 (0.0009)	-0.0026 (0.0008)	-0.0024 (0.0009)	-0.0019 (0.0009)
σ_n	0.37	0.377	0.543	0.361
Test for autocorrelation Durbin-Watson d-statistics (2,103) Durbina's alternative test for autocorrelation Breusch-Pagan/ Cook-Weisberg χ^2 (1)	2.0075 2.627 2.611	0.061	2.031	0.86
Test for heteroscedasticity Breush-Pagan/Cook-Weisberg χ^2 (1) White's test χ^2 (2)	4.62 0.0047	5.24 9.14	5.6 0.0177	5.01 7.39

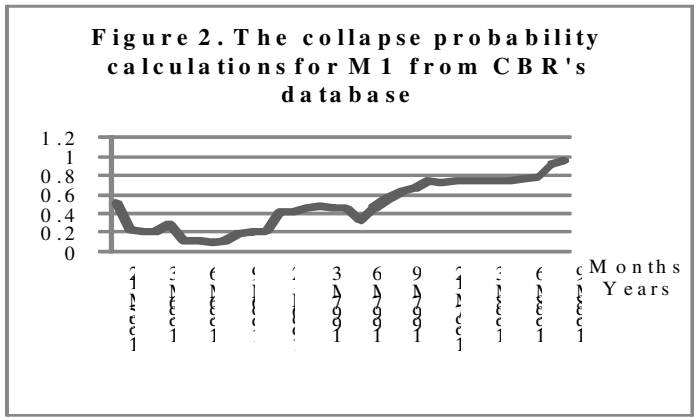
Notes: The estimation of money demand was estimated eq. (1) $m_t - q_t = a - bi_t + n_t$ **(1)** where $n_t \sim N(0, \sigma_n)$ with assumption **(4)** that $p_t = e_t$. Hence, the estimation equation was $m_t - e_t = a - bi_t + n_t$. The domestic interest rate i_t was calculated as domestic deposit rates. For each column standard error are reported in brackets.

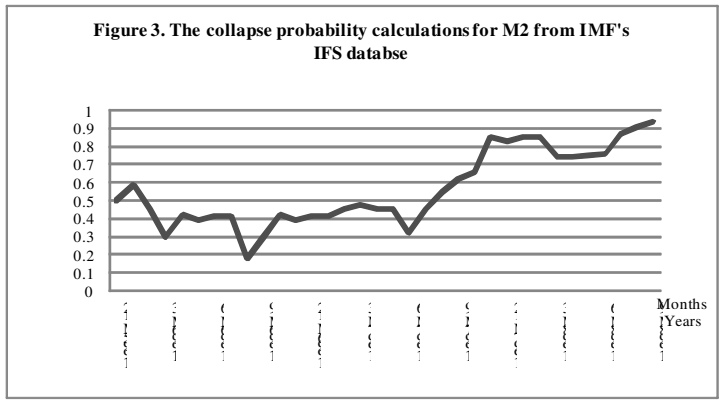
Table 3 The foreign interest rate estimation

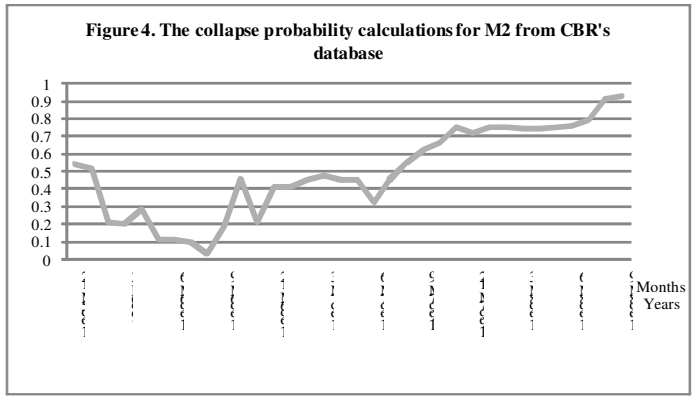
Data Source	Monthly Data-IMF's IFS
Independent variable	Coefficient(p-value)
Lag of foreign interest rate	0.991 (0.052)
Test for stationary Dicker-Fuller	 -2.58 critical value 5% -3.580
Test for autocorrelation Durbin-Watson d-statistics (2,103) Durbina's alternative test for autocorrelation Breusch-Pagan/ Cook-Weisberg χ^2 (1)	 2.13 2.627 2.611

Notes: The estimation of money demand was estimated eq. (3) $i_t^* = i_{t-1}^* + u_t$ where .For each column standard error are reported in brackets.









Note: P_t is estimated probability at the end of period t that the fixed exchange rate will be abandoned at the end of period t+1. $(D_t - D_0) / D_t$ is the rate of domestic credit growth from the end of 1995 to end of period t.

References

Alexashenko S.(1999). Battle for the Ruble, AlmaMater, Moscow (in Russian).
Alexashenko, Sergey, (2010), Lessons from Russia's Crisis. [Online] Available: http://www.carnegie.ru/publications/?fa=40883 (March 29, 2010)
Chiodo, A. J., & Owyang M. T.(2002). A case study of a currency crisis: the Russian Default of 1998. Review, Federal Reserve Bank of St. Louis, 11, 7-18
Aghion, P., Bacchetta, P., & Banerjee A. (1999). Simple model of monetary policy and currency crises. European Economic Review, 44, 728-738
Aghion, P., Bacchetta, P.,& Banerjee A. (2001).Currency crises and monetary policy in an economy with credit constraints. European Economic Review, 45, 1121-50
Bernank, B. S., & Gertler M. L. (1989). Agency costs, net worth, and business fluctuations. American Economic Review, 79, 14–31
Blanco, H., & Garber P. M. (1986). Recurrent Devaluation and speculative attacks on the Mexican Peso. The Journal of Political Economy, 94, 148-166
Borensztеn, Eduardo, & Jong-Wha, Lee, (2000), Financial Crisis and Credits crunch in Korea, Evidence from firm-level data. IMF Working Papers 00/25, International Monetary Fund. [Online] Available: http://www.imf.org/external/pubs/ft/wp/2000/wp0025.pdf (June 19, 2009)
Buchs T. D. (1999). Financial crisis in the Russian Federation: Are the Russians learning to tango?. The Economics of Transition, 7(3), 687-715
Buiter, Willem, H., (1988), Borrowing to Defend the Exchange Rate and the Timing and Magnitude of Speculative Attacks. NBER Working Papers 1844. National Bureau of Economic Research. Inc.[Online] Available: http://www.nber.org/papers/w1844.pdf (June 19, 2009)
Burda, M., & Wyplosz, Ch. (2005). Macroeconomics , A European text. (4th.ed.). Oxford: Oxford University Press.
Burnside, Craig, Eichenbaum, Martin, & Rebelo, Sergio, T.,(2001), On the Fiscal Implications of Twin Crises. RCER Working Papers 482, University of Rochester - Center for Economic Research. [Online] Available: http://rcer.econ.rochester.edu/RCERPAPERS/rcer_482.pdf (June 19, 2009)
Calvo, G., & Mendoza E. G.(2000).Contagion and the Globalization of Securities Markets. Journal of International Economics, 51(1), 79-113
Calvo G.(1998). Capital Flows and Capital-Market Crises: The simple economics of Sudden Stops. Journal of Applied Economics, 1(1), 35-54
Calvo, Guillermo, A., Izquierdo, Alejandro, & Mejia, Luis-Fernando, (2004), On the Empirics of Sudden Stops: The Relevance of Balance-Sheet Effects. NBER Working Papers 10520. National Bureau of Economic Research. Inc. [Online] Available: http://www.nber.org/papers/w10520.pdf (June 19, 2009)

The Central Bank of the Russian Federation, (1998), Bulletin of Banking Statistics. [Online] Available: www.cbr.ru/eng/ (June 19, 2003)
Chang, Roberto, &Velasco, Andres, (1998a), Financial fragility and the exchange rate regime. NBER Working paper 6469. National Bureau of Economic Research. Inc. [Online] Available: http://www.nber.org/wwphelp.html (June 19, 2009)
Chang, Roberto, Velasco, Andres, (1998b), Financial Crises in Emerging Markets: A canonical model. C.V. Starr Center for Applied Economics. New York University Working Papers 98-21.[Online] Available: http://econ.as.nyu.edu/docs/IO/9381/RR98-21.PDF (June 19, 2009)
Chang, Roberto, & Velasco, Andres, (1998b), The Asian liquidity crisis. C.V. Starr Center for Applied Economics, New York University Working Papers 98-21, [Online] Available: http://econ.as.nyu.edu/docs/IO/9381/RR98-21.PDF (June 19, 2009).
Chapman, Sheila, A., & Mulino, Marcella, (2001), Explaining Russia's currency and financial crisis, MOCT-MOST: Economic Policy in Transitional Economies 11(1), 350-366. [Online] Available: http://www.springerlink.com/content/l8874q363537427r/(November 21,2009)
Coulibaly, Brahima , & Millar, Jonathan, (2008), The Asian financial crisis, uphill flow of capital, and global imbalances: evidence from a micro study, International Finance Discussion Papers 942, Board of Governors of the Federal Reserve System (U.S.).[Online] Available: http://www.federalreserve.gov/pubs/ifdp/2008/942/default.htm (November 21,2009)
Cumby, R. E., & Van Wijnbergergen S.(1989). Financial policy and speculative runs with a crawling peg: Argentina 1979-198. Journal of International Economics, 27(1-2),111-127
Desai P. (2000).Why did the rubble collapse in August 1998. American economic Review, 90(2), 48-52
Diamond, D.W., & Dybvig P.H. (1983). Bank runs, deposit insurance, and liquidity. Journal of Political Economy. 91, 3, 401-419
Dornbusch, R.(1976). Expectations and exchange rate dynamic. The Journal of Political Economy, 84-6, 1161-1176
Dornbush R. (1987). Collapsing exchange rate regimes. Journal of Development Economy, 27, 71-83
Eichengreen, Barry, Rose, Andrew, K., & Wyplosz, Charles, (1995), Exchange Market Mayhem: The Antecedents and Aftermath of Speculative Attacks.[Online] Available: http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.154.2024 (November 20, 2010)
Eichengreen, Barry, Rose Andrew K., Wyplosz, Charles,(1996)Contagious Currency Crises," NBER Working Paper No. 5681, [Online] Available: http://www.nber.org/papers/w5681.pdf (November 20, 2010)Graham, E.,

Rothenberg, T. J., & Stock J. H. (1996).Efficient Tests for an Autoregressive Unit Root. Econometrica, 64(4), 813-836
Esquivel, Gerardo, & Larrain, Felipe, (1998), Explaining currency crisis. John F. Kennedy Faculty Research WP Series R98-07.[Online] Available: http://papers.ssrn.com/sol3/Data_Integrity_Notice.cfm?abid=107725 (November 20, 2010)
Flood R., & Marion N.(1998). Perspectives on the Recent Currency Crisis Literature. International Journal of Finance& Economics, 4(1), 1-26
Flood, R. P., Garber P.M., Kramer Ch.(1996). Collapsing exchange rate regimes: Another linear example. Journal of International Economics, 41(3-4), 223-234
Flood, R., & Garber P.(1984). Collapsing Exchange-Rate Regimes: Some linear examples. Journal of International Economics, 17, 1-13
Flood, R., & Hodrick, R. (1986). Real aspects of exchange rate choice with collapsing fixed rates. Journal of International Economics, 21(3/4), 215-232
Gaidar Y. (1999).Lessons of the Russian Crisis for Transition Economies. Finance & Development, 36(2), 6-8
Esquivel, Gerardo, & Larrain, Felipe, (1998), Explaining currency crises. [Online] Available:
http://papers.ssrn.com/sol3/papers.cfm?abstract_id=107725(November 21, 2008)
Gerlach, S., & Smets F. (1995). Contagious speculative attacks. European Journal of Political Economy, 11, 45-63
Gerlach-Kristen P. (2001).The demand for money in Switzerland 1936-1995. Swiss Journal of Economics and Statisctics, 137(4), 535-554
Glick, R., Guo, X., & Hutchison M. M. (2006). Currency Crises, Capital Account Liberalization and Selection Bias. The Review of Economics and Statistics, 88(4), 698-714
Glick, Reuven, Hutchison, & Mercier, Micheal, (1999), Banking and Currency Crises: How Common Are Twins?. Proceedings, Federal Reserve Bank of San Francisco. 9. [Online] Available:
http://econpapers.repec.org/paper/fthmidkle/pb99-07.htm (November 21,2010)
Goldberg L. S. (1991). Collapsing exchange rate regimes: Shocks and biases. Journal of International Money and Finance, 10, 252-263
Goldberg L.S.(1994). Predicting exchange rate crises: Mexico revisited. Journal of International Economics. 36, 413-430
Gurvich, Evsey, & Andryakov, Alexander, (2002), A model of the Russian crisis development. Economics Education and Research Consortium. [Online] Available: http://pdc.ceu.hu/archive/00001949/ (November 21, 2009)
Hutchison, Michael, & Noy, Ilan, (2002), Sudden stops and the Mexican wave: currency crises, capital flow reversals and output loss in emerging markets. Pacific Basin Working Paper Series 02-03. Federal Reserve Bank of San Francisco. [Online] Available:

http://www.frbsf.org/publications/economics/pbcpapers/2002/pb02-03.pdf (November 21, 2009)
Ivanova, Nadezhda, & Wyplosz, Charles, (2000), Who lost Russia?.Graduate Institute of International Studies Working Paper presented at the conference "Money Doctors" in Paris on December 14-16, 2000. [Online] Available: http://ssrn.com/abstract=259164 (November 21, 2010)
Kaminsky, G. L., & Reinhart C.M. (1999). The twin crises: the cause of banking and balance-of-payments problems. The American Economics Review, 89 (3), 473-500.
Kaminsky, Graciela, Laura, (2003), Varieties of currency crises. NBER Working Paper 10193. National Bureau of Economic Research. Inc.[Online] Available: http://www.nber.org/papers/w10193.pdf (November 21, 2010)
Kibritcioglu, Bengi , Kose , Bulent, Ugur, Gamze (2001). A Leading Indicators Approach to the Predictability of Currency. International Finance 0108001, EconWPA, revised 06 Sep 2001. [Online] Available:http://129.3.20.41/eps/if/papers/0108/0108001.pdf(November 21,2006)
Krugman P.(1979). A model of balance of payment crises. Journal of Money, Credit and Banking, 11(3), 311-325
Krugman, P., & Obstfeld, M. (2009). International Economics, Theory and policy (6th ed.) London: Pearson Addison-Wesley.
Krugman, Paul, (1998), What happened to Asia. [Online] Available: http://web.mit.edu/krugman/www/DISINTER.html (November 28, 2004)
Krugman P. (1999a). Balance sheets, the transfer problem, and financial crises. International Tax and Public Finance, 6(4), 459-472
Krugman, Paul,(1999b), Analytical Afterthoughts on the Asian Crisis. [Online] Available: http://web.mit.edu/krugman/www/(March 4, 2011)
Małecki, W., Sławiński, A., Piasecki, R., & Żuławska, U. (2001).Currency Crisis.(1st ed.) Polish Scientific Publishers PWN (in polish)
Masson, Paul, R., (1998). Contagion-Monsoonal Effects, Spillovers, and Jumps Between Multiple Equilibria. IMF Working Papers 98/142, [Online] Available: http://www.imf.org/external/pubs/cat/longres.cfm?sk=2755.0 (November 20, 2010)
Mc Kinnom R.I, & Pill, H. (1996). Credible liberalization and international capital flows: the"over borrowing syndrome". In I. Takatoshi & A. O. Krueger (Eds.), Financial deregulation and integration in East Asia .University of Chicago. pp. 7- 42
Mendoza, Enrique, G.(2001), Credit, Prices, and Crashes: Business Cycles with a Sudden Stop. NBER Working Papers 8338. National Bureau of Economic Research. Inc. [Online] Available: http://www.nber.org/papers/w8338.pdf (March 4, 2011)

Mendoza, Enrique, G., & Smith, Katherine, A., (2002), Margin Calls, Trading Costs, and Asset Prices in Emerging Markets: The Finanical Mechanics of the 'Sudden Stop' Phenomenon. NBER Working Papers 9286. National Bureau of Economic Research. Inc. [Online] Available: http://www.nber.org/papers/w9286.pdf (March 4, 2010)

Mishkin, F. S. (1996). Understanding Financial Crises: A Developing Country Perspective. In M. Bruno and B. Pleskovic (Eds.), Annual World Bank conference on development economics. Washington DC: World Bank, pp. 29–62

Muth J.F. (1960).Optimal properties of exponentially weighted forecasts. Journal of the American statistical Association, 55, 5-22

Obstfeld, Maurice, (1986a). Speculative Attack and the External Constraint in a Maximizing Model of the Balance of Payments. NBER Working Papers 1437. National Bureau of Economic Research. Inc. [Online] Available: http://www.nber.org/papers/w1437.pdf (November 20, 2001)

Obstfeld M.(1986 b). Rational and Self- Fulfilling balance of payments crises. The American Economics Review, 76(1), 78-81

Obsfeld M. (1994). The logic of currency crises. Cahiers economiques et monetaires, 43, 189-213

Ozkan, F.G., & Sutherland A. (1995). Policy measures to avoid a currency crisis. The Economic Journal, 105, 510-519

Pazarbaşioğlu, C., & Ötker İ. (1997). Likelihood versus timing of speculative attacks: A case study of Mexico. European Economic Review, 41, 837-845

Puri T. N., Kuan, Ch., & Maskooki K.(2001). An analysis of currency crisis in South Korea. Global Finance Journal 13, 121–146

Reisen, Helmut, (1998), Domestic causes of Currency Crises: Policy lesson for Crisis Avoidance, OECD Development Centre Working Paper 136. [Online] Available: http://dx.doi.org/10.1787/137464158356 (November 20, 2010)

Reynoso, A., (2002a), Using signal processing tool for regulation analysis and implementation. Centro de Investigation Economica. ITAM Working Papers no. 0203. [Online] Available: http:// ftp.itam.mx./pub/academico/inves/reynoso/02-03.pdf (November 20, 2010)

Reynoso, A., (2002b), On the effects of regulation –induced forex market segmentation in small open economics. Centro de Investigation Economica, ITAM Working Papers no. 0204. [Online] Available: http:// ftp.itam.mx./pub/academico/inves/reynoso/02-04.pdf (November 20, 2010)

Sachs, Jeffrey, Velasco, Aaron, & Tornell, Andrew, (1996), Financial crises in emerging markets: the lessons form 1995. NBER Working Paper 5576. [Online] Available: http://www.nber.org/papers/w5576.pdf (November 20, 2010)

Sagib, Omar, (2002), Interpreting currency Crises: A review of theory, evidence and Issue, DIW Berlin Germany Institute for Economic Research Discussion Papers 303. [Online]

Available:http://www.diw.de/documents/publikationen/73/diw_01.c.38608.de/dp303.pdf(November 21,2010)
Salant, S., & Henderson D. (1978). Market anticipation of government policy and the price of gold. Journal of Political Economy, 86, 627-648
Sharma Sunil, & Bikhchandani Sushil, (2000), Herd Behavior in Financial Markets - A Review, IMF Working Papers 00/48. [Online] Available: http://www.imf.org/external/pubs/cat/longres.cfm?sk=3487.0 (November 20, 2010)
Shehzad, Choudhry, Tanveer, & De Haan, Jakob, (2008), Financial Liberalization and Banking Crises. [Online] Available: http://www.finance-innovation.org/risk09/work/6450490.pdf (April, 24, 2010)
Shleifer, A., & Treisman D. (2000). Without a Map: Political Tactics and Economic Reform in Russia. Cambridge: MA MIT Press.
Stiglitz J.E. (2002). Globalisation and its discontent.(1st ed.).New York: The Penguin press, (Chapter 5).
Stock, J. H., & Watson, M. W. (1989). New Indexes of Coincident and Leading Economic Indicators. in O. J. Blanchard, & S. Fischer (Eds.), NBER macroeconomics annual. Cambridge: MA MIT Press, pp. 351–94.
Süppel, Ralph, (2002), Russia's Financial Markets Boom, Crisis and Recovery 1995-2001: Lessons for Emerging Markets Investors. SUERF Studies, SUERF - The European Money and Finance Forum, number 2003/5 edited by Morten Balling, August. [Online] Available: http://www.suerf.org/download/studies/study20035.pdf (April 20, 2008)
Sulimierska M. (2008a). The theoretical link between Capital Account Liberalization and Currency Crisis Episodes. International Journal of Business and Management, 3(4), 75-96
Sulimierska, Malgorzata, (20008b), Capital Account Liberalization and Currency Crisis - The Case of Central Eastern European Countries, International Trade and Finance Association Conference Papers. International Trade and Finance Association Working Papers 2008. Working Paper 33.[Online] Available: http://services.bepress.com/itfa/18th/art33 (November 21,2010)
Sutela, Pekka, (1999),The financial crisis in Russia. Bank of Finland Institute for economics in Transition BOFIT, Discussion Paper 11.[Online] Available: http://www.suomenpankki.fi/bofit_en/haku/Pages/Results.aspx?k=The%20financial%20crisis%20in%20Russia (November 21,2009).
Thomas G.B., & Finney R.L. (1985). Calculus and analytic geometry. (Indian Student ed.). Bombay: Addison-Wesley/Narosa.
Valdes, Rodrigo, O., (2008), Policy Responses to Sudden Stops in Capital Flows: The Case of Chile in 1998., RES Working Papers 2016, Inter-American Development Bank, Research Department.[Online] Available:

http://www.iadb.org/research/pub_hits.cfm?pub_id=CSI150&pub_file_name=pubCSI-150.pdf (November 21,2009)
Velasco, Andrés, (2001),The Impossible Duo? Globalization and Monetary Independence in Emerging Markets. Brookings Trade Forum. [Online] Available: http://muse.jhu.edu/login?uri=/journals/brookings_trade_forum/v2001/2001.1velasco.pdf (November 21,2010)
Wyplosz, Ch., & Yudaeva, K. (1998).The cost of debt conversion: Russia and Mexico Compared. Russian Economic Trends, 7(4), 26-33
Wyplosz, Charles, & Halpern, Lionel,(1997), Equilibrium Exchange Rates in Transition Economies. IMF Working Paper 96/125. [Online] Available: http://www.imf.org/external/pubs/cat/longres.cfm?sk=2089.0 (November 21, 2009)