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Currency Crisis Theories –  
Some Explanations for  
the Russian Case

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Institute for Economies in Transition  
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All opinions expressed are those of the author and do not necessarily reflect the views of the Bank of Finland.

Tuomas Komulainen<sup>1</sup>

## Currency Crisis Theories – Some Explanations for the Russian Case

### Abstract

The paper examines currency crisis theories and applies them in searching for the main causes of the Russian crisis. We first study the determination of the exchange rate and then the first and second generation theories on currency crisis and finally the recent theoretical discussions of the Asian crisis. The main reason for the Russian crisis was the long-standing federal budget deficit. During the last years the deficits were financed mainly via short-term domestic debt. This created expectations of government insolvency and central bank financing. Moreover, the Russian economy has its own basic weaknesses, which render the country incapable of growth and prone to crisis. The Asian crisis was a trigger for the Russian crisis. Lower prices for Russian export products, inadequate financial regulations and lack of information in emerging markets in general are factors explaining this contagion effect. But the main mistakes that led to the crisis were those of the Russians themselves - the federal budget deficits. Thus the repair work should also start from there.

**Keywords:** currency crisis, Russia, budget, contagion

## 1 Introduction

### 1.1 Background

Financial crises are painful for people, but interesting for economists. Thus, they have inspired in history many academic studies and this study as well.<sup>2</sup> Currency or balance of payment crises during the last two decades can be divided into four waves: 1) The collapse of the Bretton Woods system started the first wave in 1976. 2) The debt crisis in Latin America explored the second in 1982. 3) The third was the EMS-crisis in 1992. 4) And the recent one started in Asia in 1997.<sup>3</sup> Characteristic for the currency crisis theories has been progress after the practical crises. Theories have changed to correspond with the economic circumstances and problems at the given period. Also the current Asian crisis inspired a new wave of academic research.

The fact that currency crises tend to occur in waves speaks for global reasons for the crisis. However, the reasons why a particular country at a given time becomes vulnerable to crisis may differ among countries. Thus, different theories and explanation might apply for different countries. To understand properly the present round of currency crises, it behoves economists and politicians alike to try to understand both the domestic and foreign causes behind them.

In Russia, the financial and currency crisis became visible in August 1998, when the rouble was floated and the default on treasury bills (GKO) was announced. Already by the end of September, the rouble had around 35 % of its value before the crisis, monthly inflation was around 45 % and the GDP was forecast to decrease 6 % for the 1998. Moreover, the crisis has already had its political and social consequences as well. During the next months important policy decisions will be made both in the new government and in the new central bank. How deep and long the Russian crisis will become, depends largely on those decisions. In order to intervene and touch the right problems in the Russian economy, it is useful to find out the real reasons behind the crisis. *The main objective of this paper is to survey the existing theories on currency crises. With the help of these theories, the paper aims to find out the main reasons behind the Russian crisis.*

## 1.2 High Capital Mobility and Emerging Markets

Capital mobility is a desirable goal. When private capital can flow freely across countries searching for most efficient use, it can be allocated to the most efficient use on a global scale. In particular, countries with a low capital base but high growth prospects should benefit from the capital inflow.<sup>4</sup> Since the deregulation of capital markets in the 1980s, developing, newly industrialised and transition countries have been objects of massive capital inflow (Bacchetta – van Wincoop 1998). Thus, a new market for investors, emerging markets, was born. During 1984–1989, the yearly net capital inflow to these emerging markets was only \$15b. During 1990–1996 emerging markets received yearly almost a \$150b net inflow of capital, and in 1996 the net capital inflow had grown already to \$260b.<sup>5</sup> This 16-fold increase was a huge positive change in the investment possibilities in such poor countries.

However, increased capital mobility also meant increased financial instability (Kamim – Wood 1997). The five crisis countries in Asia (South Korea, Indonesia, Thailand, Malaysia and Philippines) are clear examples of the instability of capital flows: during 1996 the capital inflow to these countries was almost \$100b, but in 1997, it turned to a capital outflow of \$12b. This turnaround is equivalent to more than 10 % of the GDP of these countries (Grenville 1998).

With capital outflow, the Indonesian Rupiah lost 80 % of its value in less than a year; the Russian rouble blew off 65 % of its value in a couple months. As the fall of currencies is so deep, most of the traditional exchange rate determination theories work poorly. The asset market approach to exchange rate determination may offer a clue as it indicates that exchange rates are determined by investor's willingness to hold a currency. Like other asset prices, the exchange rate is determined by expectations about the future (Shapiro, 1996). Can rapid changes in investors' expectations towards emerging markets explain the huge capital flows and price changes?

Currency crisis theories aim to explain the huge capital outflows and fast depreciation of currencies, although country fundamentals do not support so huge movements. First generation currency crisis theories start with the weak country fundamentals, such as excessive expansionary monetary and fiscal policy, which are then unsustainable with a currency peg. In these first generation theories, country fundamentals play a major role in crisis. In the second-generation theories investors' expectations are more important. From this

theoretical debate arises then the more practical dispute around the question: Can currency crisis arise even with sustainable domestic fundamentals? <sup>6</sup>

As the first and second generation theories do not explain the current crises in emerging markets, "new wave" theories have emerged. These theories stress the characteristics of these countries, particularly banking system weaknesses, as the cause of the crisis. Clearly the high capital mobility has changed the economic environment and introduced the alarming contagion effect of currency crises. Now as crises occur at one part of the world, investors will seek the weak points from all emerging market countries.

### 1.3 The Basic Weaknesses of the Russian Economy

To understand the unique vulnerability of the Russian economy in the summer of 1998, some of the basic weaknesses and characteristics of the Russian economy deserve note.<sup>7</sup> Although these weaknesses are not the acute reasons for the crisis, they are most likely behind the crisis. The list of weaknesses given here is not complete and is written in a short, uncomplicated format.

#### **Insider ownership**

The ownership structure of the Russian enterprises is inefficient for economic growth. The fast privatisation method used resulted in an ownership structure, where insiders employees and especially managers – own the majority in most of the Russian enterprises. Although the share of the outsider owners has increased since the privatisation, managers are actually still in control in most cases.<sup>8</sup> There are several reasons why insider ownership structure is inefficient in the Russian case. Managers and employees are keen on retaining their jobs, which results in employment hoarding, although the enterprises would need restructuring. Further, these insider managers have inherited a Soviet style of management, which most likely is not appropriate to the circumstances in a market economy.

More importantly, these Russian insiders have lacked interest in capital investments in their enterprises, tending to focus on creating positive cash flows for themselves instead. In 1997, the overall capital investments in the production sectors (industry, agriculture, transportation and communication) were only 17 % of the level in 1990 (Gaddy – Ickes 1998). The positive cash flow is produced by wearing out the old capital base, like raw materials and



machines. This kind of positive cash flow does not mean that the enterprises are profitable (Sutela 1998b). The lack of capital by the insiders themselves, their unwillingness to sell the majority stake of their enterprises and to give information to outside investors have been major reasons for the lack of investments and economic growth in the Russian economy.

### **No trust – no savings**

Russian banks are small. The common assets of the Russian banks in spring 1998 were around 35 % of GDP. This is low even compared to other emerging markets countries. (Banks assets in Brazil are 72 %, in Poland 60 % and in most developed countries more than 100 % of GDP). Moreover, an abnormally large part of banks assets were invested to government paper (35 % of assets in spring 1998), while an abnormally small part was lent to non-financial private enterprises (39 % of assets in spring 1998) (CBR 1998). Thus, what little capital Russian banks had was heavily invested in financing the public deficit, not in urgently needed private investments.

Russians do not save, at least in the accounts of the Russian banks. The official savings rate has been around 25 %, but studies with reasonable adjustments by RECEP (1996) and by Gregory (1997) estimate the true savings rate to be around 10–12 %.<sup>9</sup> This is alarmingly low compare to other transition countries where the savings rate is around 18 % or even 20–30 % in Asian countries.

Why don't Russians save? The first reason is the hyperinflation history in 1992–1995, as the rouble savings were lost. The low inflation policy during 1995–1998 by the Central Bank of Russia and the governments did not earn the credibility among Russians. The practise to use Russian banks as tax collectors makes enterprises to avoid accounts in Russian banks. And finally, the bankruptcies of different financial institutions in 1992–93 reduced the credibility of Russian banks. These reasons have increased the capital flight and the use of dollars as store of value. Unfortunately, the paranoia of Russians to ascribe low credibility to the rouble and Russian banks was justified.

### **No monetary economy**

The monetisation of Russian economy is low. The ratio of M2 to GDP has been only 12–17 % in 1997–98 (RECEP 1998). The low use of the roubles makes the economy inefficient. Instead of roubles, Russians use dollars. The

results vary, but even conservative estimates put the current value of dollars among Russians higher than the value of roubles. Barter is also prevalent. Approximately half of the industrial production is exchanged through barter. Finally, enterprises use various substitutes, like promissory notes, in paying their bills, e.g. taxes. All these substitutes for roubles harm the operation of the enterprises and hamper tax policy.

### **Virtual economy**

Gaddy and Ickes (1998) have cleverly formulated the expression "virtual economy" to explain the characteristics of the Russian economy. On the top of their model are the non-payment arrears. The enterprises do not pay their suppliers, their workers, their taxes. And if they do, it is with cash substitutes. By June 1998, the total arrears in the economy had grown to around 45 % compared to the GDP (RECEP 1998). These arrears create illusory, or virtual earnings, virtual fiscal obligations and virtual prices. The existence of this virtual economy means that the Russian economy is actually smaller than what Goskomstat reports.<sup>10</sup>

### **Macroeconomic transition – no government transition**

Consumer and industrial prices have been liberalised in Russia. Around 80 % of the Russian economy are produced by private enterprises. Inflation was stabilised to 10–20 % level during 1996–97. Thus, the first parts of the successful economic transition towards market economy given in various text books (like Blanchard et al. 1991) was achieved in the Russian economy before the August 1998 crisis. These are the respectable macroeconomic results of the former governments and Dubinin's Central Bank.

Firstly, what is lacking in the Russian economy is enterprise restructuring. Although the economy has shrunk around 30–50 % since 1991 and half of the enterprises report losses, bankruptcies have been only few (RECEP 1998 and Gaddy – Ickes 1998). Employee notices have been few as well. Like already said, investments to new capital base have been almost non-existent. To put it simply, old Soviet era enterprises continue to run as always. New, smaller enterprises have not emerged as in Poland and China (RECEP 1997).

Second, the transition of the government is missing. Shleifer (1997) wisely added the transition of the government as an important reform towards prosperous market economy. The transition or changes do not mean only the

federal government, but politicians and officials in all level in the public administration. They are responsible for building the institutions for the enterprises and citizens to operate. In Poland and the Czech Republic, both the structure and the persons of the public administration have changed rapidly and deeply (Scheifer 1997). In Russia, we see little more than some ministerial job rotation. Because of the absence of government transition, no efficient public institutions have been created. The lack of efficient public institutions enables all these weaknesses of the Russian economy.

## 2 Currency Crisis Theories

This chapter starts with exchange rate determination theories. After which currency crisis theories are presented in three waves. First generation theories are based on monetary and fiscal imbalance. The second generation theories take into account investor expectation on government behaviour. These expectations render the currency crisis self-fulfilling. The most recent theories explain the spillover and contagion effect, underdevelopment of banking sector and market segmentation and herding behaviour. These were devised mostly to explain the Asian crisis.<sup>11</sup> All of these theories, even the old ones, can explain a given currency crisis. Moreover, in a currency crisis several explanations may apply. The data from the Russian economy is presented after every theoretical section. Experience from other countries, mostly from the Asian countries, appears in the footnotes.

### 2.1 Exchange Rate Determination

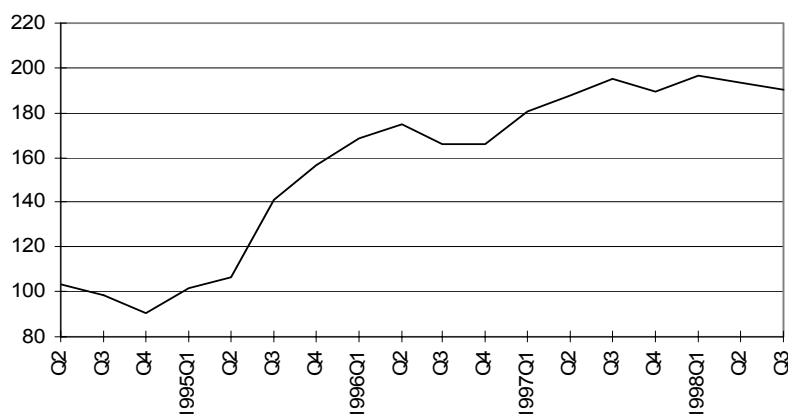
#### **Purchasing power parity approach**

Exchange rate determination theories can be divided into purchasing power, balance of payment and asset market approaches.<sup>12</sup> The purchasing power approach stresses the price task of exchange rates. It states that the value of a currency is determined by the ratio of domestic prices relative to the level of prices abroad. The absolute form implies that the equilibrium exchange rate between two countries is determined by the ratio of the two countries national price levels. According to the relative version of PPP, the percentage change in the equilibrium exchange rate between two countries is determined by the percentage difference in two countries' inflation (Rosenberg 1996).

Thus, we get excessive inflation as a reason of exchange rate depreciation. Neither of the forms of the purchasing power theory have received validity in empirical testing particularly in the short-term or between developing and developed countries (Krugman – Obstfeld 1997). In the longer term, however, exchange rates exhibit a tendency towards their PPP levels (Rosenberg 1996).

During 1995–1997 inflation was higher than rouble depreciation. Thus, the rouble appreciated around 100 % in real terms (Figure 1). However, it is extremely difficult to estimate an equilibrium exchange rate level for an transition country, and it is difficult to assume that the real exchange rate level in 1995 was an equilibrium level. Moreover, the Russian price and especially the wage level before the crisis in 1998 was not higher than in most of the other transition countries in Eastern Europe. <sup>13</sup>

Figure 1: Real Exchange rate in Russia

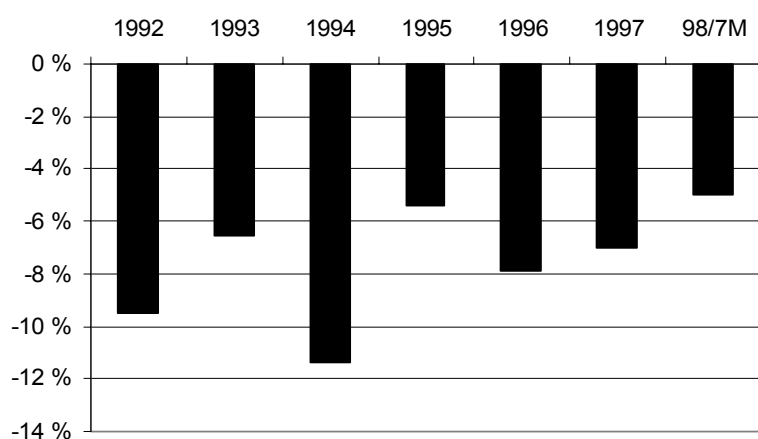


Source: *Russian Economic Trends*, BOFIT. 1995 = 100.

It is useful here to go deeper to one reason for fast inflation and currency depreciation. Assuming the velocity of money and the growth of output constant, the quantity theory of money says, that the growth of money determines the rate of inflation (Mankiw 1992). There are two major reasons for the government to be interested in excessive money creation. First, if the

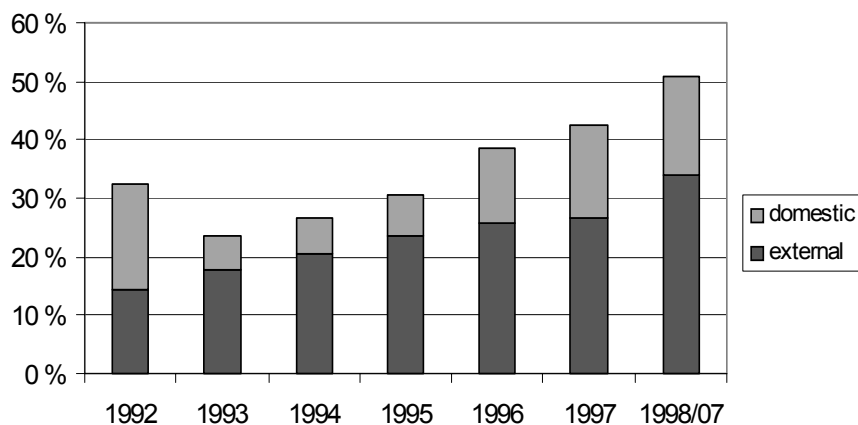
government is unable to keep its budget in balance, it may ask the central bank to cover the deficit with new emissions. Second, if the government has a large debt burden, which is denominated in the domestic currency, great money emissions will inflate the real value of the debt away. Thus, we get large budget deficit and government debt as reasons for inflation and currency depreciation expectations.<sup>14</sup>

Figure 2: Russia's Federal Budget Deficit to GDP



Source: RECEP, Russian economic trends, various issues. The figures are according to IMF definition during 1992–1998. The figure for 1998 includes only the seven first months.

Russia's budget deficit was large for years. The deficit in the federal budget has varied around 5–11 % of GDP during 1992–98. During 1992–1994 Russian government was unable to receive domestic or foreign credits to finance its deficits. In 1993, 100 % and in 1994 77 % of the deficit were financed with credits from the CBR. In 1995 the domestic treasury bill (GKO) market was created and so after 1995 the government was able to receive domestic loans. In 1997 and the first quarter of 1998, Russia was able to receive also foreign loans, Eurobonds, syndicated loans and IMF credits.

*Figure 3: The Stock of Federal Debt as % of GDP*

*Source: OECD, JPMorgan, Fitch IBCA, Goskomstat and RECEP. The internal debt includes Treasury bills and bonds (GKOs, OFZs, and OVZs) and no other debt items.*

The stock of federal debt became unsustainable. The stock of debt was still at moderate levels (around 20–30 % of GDP) during 1993–1995 (Figure 3). During 1995–96 the government piled on credit while the economy sank fast. And in 1997 and 1998 the governments continued to take new credits as the economy started to show signs of recovery. Thus, the stock of debt compared to GDP was over 50 % when crisis hit in August 1998.<sup>15</sup> Korhonen (1998) observes that Russia would have needed real high GDP growth to be able to service the debt and keep the debt stock at reasonable levels in the future. The alternative would have been to run large primary surpluses in the federal budget, which did not occur. Thus, it was quite reasonable that investors abandoned the new credits from the Russian government.

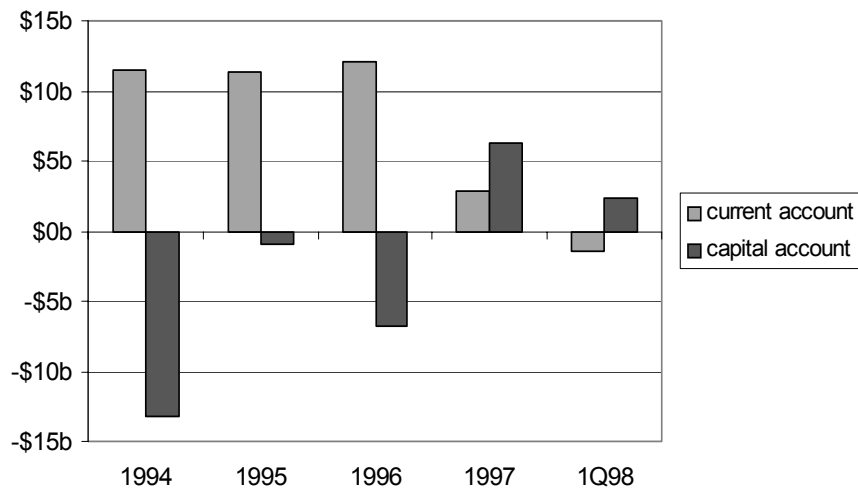
The stock of rouble-denominated domestic debt was only 15–20 % of GDP, but, in principle, this debt was possible to be inflated away with new money creation. External debt cannot be inflated away. Russia's external

debt is around USD 140 billion. On the contrary, if and as the rouble depreciates, it will be even more difficult to pay back the external debt denominated in foreign currency. Thus, defaults on external debt look now inevitable.

### Balance of payments approach

Exchange rate is also the equilibrium of demand and supply. The balance of payments approach says that the equilibrium exchange rate is determined when the net inflow of foreign exchange arising from current account transactions just match the net outflow of foreign exchange arising from capital account transaction (Rosenberg 1996). Historically, international trade drove balance of payment flows. For example, if a country imports more than exports, the current account deficit has to be balanced with capital inflow in capital account. If there is not enough capital inflow by private investors to compensate the current account deficit, the official reserves will decrease and the exchange rate might come under pressure.<sup>16</sup>

Figure 4: Russia's current account and capital account



Source: RECEP 1998, BOFIT. The figures are in USD billion.

Russia has had a healthy current account surplus. With huge trade surpluses (around USD 20b yearly) the current account has been nicely positive during 1994–1997. However, because of tax evasion efforts, the actual current account figures are most likely worse.<sup>17</sup> At the end of 1997 and more in the start of 1998 the lower raw material prices turned the current account to small deficit. However, this small current account deficit, was not the main reason for the currency crisis in Russia.

### **Asset market approach**

Capital flows registered in the capital account can influence reserves and exchange rates per se. The asset market approach to exchange rate determination indicates that the exchange rate is determined by investor's willingness to hold each currency. And like other asset prices, the exchange rate is determined by investors expectations about the future (Solnik 1996). First, the uncovered interest parity states, that the interest rate on domestic bond is equal to the interest rate on foreign bond plus the expected rate of appreciation of foreign currency. This view assumes that the foreign and domestic bonds are perfect substitutes.

The portfolio balance approach is an extension of the asset market approach. It assumes that domestic and foreign non-money assets are imperfect substitutes. International investors will hold a diversified portfolio of non-money assets and the proportion of each asset depends upon its particular risk-return characteristics (Pentecost 1993). Expectations on interest rate, currency and country risk influence the investors' decision to buy, for example, treasury bills in a given country. As an example, poor revenue expectations in the government budget raise expectations of insolvency, and can be a reason for currency depreciation. The expectations about the solvency of the debtor or economic growth influence the capital flows particularly towards emerging markets, because capital flows towards emerging markets are dominated by portfolio investments (Bacchetta – van Wincoop 1998).

While capital flight is attributed to be the reason for economic problem in Russia, it is difficult to determine and estimate the value of it (the estimates vary around \$10b–\$40b yearly). Partly the capital flight was normal international diversification of investments by the Russians, but part was tax avoidance or criminal behaviour. Anyway, the "capital flight" partly rendered the capital account negative until 1997. With foreign investments to Russia the capital account turned positive in 1997 and was still positive in



the first quarter of 1998. The capital inflow also enabled the lower GKO rates of 15–20 % in 1997.

In 1998, as the investors started to fear a default by the Russian government, investors sold their GKOs. This exacerbated both capital outflow and currency crisis. In the Russian case, it is most likely that investors were optimistic or did not receive the right information in 1996–1997 about the growth prospects of the Russian economy or about the situation in the federal budget. This led to high equity prices and low GKO yields in 1997. As the more realistic picture emerged the capital inflow ceased in 1998.

## 2.2 First Generation Theories

First generation, or traditional, currency crisis theories originate from the work of Salant and Henderson (1978), and were formalised by Krugman (1979). Krugman's (1979) and (1996) models have a country using reserves to peg its exchange rate. The model assumes interest parity conditions and that the government cannot use foreign borrowing. The government runs a budget deficit, which it must cover by domestic credit or by money creation. The continuing expansion of domestic credit or money base will lead to inflation, depreciation expectations and capital outflow. Accordingly, the central bank's reserves gradually decline. At some point, generally well before the gradual depletion of reserves would have exhausted them, there is a sudden, massive speculative attack that wipes out the reserves. This speculative attack is driven by the natural outcome of maximising behaviour or risk-averse behaviour by investors.

Several authors have since extended Krugman's work. The timing of the speculative attack and currency crisis was solved by Flood – Garber (1984). It was solved both in a perfect-foresight model and in a stochastic market model without perfect foresight.<sup>18</sup> Connolly – Taylor (1984) introduced traded and non-tradable goods to the models. Their implication was that loss of competitiveness and the current account deficit cause the currency crisis. The effect of price flexibility on the collapse time was highlighted by Blackburn (1988). Blackburn (1988) introduced imperfect asset substitutability into his models. Willman (1988) also assumed that domestic goods and bonds are not perfect substitutes, and that nominal wages might be sticky. His insight was that it is not just monetary policy, but rather the mix of fiscal, monetary and incomes policies, that are important for currency crises.

Similar for these traditional or first generation models is that they assume weak country fundamentals, which are known to be unsustainable with the current fixed exchange rate. This then establishes a unique relationship between the fundamentals and the timing of crisis (Krugman 1996). Krugman (1996) formulates, that the critical level of reserves determines the timing for the speculative attack and crisis, which is the level at which, in mind of the investors, the speculative attack can succeed.<sup>19</sup>

First generation theories are appropriate for the Russian crisis. The deficit and debt burden in the federal government budget augmented expectations of future money creation and depreciation of the rouble. The demand for roubles became so low that high interest rates by the CBR for half a year did not restore the credibility. The currency, GKO and equity –markets were exhausted and ruined during the spring and summer of 1998. Thus, there was not a sudden speculative attack, which caused the crisis. Although the long-standing budget deficit was the main reason for the Russian crisis, there was also some self-fulfilling and foreign reasons as well.

### 2.3 Second Generation Theories

The EMS crisis in 1992–93 and Latin American crisis in 1994–95 inspired a new wave of currency crisis theories. Unlike the earlier models, these second-generation models take into account the policy adjustment by the authorities in response to the attack. Obstfeld (1986) first observed this shortcoming of the earlier models. He observed that the government faces the trade-off to defend and carry the costs or to abandon the fixed rate. The costs to defend the exchange rate arise, for example, as the higher interest rates cause unemployment.<sup>20</sup> These costs then create investor's expectations that the exchange rate might be abandoned, which increases the costs (interest rates) even further. Whereas, the motivation to defend the fixed rate is e.g.: it facilitates international trade and investment, or the fixed rate works as a guarantor of low inflation (Obstfeld 1994 and Krugman 1998b).

The trade-off rises the possibility of multiple equilibrium. The two equilibrium are: 1) no attack, no change in fundamentals and indefinite maintenance of the peg. And 2) an attack and new fundamentals, which will be validated after the exchange rate change that investors expects to take place (Eichengreen – Rose – Wyplosz 1996). This possibility of two equilibrium facilitates self-fulfilling crisis, and only small change in expectations may

trigger the speculative attack.<sup>21</sup>

A sudden shift in market sentiment regarding the government's willingness to tolerate unemployment trigger the currency depreciation that would not happen under different investors expectations.<sup>23</sup> If the credibility and track record of the government is weak, these expectations might be truly self-fulfilling, although the initial output shock had been neutral. In the Obstfelds (1994) first model the market participants expect the currency to be devalued at a given rate and set the nominal interest rates at the corresponding level. Because of high unemployment or high debt burden, the higher rates makes the peg to the government too costly to hold.<sup>22</sup> In the second Obstfeld (1994) model, devaluation expectations are triggered by the governments expected desire to offset a negative output shock.

Further reasons creating self-fulfilling expectations on currency crises due to authorities behaviour are expected problems in the banking sector. When market interest rates rise as the central bank defends the peg, banks may get into trouble.<sup>24</sup> The government desire to sidestep a costly bailout at public expense may render the government reluctant to use higher interest rates. These expectations make the speculative attack self-fulfilling. Similarly, the expectations that the central bank exercise its lender-of-last-resort function by expanding the monetary base expose devaluation expectations (Obstfeld 1996a).<sup>25</sup>

Although many claim these second-generation models ignore fundamentals (Esquivel – Larrain 1998), the Obstfelds (1996a and 1996b) notion is closer to reality. He points that in second-generation theories fundamentals are far from irrelevant to the outcome, as they determine the range of possible equilibria. He stresses that in reality there exists a "grey area" in which multiple equilibria and self-fulfilling crises are possible. First generation models were too strict having just a pegged rate, which may or may not be sustainable given the fundamentals.

Kiriyenko's Government and Dubinin's Central Bank were ready to carry the cost of high interest, when they defended the peg of the rouble. The market participants, however, understood that the government finances were unsustainable, and demanded higher GKO rates. Consequently, in the first three months of 1998 the debt service costs were 35 % of the total budget spending (Helmenstein – Krylova 1998). Thus, there were also some self-fulfilling or circular aspects in the Russian crisis. So far we have only considered domestic reasons for currency crisis. Although the domestic reasons

for the Russian crisis looks sufficient, the timing of the crisis is still obscure. What happened during autumn 1997 and spring 1998 to turn the of capital net inflow into an outflow that ruined markets?

## 2.4 Spillover-effects and Contagion

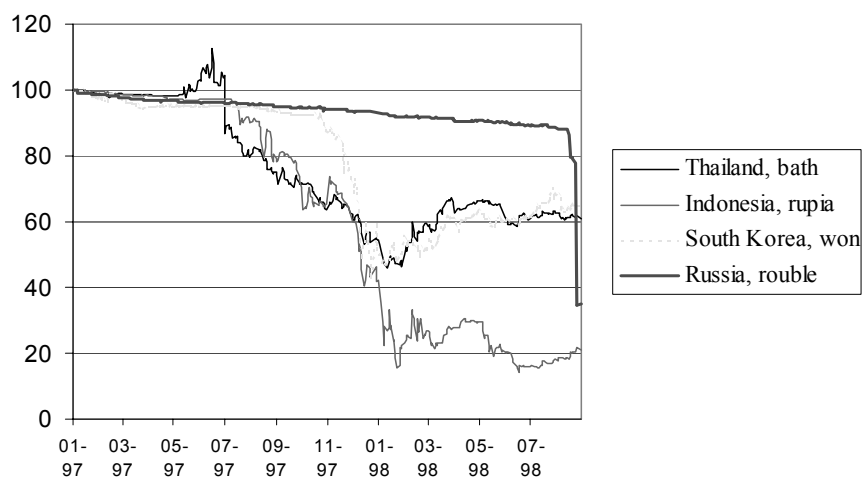
Next we turn to the truly recent theories on currency crisis. The external reasons for the currency crisis will first be discussed. In the recent crisis in Asia, the fall of the Thai Baht preceded the abandon of exchange rate pegs in the neighbouring countries and in other emerging markets like Russia. It is easier to understand that Indonesia, Malaysia and Philippines had to leave the peg after the fall of the baht. These four countries were more linked by foreign trade and had similar weak fundamentals (especially current account deficit). More curiously, Hong Kong and Singapore, with strong current account and fiscal positions and less trade linkages, were also briefly exposed to downward pressure on their currencies. Later Korea and Russia also succumbed to this contagion effect (Masson 1998) (Figure 5).

These events and regression tests have raised the question of foreign influence to the currency crisis.<sup>26</sup> The foreign influence to a currency crisis can be divided into two parts: spillover and contagion-effect.<sup>27</sup> The spillover effect focuses on trade linkages and on the loss of price competitiveness associated to a depreciation of a competitor country. Where as the contagion term refers to the change in market sentiment.

### **Spillover effects**

Gerlach-Smets (1994) were inspired by the loss of competitiveness in Sweden after collapse of the Finnish markka in 1991–1992. In their model the collapse of the first currency leads to real appreciation of the second, which depresses income and prices in the second country. This reduces the demand for money, causes loss of foreign exchange reserves and increases the probability of succeed attack in the second country. They note that the spillover effect is stronger, the lower the degree of real and nominal wage flexibility, the higher the degree of trade integration between the two countries and the less integrated the two countries are with the anchor country.

Figure 5: Currency Depreciation in Asian countries and in Russia

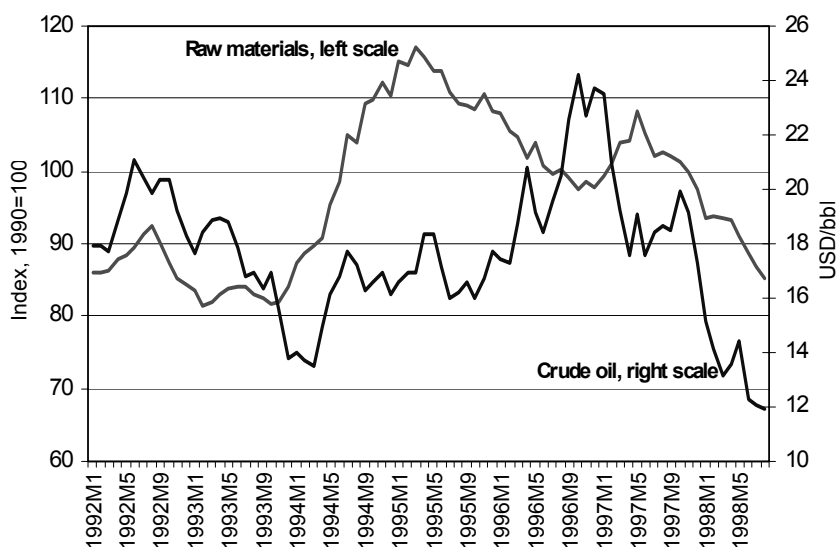


Source: Bank of Finland. 100 = 2 Jan. 1997. The data for other currencies end at 25 Aug. 1998 and for Russia 30 Sept. 1998.

Inspired by the 1997–98 Asian crisis, Corsetti – Pesenti – Roubini (1998) used game theory to model a competitive devaluation. They used a three-country centre-periphery model, where two periphery countries A and B unilaterally peg their currencies to the centre country C currency (say, dollar). They assume no intraperiphery trade, citizens in the centre country consume both domestic and imported goods and perfect substitutability between the two periphery country goods. Periphery country A is hit by a shock, which forces it to devalue. Country C consumption of the B country products falls to zero and the output of A country increases. To maintain the peg against the centre, country B must accept a sharp contraction in economic activity, consumption and welfare. However, the investors perceive a devaluation of the country B as the optimal response to the sharp devaluation of the weak-fundamental country A, and country B is forced to devalue as well.<sup>28</sup> A second implication of the Corsetti et al game model is that a coordinated response to the shock will lead to less depreciation of A and B currencies than

a non-coordinated case.

Figure 6: Raw Material Prices



Source: Bank of Finland.

The spillover-effect also occurs when the anchor country rises its interest rates. Buiter – Corsetti – Pesenti (1996) studied the N + 1 problem in a world where the centre meets a shock. The centre country raises interest rates, which causes the others to leave the system collectively. Here we see an extreme case of contagion. In a more selective case, some leave the system, some keep the peg. Thus, the spillover effect may influence countries differently.<sup>29</sup> Masson (1998) cleverly named the higher interest rates in developed countries in general as a "monsoonal" effect to the emerging markets financial crisis. Dooley – Fernandez-Arias – Kletzer (1996) find the interest rate in developed countries and the creditworthiness of the recipient country as the main factors explaining movements of developing countries Treasury bills

prices.<sup>30</sup>

The spillover-effect from Asia to Russian economy was influenced mainly through lower raw material prices. Crude oil, oil products and metals represented 40 % of Russian exports in 1997. Due to the fall in demand in Asia, raw material prices started to decline heavily during the second half of 1997 (Figure 6). This caused expectations of future current account deficits in Russia, which also materialised in the 1Q of 1998 (Figure 4). More importantly, the lower raw material prices decreased the ability of Russian enterprises to pay taxes and further hampered the government finances. As the value of Russian enterprises was decreased at least partly because of lower raw material prices, privatisation plans had to be postponed as well.

### **Contagion**

The term "contagion" refers to the change in the market sentiment. The contagion effect was first discussed after the Mexico crisis spread to Argentina, Chile and other emerging markets in 1995. At that time it was named the "Tequila" effect and now the "Vodka" effect. Sachs – Tornell – Velasco (1996) start their explanation with an investor, who considers investing in emerging markets during a period of turbulence. For a given nominal return, the real return can be adversely affected by a large depreciation or default. Even if "bad" policy or decreasing times are viewed as transitory, investors able to allocate resources at relatively low costs will park their wealth elsewhere until the dust settles. During these times also governments are unable to roll over short-term debt and may have to amortise obligations earlier than anticipated. The net effect is a massive capital outflow from the country and from the whole region. Although this explanation for the contagion effect is illustrative, it is not a sufficient one.

As the crisis elsewhere work as signal to the investors, the contagion effect is related to the multiple equilibrium (Esquivel – Larrain 1998). In the second-generation theories the trigger, which causes investors to expect the abandon of the peg, was obscure. Currency crisis abroad may work as this trigger. Inconveniently, even if the domestic fundamentals had not changed, foreign crisis will lead investors to reassess the fundamentals of similar countries as well (Masson 1998). The crisis in one country renders investors more risk averse towards all similar assets or towards similar information. Thus, if the home country's fundamentals are in the Obstfeld's grey area and similar countries leave the peg, home country will also encounter a speculative at-

tack. However, what the similarities exactly mean and which countries should be involved in the crisis are still open questions (Wyplotz 1998).

Masson (1998) tries to model the contagion effect. Depreciation or higher interest rates abroad will increase the expected debt burden by the domestic government. This moves the country into the grey area, where speculative attack is possible. Masson's model consists of two emerging market countries and an external environment that determines the risk-free interest rate. One emerging market is the home country and it has external debt. The interest rate to the debt depends on foreign interest rates, probability of devaluation and percent devaluation expected.

Two channels in the Masson's (1998) model by which the currency crisis in emerging market may coincide: 1) foreign risk-free interest rate and 2) devaluation by the other emerging market country. The source of uncertainty in Masson's model is a shock to the trade balance in one of the emerging market countries. The probability of attack and devaluation in the home country depends negatively on the level of reserves and expected trade balance, and positively on stock of debt, foreign interest rates and possibility of competitor devaluation. Masson states also that the model should be further extended to include rollover risk, banking sector problems and the existence of risk-averse investors.<sup>31</sup>

The currency devaluations in Asia worked as a trigger in the Russian case. Investors became more risk averse towards all emerging markets and started to look more carefully the fundamentals in Russia as well. It is possible to argue that, due to the Asian crisis, debt service costs rose and moved Russia into the Obstfeld's grey area, making a currency crisis possible. It is still obscure, however, why an investor would see emerging markets as one investment area and not distinguish among emerging market countries.

## 2.5 Underdevelopment of the Banking Sector

Underdevelopment of the banking sector has been stressed as a main reason for the recent crisis in Asia. These theories point the liberalisation of financial markets, inadequate legal infrastructure and illiquidity as reasons for crises.

Banking crises and currency crises are highly related. Kaminsky – Reinhardt (1996) studied the links between currency crisis and banking crisis in 25 crisis in 20 countries.<sup>32</sup> They give four different explanations and



chain of causation how these two crisis are linked: 1) The speculative attack on the currency is followed by a period of abnormally high interest rates, as the central bank attempts to defend the parity. This decreases private banks assets. In this case, the balance of payment crisis occurs before the banking crisis. 2) As the central bank finances the bailout of troubled financial institutions, its ability to maintain the peg erodes. 3) The consumption/investment boom is usually financed by bank credits. Banks have borrowed abroad and short-term. The consumption and investment boom erodes the current account, which at some point can be perceived unsustainable by investors and a speculative attack occurs. The capital inflow becomes an outflow, asset markets crash and the banking system caves in. 4) The financial liberalisation without relevant regulator laws may be the cause for the same boom-bust dynamics.

The last two cases are more studied in Kamim – Wood (1997) and they introduced the following series of events: stabilisation and liberalisation of financial markets, which improves the investment environment. Capital inflow and real appreciation of the currency, which leads to widening of the current account. Accumulation of international reserves by the central bank, which is reflected in an expansion of monetary aggregates and bank credits (see also Calvo 1998). Expansion of the loanable funds, which leads to fast increases in consumption and investment. Increases in private net indebtedness and the emergence of non-performing loans.<sup>33</sup> Reversal of capital flow, which may lead to further speculative attacks against the currency. This seems to give a good explanation about the Asian crisis, although the Kamim and Wood (1997) paper was already written to the Mexico crisis in 1995.

Krugman (1998a and 1998b) stresses moral hazard as a cause of the Asian crisis. He starts with financial intermediates, whose liabilities were perceived as having an implicit government guarantee, but were unregulated. This induced risky lending, which induced inflation of asset prices. This "overpricing" of assets was sustained by circular process, in which proliferation of risky lending drove up the prices of risky assets, making the condition of financial intermediates seem sounder than it was. When the bubble burst, the virtuous circle turned vicious. Falling asset prices make the insolvency of intermediaries visible, forcing them to seek liquidity or to cease operation, leading to further asset deflation.

Obstfeld (1998) emphasises the attempt to assure fixed exchange rates. When domestic banks and corporate borrowers are (over)confident in the

exchange rate, they may borrow in dollar terms without adequately hedging against the exchange rate risk. If devaluation occurs, it raises the ratio of their domestic-currency liabilities to their assets and deepens the vicious circle further. Moreover, banks may believe that even if crisis occurs, the government's promise to peg the exchange rate represents an implicit promise of a bail out. Maybe more to the point, McKinnon and Pill (1998) stress that failure to limit the exposure of banks to foreign exchange risk, increases the magnitude of the boom.

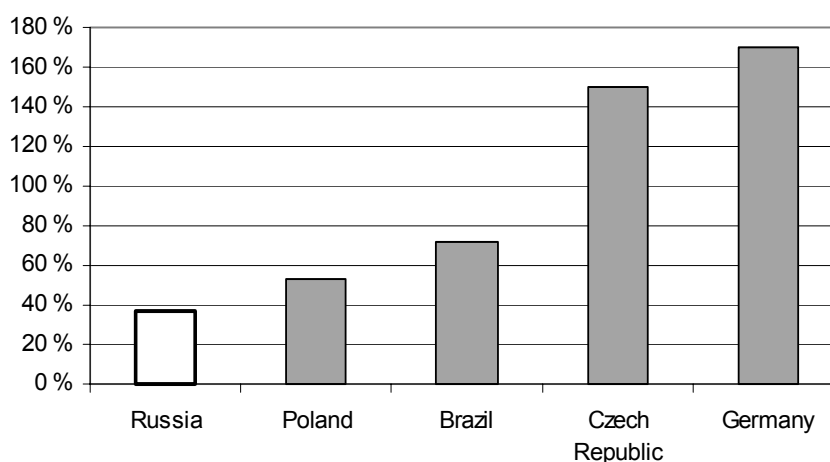
Unlike the Asian crisis, the Russian economy did not receive huge capital inflows before the crisis. The Russian economy never experienced an investment/consumption boom like many Asian and Latin American countries. Moreover, Russian banks did not have time to be largely involved in the new borrowing possibilities abroad, which opened in the 1990s for the other emerging markets. Russian banks received only around two billion dollars worth of eurobonds and syndicated loans during 1997 and early 1998. Thus, bank assets remained small compared to other emerging markets (Figure 7) and Russian banks did not start to finance investments or consumption in the private part of the economy. Of course, this thinness of the financial sector made the crisis worse later.

Russian banks were not adequately prepared for the exchange risk. On the contrary, they underwrote forward contracts (estimates vary between \$5b–\$20b) to foreign investors. Secondly, Russian banks suffered huge losses as the value of GKO's decreased and became illiquid in August 1998. Unlike in the Asian crisis, the Russian banking crisis materialised after the currency crisis and insolvency of the Russian government.

Next we turn to the weak financial infrastructure in emerging markets, which render the capital flows unstable and currency crises more probable. Knight (1998) listed a supportive legal and regulatory environment, strong internal governance, external discipline provided by market forces, and external governance provided by regulation and supervision at both the domestic and international level as basic elements of a sound financial system. It requires a legal framework that facilitates the enforcement of financial contracts, loan recovery, and the realization of collateral. Moreover, a supervision body that limits the open currency positions is highly needed. Such infrastructure is clearly lacking in most emerging markets. Further characteristics for the emerging markets is the illiquidity as the access from emerging markets to world capital markets is limited to few issuers only. Moreo-

ver, information on issuers is costly or even impossible to receive.

Figure 7: Banks Assets to GDP



Source: Alfa Capital. Figures are for the first half of 1998.

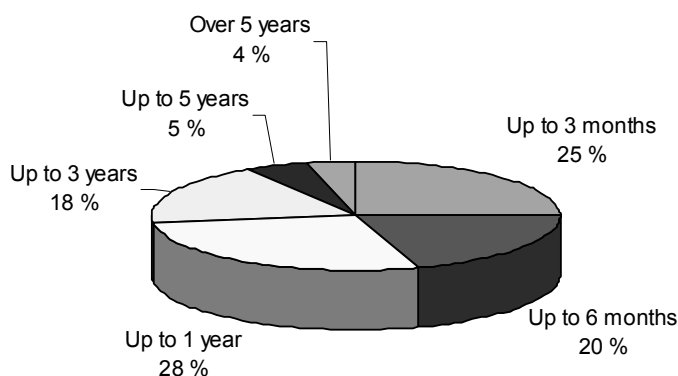
In such environments even a small exogenous change such as world interest rates, terms of trade or devaluation by other countries, may result in financial distress. A creditor panic leads to a refusal to roll over short-term loans and even bank runs. And banks face costly liquidation of their assets. Weak infrastructure and illiquidity aspect has inspired some currency crisis models.

Chang–Velasco (1998) placed the illiquidity of the financial system at the centre of their currency crisis model. They assume banks to take liquid deposit and invest part of the proceeds in illiquid assets. Even small capital outflows may cause banking crisis.<sup>34</sup> The illiquidity may be born also by the government finances. Governments in emerging markets often have to borrow in short-term debt papers. If the government’s credibility is decreased in an investor’s mind, investors refuse to roll over the expiring debt.<sup>35</sup> The government is left with the unpleasant options: 1) outright repudiation, 2) invol-

untary debt rescheduling, 3) persuade the private sector to roll over the debt or 4) tough measures towards the budget, which will contract the real economy. All these options either limit the government's access to world capital market further or decrease the growth prospects of the economy. This will deepen the crisis even further (Calvo 1998).

In emerging markets, the illiquidity aspect increases the contagion effect as well. If agents want to change their portfolios in one country, they will cash their claims asking for liquidity. If they do not find the liquidity in the first country they will seek for it in the second one (usually another emerging market country). The illiquidity in the first country will influence the size of the withdrawals in the second country (Valdes 1998). This run for liquidity effect was operating at least in the Asian crisis and affected other emerging markets as well.

Figure 8: Maturity Structure of Rouble Debt in May 1998



Source: Helmenstein-Krylova (1998)

In Russia, banks liabilities were more liquid than their assets. Financial markets were illiquid as well. These rendered the economy more vulnerable for crisis. However, the illiquidity born by the government is the more suitable

reason for the Russian crisis. As the domestic debt of Russian government was highly short-term (Figure 8) and in the summer 1998 investors refused to roll over the debt anymore, the Kiriyenko government was left with few options. First it proposed a voluntary debt rescheduling and later it tried to impose a mandatory one. Thus, the short maturity of government debt was clearly a technical reason for the Russian crisis.

## 2.6 Market Segmentation and Herding Behaviour

Can inefficient international financial markets be a reason for the contagion effect? <sup>36</sup> Investor's expectation and preferences towards assets in a country or group of countries influence the capital flows and may cause currency crisis. If financial markets were internationally efficient, massive turnarounds in capital flows and currency crisis would not happen without really a dramatic new information. However, as Table 1 shows, the capital inflows to emerging markets in 1996 have diminished quite heavily. The turnaround occurred during few months in the autumn of 1997. Particularly, the Asian countries lost all the massive inflows of foreign investments.

*Table 1: Net Capital Flows to Emerging Markets (in billion USD)*

Net capital flows	1984–89	1990–96	1996	1997	1998E
Total emerging markets	15	148	241	174	122
Asian countries	13	56	102	39	2
Countries in transition	0	13	21	35	35

*Source: IMF 1998. For the items 1984–89 and 1990–96 the figures are yearly averages during the period. For the 1998 the figure is an estimate and might prove to be too large. Net capital flows include: net direct investment, net portfolio investment, official-, private borrowing, other long- and short-term net investment flows.*

Studies and theories in international finance can be divided into three categories (Bakaert – Harvey 1995): 1) integrated 2) segmented or 3) partially segmented markets. The international asset pricing theories (IAPT and ICAPM) say that markets are completely integrated if assets with same risk have identical expected returns irrespective of the market. In other words, the reward for various investment risks is the same in each market. Risk refers here to exposure to some common world factor.<sup>37</sup>

Financial markets are said to be segmented if securities with the same

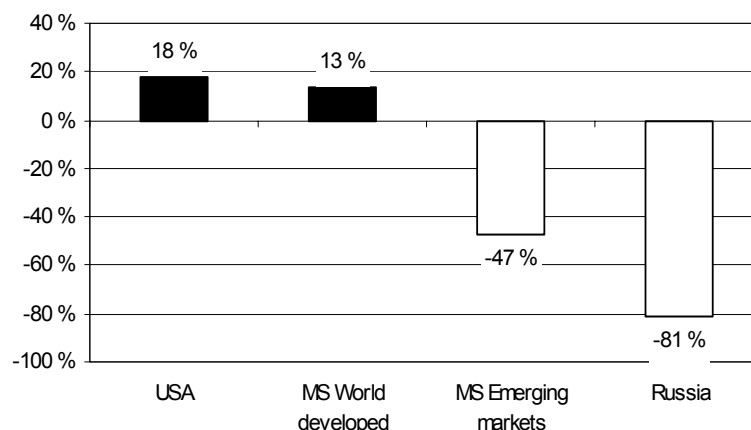
risk characteristics but listed in two different markets have different value (Solnik 1996). In other words, in segmented markets the cost of capital and the corresponding value of an investment will generally depend on the market in which the project is financed. Segmentation may arise either because of government impediments to capital movements or because of individuals' attitude or irrationality (Gultekin – Gultekin – Penati 1989). In fact, all asset pricing studies using only one country data assume that domestic capital market is completely segmented.

The third class of theories assumes the global markets to be partially segmented, which might also be cautiously proven by the empirical results.<sup>38</sup> Bekaert – Harvey (1995) introduce a measure of capital market integration for individual market. They found that a number of emerging market are partially segmented, and that the integration or segmentation is time varying. Valdes (1998) studied the correlation of secondary debt prices among seven Latin American countries during 1979 and 1994, and found significant correlation. Moreover, he found that the correlation is stronger for negative movements. Patel – Sarkar (1998) studied nine stock market crisis during 1970–1997 in 18 countries. They found strong evidence of contagion within regions, in that most countries in a region participate in a crisis and even that the countries participate with similar amounts of decreases.

While more studies on the efficiency of international financial market are clearly needed, we may already cautiously infer that investors do not use all the diversification possibilities and that in crisis situations investors tend to withdraw their investments from many emerging markets simultaneously. Also the events in the one-year period, August 1997 to August 1998, indicates that investors can segment emerging markets as a group (Figure 9).

Herding behaviour can be seen as one reason for this inefficiency. Krugman (1998a) explains the Asian crisis by herding behaviour in the financial markets and gives two reasons. First, there is a bandwagon effect driven by the investor's awareness or expectations that the other investors have private information. When one investor sells, the others sell as well. Second, much of the money invested in emerging market is managed by agents rather than directly by principals. These are compensated based on comparison with other money managers. Before the crisis money managers are not enough concerned about the crisis possibility. Although the prices of assets have decreased remarkably after the crisis, managers refuse to invest.

Figure 9: Equity indexes in Developed and Emerging markets during 18 Aug. 1997 – 18 Aug. 1998



Source: Morgan Stanley, Bloomberg. MS World developed and MS Emerging markets are Morgan Stanley's indexes in USD terms. For Russia the index is the RTS index.

Calvo – Mendoza (1997) studied international portfolio diversification with incomplete information. Their reasoning for herding behaviour is that the expected utility gain made by paying the cost of processing country-specific information falls as the number of investable countries grows.<sup>39</sup> Emerging market countries are the latest, where the research departments are built. In emerging markets processing information is highly expensive and sometimes even impossible to receive. Because of lack information emerging markets are, thus, more vulnerable to herding behaviour than developed ones.

In the Russian financial market this bandwagon was also in effect. During the capital inflow period, January 1997 – October 1997, GKO- and equity markets rallied. Many hedge funds wanted to invest in Russia without enough accurate information; what are the financial ratios of enterprises, what is the actual balance of the federal budget, or even what is the GDP growth rate of the economy? Public administration, enterprises and investment banks were not ready to grant all the information. Consequently, in

January 1999 the value of the 200 largest enterprises in Russia is around USD 20 billion and the value of Nokia (largest enterprise in Finland) is around USD 60 billion. Nobody wants to take the risk and invest in Russia again.

### 3 Conclusion

Different theories explain different crises. For the Asian crisis, new currency crisis theories might be most appropriate. These are particularly based on inadequate regulation of the banking or financial sector, which then after liberalisation of capital markets, cause over-lending and over-investments in the economy.

In Russia's case, basic weaknesses in the economy rendered the country inefficient and inclined to crisis. The acute reason for the currency crisis was the long-term deficit of the federal budget. This rendered the stock of debt unsustainable for the government to service and argued expectations of future money creation. A minor reason was the short-term maturity of the rouble debt, which then made Kiriyenko's government insolvent. These poor government finances created expectations of central bank finances. The Asian crisis helped trigger the Russian crisis. After the Asian crisis, investors monitored country fundamentals more carefully. Moreover, it may well be the investors are now more risk-averse towards emerging markets as a group as well. And hopefully, after the Russian default private investors might start to insist more solvent finances from governments and from other debtors in all emerging markets.

Although low raw material prices diminished the Russian trade surplus, current account deficits were not reasons for the Russian crisis. Unlike the Asian crisis, over-lending by the Russian banks was not a reason for the crisis either, although their inability to protect themselves against exchange rate movements rendered the crisis more worse. Russia and the Kiriyenko's government had bad luck, but the main reasons for the crisis are the own mistakes by the Russians – the long-time federal budget deficit. Thus, the repairs should also start from there. The long-term repairs should also take up the basic weaknesses of the economy and build trustworthy public institutions into the country. Unfortunately, the Primakov's government remedy - new money creation - will make the currency crisis worse and postpone recovery far into the future.



The fact that fundamental weaknesses exist, means that countries should repair their own weaknesses in currency crisis situations. Also, some aspects of the current crisis defy conventional explanation. Why did the crisis in 1997-1998 contagiously spread from one emerging market to another? Perhaps, in an environment where capital is highly mobile, the lack of information is an explanation. Building an information infrastructure, more strict monitoring of the country fundamentals and banking regulation might be some starting points for the IMF to consider as it assembles its blueprints for building an infrastructure for global capital markets.

## Notes

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<sup>2</sup> See Kindleberger 1978 for good review on the history of financial crisis.

<sup>3</sup> This classification to four currency crisis periods is made by Esquivel – Larrain 1998. However, particularly in emerging market countries there have been more currency crises.

<sup>4</sup> If capital flows only towards high growth country, capital flows may become too procyclical and might also be harmful, see Stiglitz 1998. See also Obstfeld 1998 for clever arguments in favour of free capital mobility.

<sup>5</sup> Net capital flows include: net direct investment, net portfolio investment, official-, private borrowing, other long- and short-term net investment flows, IMF 1998.

<sup>6</sup> In 1996 an academic discussion emerged whether a currency crisis is self-fulfilling or are the crises caused mainly by the country fundamentals, e.g. Krugman 1996, Obstfeld 1996b and Eichengreen - Wyplosz - Rose 1996.

<sup>7</sup> The characteristics given here follow largely the one given in Sutela, 1998b.

<sup>8</sup> See Blasi 1997. Often in Russia the outsider, especially a foreign owner, is not represented in the board of directors. Secondly, the supposed outsider owner is actually a holding company own by the insiders themselves. These holding companies have been created most likely because of tax evasion reasons.

<sup>9</sup> The Goskomstat does not adjust its savings rate figure by household sales of hard currency, currency purchases to pay shuttle import and hard currency spent abroad, see RECEP 1996.

<sup>10</sup> The expression and partly the virtual economy story explained Gaddy and Ickes is based on the report by Inter-Agency Balance-Sheet Commission with P.A. Karpov as a chairman.

<sup>11</sup> For discussion as to how well first and second generation theories explain the recent currency crisis in Asia, see Corsetti et al. 1998.

<sup>12</sup> This definition is according to Solnik 1996. Later we mention also seigniorage revenues and the portfolio balance approach as special cases. A more extended defi-

dition and survey of the exchange rate determination theories can be seen e.g. in Pentecost 1993 or Rosenberg 1996.

<sup>13</sup> See Krajnyark and Zettelmeyer 1998 for wage levels in transition countries and some calculations how competitive the economies were.

<sup>14</sup> Major cases of need for seigniorage revenues, hyperinflation, and free fall of the value of the currency are: Germany 1922–23, Mexico 1982, Argentina 1982, see e.g. Corsetti et al. 1998. Although excessive money creation is not so common these days, the option is always there. Thus, the independence of central banks has been cited as a main indicator of credible and stable currency, Alesina et al. 1993.

<sup>15</sup> The stock of debt figures are most likely higher as there are domestic debt items, like wage arrears and even some domestic debt items, which are not included. These figures might add around 5 % to figures given here.

<sup>16</sup> Recent cases where the excessive current account deficits at least partly caused currency crises are Mexico in 1994 and Thailand in 1997, e.g. Martinez 1998. Excessive inflation may cause trade deficit. If costs in a country rise so that enterprises lose their price competitiveness, the trade balance will worsen and the exchange rate may come under attack.

<sup>17</sup> See study by Rautava 1998 for the errors in the foreign trade data between Russia and Finland. Secondly, the negative service balance in Russia diminished the current account surplus already in 1997.

<sup>18</sup> In the latter case, credit expansion is dependent on a random component.

<sup>19</sup> Krugman 1996, Obstfeld 1996a and Esquivel – Larrain 1998 have all a summary, but have also slightly different interpretations to the first generation theories on currency crisis. On the rational expectations, government deficit and depreciation of the currency see Sargent 1986.

<sup>20</sup> A second example of costs is a high debt denominated in domestic currency. This gives the government justification to inflate the debt away by abandoning the peg. In addition, Obstfeld 1994 cleverly notes that for countries with access to world capital markets, reserve adequacy per se is far less a concern than it was in the early 1970s; it is the authorities' willingness to endure the costs.

<sup>21</sup> Obstfeld 1996a study uses a game theory approach. When the authorities have an intermediate level of reserves, investors have to coordinate their actions to make the attack successful and profitable. The two Nash equilibria are: one where the attack is

successful, many investors attack and make a profit, or there is no attack and no rent seeking.

<sup>22</sup> Obstfeld 1994 leaves it a bit obscure as to what is the trigger for currency depreciation expectations. The trigger might be fundamentals. Obstfeld 1994 mentions, for example, the negative vote on Maastricht treaty by the Danish as a trigger for the EMS crises.

<sup>23</sup> Since wages are set at the earlier period the government might attempt a "surprise" devaluation to increase price competitiveness in the country, which might increase the devaluation expectations even further, see Obstfeld 1994.

<sup>24</sup> Banks liabilities are usually short-term maturity and assets long-term. In many emerging markets countries the devaluation itself causes problems for banks, which have liabilities denominated in foreign currency.

<sup>25</sup> A political commitment might also be a reason for self-fulfilling crisis (Krugman 1997). The EMS crisis is the clearest example of this. Once Britain and Italy left the system, it raised expectations that it was easier for other governments to abandon the system as well. This expectation caused the capital flows and the collapse (or change) of the system, although the governments were actually unwilling to abandon the system.

<sup>26</sup> In the regression tests both Eichengreen – Rose – Wyplosz 1996 and Esquível – Larrain 1998 found that the foreign effect (contagious effect) is statistically significant to the domestic currency, and that a crisis in one country raises the contemporaneous probability of crisis for all countries of the region by more than 7 percent. Both tests use a time span of more than 30 years, which might understate the contagion effect in today's environment.

<sup>27</sup> The definition for contagion effect used here follows the definition in Masson 1998 and in Esquível – Larrain 1998. However, is the reason for the simultaneous currency crisis the spillover (trade) or contagion (sentiment) effect, is hard to measure and depends by the currency crisis case.

<sup>28</sup> At the time in which their currencies were allowed to float Taiwan and Singapore had a massive stock of foreign reserves (\$80b in Singapore and \$100b in Taiwan) and strong fundamentals (current account surplus and small stock of foreign debt), e.g. Corsetti et al. 1998. Thus, in these cases a competitive devaluation model is useful. However, according to Alba et al. 1998, competitive devaluation is not the reason for the Asian crisis. According to their calculations: 10–20 % devaluations by

neighbouring countries increase the needed depreciation by the other countries only by half to one-percentage points, Alba et al. 1998.

<sup>29</sup> This was said to be one of the reasons for the EMS crisis, e.g. Bayomi – Eichengreen 1993, and to the debt crisis in developing countries in 1982, e.g. Masson 1998.

<sup>30</sup> During the 1997–98 crisis in Asia the Federal Reserve only considered raising its key interest rates in the spring 1997. However, the sentiment in the Federal Reserve and in some European central banks changed in winter 1997 from loosening towards tightening. This might have been one reason to the change in the capital flows towards developed away from emerging markets. Studying the currency crisis in Latin America in 1994–95 Godfajn – Valdes 1997 conclude: it is difficult to justify how the rather modest changes in U.S. interest rates can determine the magnitude of these capital outflows. Uribe 1998 observed that the Federal Reserve raised its key rates from 3 % to 6 % between January, 1994 and February, 1995 and points this as one reason for the capital outflow from emerging market in 1995 crisis. But according to Uribe it fails to explain the timing of the crisis in Latin America at the first quarter of 1995.

<sup>31</sup> Based on the just mentioned indicators Masson (1998) calculates a fundamental parameter for 13 emerging market countries during 1994–96. If this parameter is high enough, multiple equilibria are not possible and speculative attack should not occur. Most of the countries involved in the 1994–95 or 1997–98 crises (besides Brazil and Thailand) were noted in the study.

<sup>32</sup> The empirical part in the Kaminsky – Reinhardt (1996) study provides the interesting result that in half of the studied cases, the banking crisis gets underway before the balance of payments crisis. Even more interesting, 71 % these banking crises were preceded by financial liberalisation. They conclude that the financial sector liberalisation usually came without an adequate regulatory and supervisory framework to accompany it. Also the study Kaminsky – Reinhardt – Lizondo 1998 list the banking crisis as a leading indicator for currency crisis, but did not found that currency crisis cause banking crisis.

<sup>33</sup> The size of external debt and the structure of it in Asian crisis countries is listed in Corsetti et al. 1998.

<sup>34</sup> Chang – Velasco 1998 stress that this illiquidity story is more suitable for emerging markets, because non-banks play only minority role in debt and equity markets. Moreover, the access of emerging market banks to world capital is more limited. In case of illiquidity, banks just can't receive emergency funds from international pri-

vate capital markets. Chang – Velasco conclude that central banks acting as lender of last resort, fixed exchange rates and insufficient reserves (illiquidity), makes currency crisis at the end unavoidable if investors sentiment turns negative.

<sup>35</sup> One indicator widely used by investors is the short-term debt compared to international reserves, which indicates the total public insolvency. This was at least partly the case in Mexico in 1994, see Calvo 1998, and in Russia in 1998, see JP Morgan and CSFB reports.

<sup>36</sup> This is a problematic question for economists. If financial markets would be globally inefficient, free capital movement would not be worth supporting. Moreover, big investors like George Soros could influence the markets. See Krugman 1996 and 1998a for the role of big investors.

<sup>37</sup> The well-known problem in testing the efficiency of world financial markets is to find the true market portfolio in the case of ICAPM or to find the relevant risk factors in the case of IAPT.

<sup>38</sup> Partial market segmentation can be caused by costs associated with transaction costs, information costs, different taxation or legal restriction, see Stulz 1981 and Eun – Janakiraman 1986.

<sup>39</sup> More accurately, Calvo – Mendoza 1997 found that if the block of emerging economies is viewed as segmented market, investors will rationally choose not to assess the veracity of country-specific rumours if fixed information costs exceed  $1/6$  of the mean portfolio return prior to the emergence of the rumour.

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