Lessons from the Russian Financial Crisis

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Abstract

This paper analyzes the economic fundamentals of Russia and other factors which might have affected the Russian crisis in 1998. Through investigating the fundamentals, we found that the Asian crisis did not cause the Russian crisis directly, but led to multiple equilibria. In 1995, the Russian government, in order to finance its budget deficits, began to issue large amounts of short-term bonds and to deregulate the asset market. Yet, as asset prices in the emerging markets are correlated to one another, there is a strong possibility that the Russian economy was affected by those emerging market's asset deflation. It is thus evident that the Asian crisis may have had an effect on the Russian economy.

1. Introduction

This paper analyzes the economic fundamentals of Russia and other factors which might have brought on the Russian crisis in 1998. It is possible to conclude that failures in Russian government policy led the crisis, since the government faced various problems: political instability; the failure to privatize state-owned companies; and budget deficits. While the economic conditions which affect the exchange rate, i.e., the fundamentals, were weak, they do not appear to have suddenly worsened before the crisis, because the deterioration of the fundamentals had been taking place as a long-term process. Therefore, we must verify not only the fundamentals but also other factors to clarify why the crisis occurred in 1998.

Currently, the idea that there was contagion effects of the financial crises is very popular. In the Asian crisis, the fact that a number of Asian countries collapsed shows the possibility that there were such contagion effects. If the Russian economy plummeted because of the contagion effects, then the roots of the effects must be identifiable. In other words, we need to investigate concretely how the Russian crisis was affected by the Asian crisis.

It has been suggested that the contagion effect in the Asian crisis took place as follows. First, there was a spillover effect of trade. In a country with a large amount of bilateral trade with a crisis-hit country or which is an export competitor of such a country, a devaluation of other country's currency causes a deterioration of exports. This leads to a current account

deficit and then contagion occurs in the form of competitive devaluation. However, in the case of Russia, trade and export competition with Asian countries was relatively small. As shown in section 4, there were a few signals of crisis in the financial sectors, but not in the real economic sector. Therefore, the spillover effect did not reach Russia.

A second interpretation is that contagion is caused by having common creditors. When a country shares a creditor with a crisis-hit country, the creditor may repatriate the capital from many countries in order to avoid capital shortfalls, so contagion may occur. The Russian economy was largely financed by German banks. Other emerging market countries which shared the same creditors were, for instance, Greece, Portugal, and Turkey. On the other hand, the most important creditor country in East Asia was Japan. Though many German banks repatriated large amounts of capital from Asian countries, it is difficult to completely explain the contagion from Asia to Russia using the common creditor approach.

A third interpretation, which is presented by this paper, is that the international correlation of asset prices caused the contagion effect. Most of the countries that collapsed early on experienced a currency crisis, banking crisis, and asset market crisis simultaneously. Moreover, these asset market crises occurred in many countries at the same time. This may suggest that all of the international investors were in the same position, leading to a huge and unilateral movement of capital. This may be the reason why a number of countries collapsed simultaneously.

This paper demonstrates that the third approach is suitable to describe the contagion effects. We use the third hypothesis to analyze the contagion effects from Asia to Russia and Latin American countries. Yet, these effects alone might not have been the only cause of the crises. The deterioration of Russia's fundamentals appears to have contributed to the crisis there since they were not strong enough to prevent the economy from speculative attacks. This supports Desai (2000) who stresses the exogenous factors of the crisis as well as the weak fundamentals.

The key distinguishing features of this paper are as follows. The first is its theoretical analysis of the effect of the speed of the deterioration in economic fundamentals. As noted by much of the literature, the deterioration of fundamentals can invite speculative attacks. However, a slow deterioration of the fundamentals causes not only the timing of attack to be slower but also leads to a large variance of the timing which makes speculations self-fulfilling. Thus, the Russian crisis might have been self-fulfiling because the fundamentals deteriorated slowly.

The second is that we estimate statistically whether or not the Russian economy's conditions, i.e., the fundamentals, were aggravated before the crisis. Previous studies on the Russian crisis have limited themselves to just surveying some data on the economy, but have not tried to determine if the fundamentals in the pre-crisis period were statistically different from that of a normal period. Our empirical analysis shows that the fundamentals in the pre-crisis period were not in particularly poor shape, and that most market participants did not carry out attacks because of bad fundamentals.

Our third contribution is to show evidence of a contagion effect through asset markets. The flurry of papers about the contagion effects of the Asian crises has only shed light on trade-based or bank-induced contagion. However, particularly in the Russian crisis, the contagion effects through asset markets appear to have been the most important cause of the crisis. In order to clarify this, this paper examines this question empirically and theoretically.

The remainder of this paper is organized as follows: Section 2 surveys the chronology

of the Russian crisis; Section 3 presents a simple model which explains the variance of the timing of speculative attacks depending on the deterioration of fundamentals; in Section 4, we investigate Russia's fundamentals statistically; Section 5 demonstrates the possibility that the Asian crisis affected Russia and Latin American countries though asset markets; and Section 6 gives the conclusion.

2. Chronology

In October 1997, the Asian crisis erupted, acting as the start of the destabilization of Russia's financial market. Russia's condition worsened with the world-wide fall of oil prices in the beginning of 1998. The damage suffered by the oil industry, one of the Russia's most important economic sectors, led not only to contractions of exports, but also to a contraction of government revenues. As the budget deficit deepened, it became apparent that heavy damage to the Russian government was unavoidable, and market participants, losing confdence in the Russian economy, began to repatriate large amounts of capital. At the same time, the prices of stocks and short-term sovereign bonds, seemingly as a result of pension funds of the United States, fell sharply. In the end, causing the collapse of the Russian financial market.

In March of 1998, the president Boris Yeltsin replaced prime minister Sergei Kiriyenko by Victor Chernomyrdin. In May of the same year, turmoil in the coal industry and the failure to sell state-regulated oil company caused political and economic problems. In June, the ruble, the Russian currency, started to gradually depreciate along with stock and bond prices. Although GDP grew in the previous year, the government had to tighten its monetary policy because of the occurrences of 1998. As a result, on June 27 the official discount rate rose to 150 percent per annum and the government issued an emergency one billion U.S. dollars of sovereign bonds denominated in dollars, in order to repay the bonds denominated in rubles.

To deal with the financial turmoil and external debt repayment problems, in the end of July 1998 the International Monetary Fund (IMF) lent 4.8 billion dollars to Russia. Although this helped to stabilize the economy for a short period, stock prices fell again sharply on August 13, 1998, causing the suspension of all stock exchange transactions. On August 17, the government and the central bank issued a joint statement on the state of the devaluation of the ruble and declaring a moratorium on external debt. In conclusion, on September 3, the central bank officially declared the abandonment of the exchange rate band, leading to a further fall of the ruble and a collapse of the market.[1]

3. A Minimal Model

Seemingly, the failure of government policy was the cause of the Russian crisis. Shiobara (1999), for example, emphasizes that it was a failure of fiscal policy, because of the huge size of the budget deficit and sovereign bonds. Similarly, Iwata (1999) suggests that the budget deficit was what differentiated Russia most clearly from the Asian crisis countries. If they are right, the Russian economy's collapse was caused by bad fundamentals.

However, Russia's government policies were based on the running of budget deficits

and on increasing domestic credit, both of which have long term effects on the economy. For instance, Desai (2000) explains that the most important factor behind the crisis was "exogenous factors," e.g., the Asian crisis, even in spite of the weaknesses in fundamentals. A further examination of the fundamentals is necessary to unlock the true characteristics of the Russian economy's deterioration.

Why are the fundamentals of country in crisis referred to when we analyze speculative attacks against a currency? The reason is that theories of currency crisis interpret the fundamentals as follows. In general, theories of currency crisis can be divided into two models. One is the so-called first generation model, which presents the deterioration of fundamentals as causing an abandonment of the fixed exchange rate regime.[2] For instance, if a government continues to run a policy under which international reserves are finally depleted, speculators will start an attack to make capital gains.

The other is the second generation model, which supposes that there is uncertainty over whether a crisis will occur (i.e., bad equilibrium) or not (i.e., good equilibrium) if a monetary authority does not have sufficient international reserves to intervene in the foreign exchange market and/or has an incentive to abandon intervention.[3] When multiple equilibria exist, the question of which one is reached depends on the self-fulfilling expectations of speculators. In other words, if speculators expect that a crisis will occur, they will begin an attack, eventually causing a crisis even though its fundamentals are not weak enough to justify the devaluation.

The remainder of this section shows that variance of timing of crisis is larger when fundamentals deteriorate moderately. We extend Flood and Garber's (1984) model and assume a small open economy as follows:

$$m_t - p_t = \phi y - \lambda i_t, \tag{1}$$

$$p_t = s_t + p^*, \tag{2}$$

$$i_t = i^* + \dot{s}_t^e, \tag{3}$$

$$M_t = D_t - R_t, \tag{4}$$

$$D_t = \mu D_t, \tag{5}$$

where (1) is the equilibrium function in the money market; (2) is purchasing power parity; (3) is interest rate parity; (4) is the central bank's balance sheet; and (5) is the change of domestic credit. In each equation, M_t denotes the monetary base; D_t domestic credit; R_t foreign reserve; p_t price level; y output level (constant); s_t exchange rate; $\dot{s}_t^e$ expected rate of change of the exchange rate; and μ the constant rate of increase of change of domestic credit. Lower case letters represent natural logarithms, except for interest rates, and asterisks constant variables of foreign country. For simplicity, we assume that y is constant and p^* is zero.

If the exchange rate is fixed, then $\dot{s}_t^e = 0$ and the government has to keep the money supply constant to fix the parity, i.e., $m_t = m_0$. Substituting (2) and (3) into (1), we have

$$s^{FIX} = m_0 - \phi y + \lambda i^*. \tag{6}$$

The government raises domestic credit gradually, i.e., $d_t = \mu t + d_0$ from (5). Speculators expect that if it is floated, the exchange rate will depreciate at the rate of deterioration of the fundamentals, μ. Moreover $m_t = d_t$ because the government does not have to intervene in the exchange market. Thus, combining (1) to (3) we attain the shadow exchange rate,

$$s_t^{SHADOW} = \mu t + d_0 + \lambda \mu - \phi y + \lambda i^* + \varepsilon_t, \tag{7}$$

where ε_t denotes the uncertainty of the shadow exchange rate and i.i.d. with mean zero and variance σ^2.

On the other hand, speculators attempt to obtain opportunities for arbitrage, which depends on the difference between the fixed rate and the shadow floating exchange rate, the rate "which would materialize if the fixed exchange rate collapsed" (Flood and Garber (1984)). If they succeed in an attack against the fixed rate, speculators can sell the currency at the shadow exchange rate. Let $\hat{t}$ be the timing of the attack. A representative speculator's profit per unit of speculation can be represented as follows:

$$\pi_{\hat{t}} = s_{\hat{t}}^{SHADOW} - s^{FIX}. \tag{8}$$

Lemma 1   *If the foreign exchange market is competitive, then $\pi_{\hat{t}} = 0$.*
Proof.   This Lemma is derived by backward induction.[3] When the exchange rate is pegged and $\pi_{\hat{t}} > 0$, it is possible for speculators to make capital gains by selling the currency, whereas there is no room for arbitrage after the floating regime begins. Therefore each speculator seeks to attack earlier than his competitors. This behavior hastens the timing of the attack. In the end, the equation, $\pi_{\hat{t}} = 0$, comes true. ■

In other words, the speculative attack ends at the time when the shadow exchange rate corresponds with the fixed rate. Suppose that speculators are not able to know the shadow exchange rate completely.

Proposition 1   *The expected timing of the speculative attack is*

$$E(\hat{t}) = \frac{m_0 - d_0}{\mu} - \lambda. \tag{9}$$

Proof.   As $\pi_{\hat{t}} = 0$, s^{FIX} is equal to s^{SHADOW}. Therefore the timing of the speculative attack is determined. ■

Equation (9) shows that the timing of the speculative attack is related to the deterioration of fundamentals. The fundamental which exogenously deteriorates in this model is domestic credit, and its rate of deterioration is μ. The higher μ, the earlier the timing of attack. While this important result has been noted by a large number of papers, we have derived the following proposition from the second moment of the timing.

Proposition 2   *The variance of the timing of speculative attack increases as μ decreases.*

Proof.   The variance of the timing of the attack is $\text{var}(\hat{t}) = \left(\dfrac{\sigma}{\mu} \right)^2$. ■

If σ is given, then the slower the deterioration of the fundamentals, μ, the larger the variance of the timing of the speculative attack. In short, the timing may depend largely on self-fulfilling expectation of speculators and/or external shocks.

According to this proposition, the more moderate the deterioration of the fundamentals, the larger the variance in the timing of crisis. In other words, an exogenous shock may affect the possibility of the onset of crisis. A moderate deterioration of fundamentals also means that the government might be able to change its policy in the future. Thus, confining the blame to failures of government policy may lead to incorrect conclusions and to disregard for the other factor of the crisis, i.e., external shocks.

4. Russia's Fundamentals

If the fundamentals had deteriorated significantly in the pre-crisis period, market participants would had transacted at an appropriate value of the currency in the foreign exchange market and the Russian economy might have collapsed by itself. On the other hand, if the fundamentals had not deteriorated, the exchange rate would have depreciated excessively as a result of the self-fulfilling expectations of the participants. Thus, we must estimate whether or not the fundamentals were weak during the pre-crisis period. Prior attempts to investigate the Russian crisis have been inconclusive because of the lack of empirical analysis. In this section, we would like to examine whether Russia's fundamentals and self-fulfilling expectations should have changed.

To compare the pre-crisis to the tranquil period, we use a χ^2-test using sample variances of some variables in the pre-crisis period, and test the following statistic $(n - 1)s^2/\sigma_0^2$, where σ_0^2 is the variance in the tranquil period, s^2 is the sample variance of a variable in the pre-crisis period, and n is the sample period. This estimator depends on $\chi^2(n - 1)$. The null hypothesis, in which the variance of fundamentals during the tranquil period is the same as that during the pre-crisis period, i.e., H_0: $\sigma^2 = \sigma_0^2$, and the alternative hypothesis, in which the variance of fundamentals during the tranquil period is larger than that during the pre-crisis period, i.e., H_1: $\sigma^2 > \sigma_0^2$, are estimated.

For the Russian crisis, we assume that the tranquil period was from June 1995 to July 1997.[5] The pre-crisis period includes six months, and it is necessary to vary the beginning month over two of eight months (from June 1997 to February 1998). If the null hypothesis is rejected, the fundamentals in the pre-crisis period might have been volatile in comparison with the tranquil period. As for fundamentals, we test foreign reserves, GDP growth, M2 to foreign reserve ratio, real exchange rate (RER), bank lending to GDP, money market rate (MM Rate), current account to GDP, and budget deficit to GDP. We use the data from *International Financial Statistics*, IMF. The results are shown in Table 1.

4.1 Foreign Reserves and M2 to Foreign Reserve Ratio

The monetary authority intervenes in exchange markets in order to maintain the parity of the currency. It gradually uses foreign reserves for this purpose. When a undesirable shock occurs in an economy or an exchange market and the exchange rate depreciates, the monetary authority sells its foreign reserves so as to prevent the parity against speculative attacks. Yet, speculators attack the currencies of countries that have few foreign reserves, and cause the currencies to depreciate seeking opportunities for arbitrage. In short, speculative attacks occur when foreign reserves decrease to the minimum level where the parity can be defended.

Moreover, the more liquid capital there is, the higher the possibility of the occurrence of a currency crisis. Hence, the M2 to foreign reserve ratio is usually used as an index of international liquidity. As far as Russia is concerned, the ratio could be defined as the short-term debt to reserve ratio, because the M2 to foreign reserve ratio and short-term debt to reserve ratio moved in parallel to one another. Iwata (1999) suggests that the M2 to reserve ratio grew in the pre-crisis period. However, Table 1 demonstrates that in the 12-month pre-crisis period (from August 1997 to January 1998), the variance of foreign reserve and M2 to reserve ratio was significantly different from the variance in the tranquil period, while

neither variable was significant *after* this period. In other words, the indicators did not move abnormally in the pre-crisis period, so they could not have been used to predict the crisis exactly.

4.2 GDP Growth

According to equation (1) of section 3, lower output leads to lower demand for money, which causes a depreciation of the currency. In emerging markets, moreover, capital may flow out of the country and the exchange rate may depreciate when international investors expect that GDP will fall and there is a probability of default. In 1997, real GDP growth was 0.4 percent and market participants expected economic growth in the future, causing the demand for Russian assets to increase.

In spite of the occurrence of the Asian crisis and the oil turmoil, no increase in the volatility of GDP growth can be seen in Table 1. There was a slight change eight months before the crisis, but the variance was not significant. This means that the indicator was not correlated with the collapse of the ruble in 1998.

4.3 Real Exchange Rate

Shiobara (1999) suggests that the real exchange rate had been undervalued in the long run. Table 2 represents the differences between the purchasing power parity (PPP) and the exchange rate. In the beginning of 1990's, the ruble was undervalued. Therefore, the government pursued policies to raise the parity of the ruble. This implies that policy made the real exchange rate stable. Table 1 also demonstrates that the real exchange rate is not statistically significant and then does not give the sign to the crisis.

4.4 Bank Lending

A large amount of bank lending and non-performing loans in the domestic market could have led to a high possibility of default on debt from international financial markets.

Table 1. Russia's Fundamentals

variable	Jun. 97–Nov. 97	Aug. 97–Jan. 98	Oct. 97–Mar. 98	Dec. 97–May. 98	Feb. 98–Jul. 98
Foreign Reserve	14.290	23.939*	13.688	2.187	3.271
M2/Reserve	9.184	18.648*	11.476	3.952	7.906
GDP Growth	2.054	5.873	6.823	10.464	7.116
RER	0.317	0.325	0.336	0.055	0.024
Bank Lending	5.047	19.107*	30.033*	10.419	7.220
MM Rate	0.009	0.045	0.039	0.132	0.392
Current Account	0.196	0.318	1.739	2.449	1.643
Budget Deficit	4.740	1.704	5.410	4.465	2.325

Note: GDP and current account are converted into monthly data with linear approximation.
* denotes significant at 1 percent level.

Table 2. Changes of the Rate of the Ruble

		1991	1992	1993	1994	1995	1996	1997
1.	Exchange Rate	58	222	933	2201	4563	5122	5785
2.	PPP	1.5	21	180.0	725.0	2311	3075	3337
3.	2/1 (percent)	2.6	9.5	19.3	32.9	50.6	60.0	57.7

Source: Shiobara (1999).

Moreover, if a monetary authority provides enormous amounts of domestic credit to bail banks out, this can break the balance between money supply and demand, leading to a depreciation fo the exchange rate. As Sachs, Tornell and Velasco (1996) suggested, most of the countries whose economies collapsed experienced such a situation.

The effect of bank lending is significant in the eight-month pre-crisis period, but not in the six-month period immediately before the Russian crisis. However, due to the weak development of the financial sector, it was difficult to predict the crisis using banking sector variables. Privatization, in particular, caused distortions in the financial sector. In the Asian crisis, banking crises led to currency crises while in the Russian case, the currency crisis led to the banking crisis. To be more precise, the banking crisis occurred as a result of increases in external debt following the depreciation of the ruble, but the banking crisis did not itself lead to capital flight from the country at the time of the crisis. Therefore, it is difficult to explain the crisis using the banking sector indicators.

4.5 Current Account

When the monetary authority seeks to stabilize the exchange rate in a period of current account deficits, the balance of payments have to be adjusted by a depreciation of the parity unless the authority intervenes in the market using its foreign reserves. Thus, the current account deficit is generally regarded as an important indicator of currency crisis because it affects either the foreign reserves of the monetary authority or the exchange rate.

In the case of Russia, the current account was not deteriorating in the long run; rather there was a slight surplus. Gavrilenkov (1999) suggests that the depreciation adjusted the deficit. If this is true, variance in the current account during the pre-crisis period should have been different from that during the tranquil period. As shown in Table 1, however, it was not significant over time. In the Asian crisis, the affected countries had current account deficits, though recent empirical papers conclude that current accounts do not significantly affect crises.[6] Therefore, this seems that it did not play an important role in Russia's crisis. At the same time, the budget deficit's effect is not significant over time, as shown in Table 1. Looking at it over the long term, it also failed to provide a sign of the oncoming crisis.

4.6 Unanticipated Crisis

It is important to note that the most volatile period was the period following the Asian crisis. As the Asian crisis started to affect the Russian economy, its foreign reserves decreased dramatically. However, statistically speaking, the Russian economy seems to have recovered or stabilized, showing no signs of further deterioration.

Table 3 shows the credit ratings of Russian debt during the pre-crisis and post-crisis period. The ratings in the two months after the crisis were default grade. Moody's, Fitch IBCA and S&P downgraded the ratings on August 13, 14, and 17 respectively.[7] The joint statement which triggered the crisis was declared on August 17, and therefore the ratings

Table 3. Credit Ratings

	June 1998	Oct. 1998
Moody's	B1	B3
S&P	B +	CCC-
Fitch IBCA	BB	CCC

Source: IMF, *World Economic Outlook*, 1998.

were not changed until the start of the crisis.[8] This implies that the rating companies were not able to predict the crisis either, and the speculative attack was more severe than expected. One famous investor, who had insisted on a devaluation of the ruble a few months before, also suffered large capital losses.

However, it is hard to conclude that the Russian crisis was not caused by bad fundamentals. The economy was in multiple equilibria, and thus was vulnerable to speculative pressures. Gavrilenkov (1999) suggests that "financial crisis in South-Eastern Asia and fall in the energy prices could only speed up the collapse of stabilization in Russia." Yet, the evidence shows that speculators were unable to pinpoint the timing of the crisis because the deterioration of the fundamentals was not only steady but also moderate. Proposition 2 of the last section is consistent with such a situation.

The Russian crisis occurred in a period when the fall of oil prices had not yet significantly affected the GDP and other signals. This implies that there were other shocks, as investigated above. As Masson (1999) points out, a country where multiple equilibria exists can be affected by a shock occurring elsewhere.[9] What shock occurred in the recent crises? In the next section, we shall show that the parallel movement of asset prices in emerging markets led to the contagion from Asia to Russia and Latin America.

5. Contagion through Asset Markets

In Russia, ruble-denominated discount instruments (GKOs) and ruble-denominated coupon bonds (OFZs) began to be issued from 1995 in order to finance a large budget deficit. In 1996–97, furthermore, deregulation of the financial market began, and the government gave permission to nonresidents to purchase short-term bonds in January 1996. Table 4 shows the short-term debt to foreign reserve ratio. In countries where this ratio is greater than 1, the vulnerability to capital outflow is high. Therefore, the short-term debt to foreign reserve ratio is often used as an index of international liquidity. In particular, the ratio in Russia was larger than that of other countries, so it is possible that short-term capital was being repatriated. Actually, at the beginning of 1998, market analysts suggested that

Table 4. Short-term Debt and Foreign Reserves

country	Short-Term Debt/Reserves	
	June 1997	June 1998
Russia	1.878	3.105
Argentina	1.210	1.518
Brazil	0.792	0.761
Chile	0.447	0.664
Colombia	0.674	0.784
Mexico	1.187	0.920
Peru	0.503	0.799
Indonesia	1.704	1.541
Korea	2.073	0.812
Malaysia	0.612	0.568
Philippines	0.848	1.127
Taiwan	0.244	0.223
Thailand	1.453	1.077

Source: Radalet and Sachs (1999).

about 70 billion dollars in short-term sovereign bonds had been issued and that nonresidents held about 30 percent. Institutional investors from the United States and Korea seemed to lead broad attacks against the bond markets.

However, the fall of bond and stock prices was due not only to doubts about Russia's fundamentals but also to the contagion effect from Asian countries. In May 1998, the Indonesian political situation and economy worsened and an atmosphere of crisis grew in emerging markets. It led to contagion to Russia, whose asset prices were strongly correlated to those in Asia.

Table 5 shows the correlation coefficients between stock prices in Russia, Asia, and Latin American countries. Russian stock prices are strongly correlated both with those in Asia and Latin America. In particular, the correlation with Indonesia is so close that co-movements of stock prices could have caused contagion effect. It is possible to argue that the Russian crisis followed the Indonesian turbulence. Although the correlation of values in Asia against Argentina, Brazil, and Chile are also high, it is more natural to interpret that the Latin American countries were affected rather by Russia, since Indonesia played an important role in the contagion. In the contagion effect which started from Asia, the fall of asset prices spread through the economies where there were multiple equilibria, and the crises started.

Comparing Tables 4 and 5 clarifies the relation between multiple equilibria and contagion effect. Table 4 shows that the Asian countries suffered more seriously from speculative attacks than some Latin American countries did. Brazil's crisis occurred because the correlation with Russia, as shown in Table 5, was high. The international liquidity ratio of Brazil, as shown in Table 4, was not higher than 1 but relatively higher than the other countries, and some studies suggest that it worsened.[10] On the other hand, Chile, whose correlation coefficient was also high, did not collapse as it had sufficient international liquidity. Therefore, international illiquidity leads to a country having multiple equilibria, and then a change in self-fulfilling expectations can be caused by a co-movement of asset prices.

In sum, Table 4 and 5 present the following facts about the crises in 1997–98. Initially, the Thai crisis spread to other Asian countries which were in international illiquidity and had a relationship to Thai asset markets. The contagion effect reached Russia, as their asset prices were related to those of Indonesia. As asset prices in Latin American countries were

Table 5. Correlation of Stock Prices

	Russ	Arge	Braz	Chil	Colo	Mexi	Peru	Indo	Kore	Mala	Phil	Taiw	Thai
Russia	1.00												
Argentina	0.56	1.00											
Brazil	0.68	0.59	1.00										
Chile	0.72	0.61	0.64	1.00									
Colombia	0.51	0.07	0.26	0.34	1.00								
Mexico	0.50	0.73	0.59	0.46	0.00	1.00							
Peru	0.62	0.47	0.65	0.68	0.34	0.53	1.00						
Indonesia	0.61	0.39	0.40	0.57	0.17	0.25	0.29	1.00					
Korea	0.10	0.16	0.13	0.21	0.09	0.09	0.14	0.35	1.00				
Malaysia	0.28	0.36	0.27	0.45	0.01	0.27	0.17	0.49	0.23	1.00			
Philippines	0.51	0.47	0.34	0.50	0.00	0.36	0.28	0.69	0.30	0.69	1.00		
Taiwan	0.52	0.46	0.31	0.43	0.08	0.27	0.15	0.33	0.18	0.52	0.46	1.00	
Thailand	0.26	0.41	0.28	0.38	−0.15	0.28	0.10	0.56	0.56	0.69	0.74	0.47	1.00

Source: IFC, *Emerging Stock Market Factbook*, 1999.
Note: Correlation coefficients are estimated from December 1993 to December 1998.

affected by the Russian crisis, those without sufficient liquidity began to fall into crisis. Although these crises were due to the deterioration of other fundamentals, the important factors were both international liquidity and the correlation of asset prices.

In Russia, the deregulation of stock and short-term bond markets to nonresidents started in 1995. The purpose was to allow the government to pursue its exchange rate regime without any contagion, as happened during the 1994 Mexico crisis, "tequila effect." However, the ensuing liberalization of capital movements caused the opposite reaction, and made the Russian economy vulnerable to crisis. The continuing deterioration of the budget deficit led the government to look toward overseas financing. In fact, after the deregulation, the government mostly relied on sovereign bonds to finance its deficits. Thereafter, there was no capital control on nonresidents until the joint statement of August 1998. It was therefore asset markets that led to the contagion effect as well as to the multiple equilibria. The liberalization of international capital movements was premature given the existence of bad fundamentals and insufficient foreign reserves.

6. Conclusion

The contagion from Asia to Russia was due to a correlation of asset prices rather than to a trade spillover or one of international bank lending. Emerging market bonds are often used as an opportunity to distribute portfolio risks, to investors in industrial countries. Therefore, if the asset prices of a country fall, other countries' assets whose price moves in parallel are sold in order to avoid capital losses.

In Russia, the continuing deterioration of fundamentals caused the emergence of multiple equilibria and increased the economy's sensitivity to the asset prices of other emerging markets. The Asian crisis affected the Russian economy through asset markets, and this effect spread further to Latin American countries. This implies that it was a contagion effect through asset markets that played the critical role in these emerging market crises. Asset price correlations between countries in multiple equilibria allow a crisis in one country to jump to another.

The most remarkable feature of the Russian crisis is that it occurred due to several factors demonstrated by currency crises: a deterioration of fundamentals; multiple equilibria and self-fulfilling expectations; herding behavior; financial liberalization; and asset market contagion. In particular, the fact that the movement of asset prices causes contagion between countries in multiple equilibria may deepen the analysis of currency crises.

There are two policy implications of this. First, a continuous deterioration of fundamentals, and especially of international liquidity, makes it difficult for a government to peg the exchange rate. Although in the 1990's the theory of self-fulfilling currency crises attracted public attention, there are still many crises that fit the first generation model. In particular in Russia, the first generation model could have predicted some factors of the crisis. On the other hand, asymmetric information can lead to multiple equilibria, in which nobody knows when a bad equilibrium may occur even if the economy is in a good equilibrium. Therefore, it is important to keep the international liquidity ratio low in order to avoid a self-fulfilling crisis.

Second, the deregulation of capital movements to nonresidents should be done prudently. In Russia, the rapid sale of short-term sovereign bonds and stocks by nonresidents triggered the crisis. Moreover, as asset prices tend to move in a parallel way between

emerging markets, an asset deflation in one country can cause one in other countries. It is not until there are good fundamentals and sufficient foreign reserves that a government is able to deregulate its capital controls. Therefore, it may be necessary for emerging markets to control capital inflows when necessary.

Notes

1   For more detail, see Kharas, Pinto and Ulatov (2001).
2   See Krugman (1979) and Flood and Garber (1984).
3   See Obstfeld (1994).
4   See Krugman (1979).
5   A Target zone was introduced in July 1995 and a crawling peg in July 1996. This implies that the economy was comparably stable in this period.
6   See Frankel and Rose (1996).
7   S&P's rating for long-term debt was lowered on August 17, but the rating for short-term debt was not made, though the price fell after that.
8   This has shed light on the discussion that news such as credit ratings causes crises. See Baig and Goldfajn (1998) and Kaminsky and Schmukler (1999) for the effects of news on the Asian crisis. See also Calvo (1998 and 1999) and Calvo and Mendoza (2000).
9   Masson (1999) defines it as "jumps between multiple equilibria."
10   See Radalet and Sachs (1999).

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