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**Currency Crises
in Emerging Markets
– Selected Comparative
Studies**

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Introduction

Marek Dąbrowski

This volume presents seven comparative studies of currency crises, which happened in the decade of 1990s in Latin America, South East Asia and in transition countries of Eastern Europe and the former USSR. All the studies were prepared under the research project no. OI44/H02/99/17 on "Analysis of Currency Crises in Countries of Asia, Latin America and Central and Eastern Europe: Lessons for Poland and Other Transition Countries", carried out by CASE and financed by the Committee for Scientific Research (KBN) in the years 1999–2001. They will be subjects of public presentation and discussion during the seminar in Warsaw organized by CASE on June 28, 2001, under the same research project. This is a continuation of two other issues of CASE Reports containing eleven countries' monographs related to currency crises episodes in these three regions and a couple of other comparative studies published in the CASE Studies and Analyzes series.

Three first studies in this volume deal with broad issue of current account, exchange rate and international reserves of a central bank.

Marcin Sasin discusses the importance of the real exchange rate overvaluation and the current account deficit, which are usually considered as the main causes of currency crises. While generally confirming the importance of the first factor, author shows that question of sustainability of current account deficit has a very individual country characteristic.

The next analysis of Małgorzata Jakubiak concerns the choice of exchange rate regimes from the point of view of both avoiding and efficient managing currency crises. Author compares advantages and disadvantages of the fixed versus floating exchange rate regimes from the point of view of credibility of monetary policies, preventing currency crisis and coping with its consequences. She demonstrates, basing on an empirical analysis, that the most costly are changes of exchange rate regimes (usually abandoning the peg) under the pressure of speculative attack.

Mateusz Szczurek provides the additional insight to this discussion estimating the size of optimal international liquidity taking into consideration potential costs of the crisis, on the one hand, and costs of maintaining the international reserves, on the other.

The next study concerns interrelations between banking and currency crises basing on extensive review of an economic literature. Marcin Sasin analyzes the institutional and structural sources of instability of the banking sector in emerging markets. One of them is the direct and indirect vulnerability of banks in relation to sudden interest rate and exchange rate changes. On the other hand, collapse of the some big banks must lead to credibility crisis of a domestic currency.

Lukasz Rawdanowicz addresses another hot issue in the economic debates of the last decade, i.e. contagion effect of a crisis in one country on the macroeconomic stability of its close and more distant neighbors. He analyzes the impact of the Russian 1998 crisis on the situation of CIS countries taking into consideration both trade and financial channels.

Monika Błaszczewicz and Wojciech Paczyński try to assess the economic and social consequences of currency crises in the last decade. The main question discussed by them is to what extent crisis plays a role of self-correcting mechanism of previously unsustainable policies.

Finally, Rafał Antczak, Małgorzata Markiewicz and Artur Radziwiłł analyze the role of the IMF in preventing the currency crises in five selected CIS countries – Russia, Ukraine, Moldova, Georgia and Kyrgyzstan, identifying the main sources of Fund's failures.

Warsaw, June 13, 2001

Part I.

The Importance of the Real Exchange Rate Overvaluation and the Current Account Deficit in the Emergence of Financial Crises

by Marcin Sasin

1.1. Introduction

This paper investigates the links between real exchange rate overvaluation, current account deficit and currency crises. Particularly an attempt is made to answer the question whether and to what extent overvaluation and current account deficit is a cause of crises and how useful it is in crisis prediction.

Overvaluation and current account deficit are, of course, interrelated variables. As for real exchange rate misalignment there is little disagreement that, indeed, it is a warning signal against possible distress – the empirical regularities are presented along with a theory brief. The evidence on the current account is much more complicated. Not only there are various theories on how the current account balance behaves and how sustainable it is but also the empirical research produces contradictory results on the role of current account deficits as crisis cause or its early indicator. For this reason the current account issue obtains more extensive treatment.

1.2. Overvaluation

1.2.1. Theory

Law of one price states that, abstracting from transportation costs etc., prices of identical goods when converted from one currency to another should be the same. Otherwise an arbitrage would take place, the currency demand/supply condition would change and finally equality restored through a change in the exchange rate to its equilibrium value.

$$s + p_i^* = p_i \quad (1.1)$$

where p_i is a (log) price of a good i , $*$ indicates foreign variable and s is a (log) nominal exchange rate. Because prices for all goods are not observed (recorded) one can only use aggregate price levels.

$$s + p^* = p \quad (1.2)$$

which brings the notion of purchasing power parity (PPP) and real exchange rate

$$q = s - p + p^* + k \quad (1.3)$$

where q is a (log) real exchange rate and k is a constant. Because consumption bundles are not identical and prices of goods of which they consist can relatively change and because aggregate price levels are only index numbers (not real, direct prices), the "base year problem" arises – the above expression holds only up to a constant k . In other words, one have to explicitly state in what point of time the real exchange rate is in equilibrium, set q to zero and respectively calibrate the constant.

Another problem is that there are various price indexes out of which popular are: consumer price index (CPI), producer price index (PPP), wholesale price index (WPI), export unit value (EUV). They, of course imply different values for the real exchange rate. Composition of the same indexes vary over countries making them imperfect measures of overall price level and at the same time distorting the meaning of the real exchange rate index.

It is well known that PPP doesn't hold continuously, it probably even doesn't hold for quite long periods. Therefore a key question is whether there is any average value of (such computed) real exchange rate, or put differently whether it is mean reverting (stationary). If yes, then if the rate is overvalued it will certainly depreciate in the future (sometimes through a currency crisis), if not (if the RER is nonstationary) than its level tells nothing about its future development. The standard framework to test the stationarity of time series is Augmented Dickey-Fuller test.

$$\Delta q_t = \alpha_0 + \varphi q_{t-1} + \sum_{i=1}^k \alpha_i \Delta q_{t-i} + \varepsilon_t \quad (1.4)$$

where α , φ are parameters and ε is a disturbance term and Δ is a backward difference operator. This test has, however, very low power against local alternatives, this is the reason why it is very hard to detect mean reversion (or reject

nonstationarity) in the RER [1]. Soehow better alternative is to use Johansen's approach and test for cointegration between s , p and p^* .

On the other hand, the CPI-based RER can indeed be nonstationary. Since there is a considerable share of non-tradable goods in the consumer's basket and since the PPP applies only to tradable goods it can happen that if there is a different rate of productivity improvement in tradable goods sectors between countries [2] the so-called Balassa-Samuelson effect arises. This effect refers to an apparent overvaluation of the CPI-based exchange rate: the price of non-tradable goods must increase to assure equal wages across sectors, this implies a (relative) rise in CPI in the country where the productivity gains are higher. Since competitiveness is not affected the (nominal) exchange rate remains unchanged; hence CPI-based RER becomes overvalued. This effect introduces a nonstationary trend in the CPI-based RER, which means, that the RER would never (systematically) come back to its historical average and the appreciation can continue indefinitely. In this case the level (overvaluation) of the RER would be almost meaningless, and (theoretically) should not contain any (or not enough) information for currency crisis prediction. Actually the case is made, that the Balassa-Samuelson effect is present in most emerging economies. Consequently, as evidence show, it is indeed harder to prove CPI-based RER mean reversion. The evidence of PPI- and WPI-RER nonstationarity is more ample.

Another way of determining the real exchange rate is to derive it from the theoretical model of exchange rate (a monetary model). For example we can start from the money demand function

$$m-p = \phi y - \lambda i \quad (1.5)$$

where ϕ , λ are parameters and m is money demand, y is output, i is nominal interest rate. Together with purchasing power parity (2) we obtain

$$s_t = (m_t - m_t^*) - \phi (y_t - y_t^*) + \lambda (i_t - i_t^*) \quad (1.6)$$

where m is money supply. In this model, by construction, the real exchange rate is always in equilibrium. It is reasonable to introduce rigidities in the goods market. When in response to the shock prices adjust slowly the exchange rate behaves the following way

$$E_t(s_{t+1}) - s_t = -\theta (s_t - \hat{s}_t) + E_t(\pi_{t+1} - \pi_{t+1}^*) \quad (1.7)$$

which implies regressive expectations [3]; E_t is an expectation operator basing on the knowledge available at time t ; the last term on the right represents structural differences in inflation rates. After some algebra model yields a Dornbusch-type equation (a Frankel model)

$$s_t = (m_t - m_t^*) - \phi (y_t - y_t^*) + (\lambda + \frac{1}{\theta}) E_t(\pi_t - \pi_t^*) - \frac{1}{\theta} (r_t - r_t^*) \quad (1.8)$$

where r is real interest rate. Now, in response to the shocks the nominal exchange rate overshoots its equilibrium value, hence the RER becomes over- (under-) valued.

Until 1983, i.e. before tremendously influential paper of Meese and Rogoff (1983), monetary models were believed to be valid [4]. After that, the research on exchange rate has been paralyzed and only resumed since MacDonald and Taylor (1994) and Mark (1995) who has shown, using new econometric tools, that monetary factors affect exchange rates and that these models hold in the long-run. It meant that the exchange rate actually comes back to its model-predicted equilibrium value.

1.2.2. How to Calculate a Real Exchange Rate

When the mean reversion of the RER is established it makes sense to estimate the over- (under-) valuation of the exchange rate. This is generally done in two ways:

The first approach (fundamental equilibrium exchange rate or FEER approach) is based on the assumption that equilibrium RER implies balanced current account. It explores the general identity

$$\text{current account} = \text{savings} - \text{investment} = \text{change in debt} = \text{capital account}$$

In the beginning the long run sustainable level of domestic savings and investment is estimated, then the normal capital flows (at long run equilibrium interest rate differential, growth rate of the economy, etc.) are determined. If the two sides are very different it means that the real exchange rate is not in balance [5]. Afterwards, the equilibrium value that would equate the two sides is assessed basing on estimated coefficients of exchange rate elasticities of various macroeconomic variables. Subtracting prevailing exchange rate from the equilibrium one gives the RER overvaluation.

[1] The above reasoning should as well incorporate trend-reversion, which is even harder to detect than mean reversion.

[2] The growth in productivity in non-tradable sector (usually services) is assumed to be the same across countries (e.g. zero).

[3] With rational expectations derivation would be somehow more complicated but yield the same results.

[4] Meese and Rogoff established that a simple random walk model performed better than monetary models in predicting exchange rate movements.

[5] It can also mean that the current government policy is unsustainable. The procedure is explained in more detail in section 1.3.3.1.

Table I-1. The percentage overvaluation of currencies, as given by various studies.

Asia in 1997	MA	PH	TH	IN	KO	SI	Latin America	MX	BR	AR	CH	CO	PE	VE	
Chinn (PPI) '97	8	19	7	-5	-9	-6	1994	STV	29						
Chinn(WPI) '97	17	24	13	30	-2	12		G-S	16						
Monetary '97	2	-25	2	2	-12	35		Dornbusch	30						
G-S '97	mo	mo	mo	mo	mo	mo	2000	G-S	22	-11	7	5	-4	-2	44
Corsetti et.al.'97	12	16	7.6	5.4	-13	18		JPM	3	1	13	-8	0	-5	9
Sachs 1990-97	10	30	10	20	-	10		DB	-2	5	17	0	10	5	-

mo- "moderately overvalued"; STV-Sachs, Tornell, Velasco (1995); G-S - Goldman and Sachs, G-S (2000); Chinn (1998), Monetary - Chinn (1998), monetary model; JPM - JP Morgan; DB - Deutsche Bank; Dornbusch (2001), Corsetti et.al. (1998), Sachs (1997)

The second approach uses the econometric and statistical tools and rather abstracts from detailed country-specific knowledge. The easiest way is to explicitly use the notion of purchasing power parity. One selects the price index (CPI, WPI, PPI) and a period of time, and then decides that the average of index-based RER over the chosen period constitutes an equilibrium rate. Subtracting that average from the current index-based RER gives the RER overvaluation. Other popular method – the behavioral equilibrium exchange rate or BEER approach – is slightly more demanding and requires empirical estimation of the real exchange rate determinants what is usually done through one-equation regression. Basing on the common knowledge and various models relevant theoretical fundamentals are selected (these usually include the terms of trade, degree of openness, government expenditures, etc.) and included in the regression. Afterwards the fundamentals are decomposed into permanent and temporary components – the permanent components are included in the estimated real exchange rate equation and equilibrium (fitted) rate is inferred. Even more sophisticated method requires an underlying model of the exchange rate – it is usually a monetary model, like given by equation (1.6). First there is a need to estimate parameters ϕ and λ what is done using historical data. Then the parameters together with domestic and foreign values for money supply, output, interest rate and price levels are substituted to the model. If we are (however unjustified) satisfied with a flexible model (6) the subtraction of the result of (6) from a current exchange rate gives the overvaluation measure. If we prefer the (more realistic) sticky price model (7)-(8) by subtracting the result of predicted exchange rate (8) from the current one, again, we obtain RER overvaluation [6].

In practice the values obtained for RER are obviously not precise. This happens primarily because of: different method used, different composition of price indexes and measurement errors. For example, Table I-1 presents an answer to the question whether the currencies of a country in question were overvalued (before a crisis if applicable), given by various authors and produced with various methods.

Although implications are quantitatively different, qualitatively they are similar. So, there is a point in estimating the overvaluation, especially in light of a finding, that in general the overvaluation helps predicting currency crises – as explained in the next section.

1.2.3. Overvaluation and Currency Crises, an Empirical Evidence

To fully understand the implications of the real exchange rate overvaluation one has to analyze its sources. Generally speaking, the overvaluation can arise as a consequence of:

- changes in the external environment: e.g. a change in the terms of trade or a depreciation (devaluation) of major trade partners' currencies. If these changes are temporary the overvaluation is usually sustainable, if not (as in the case of other currencies devaluation) they are the reason for an adjustment;

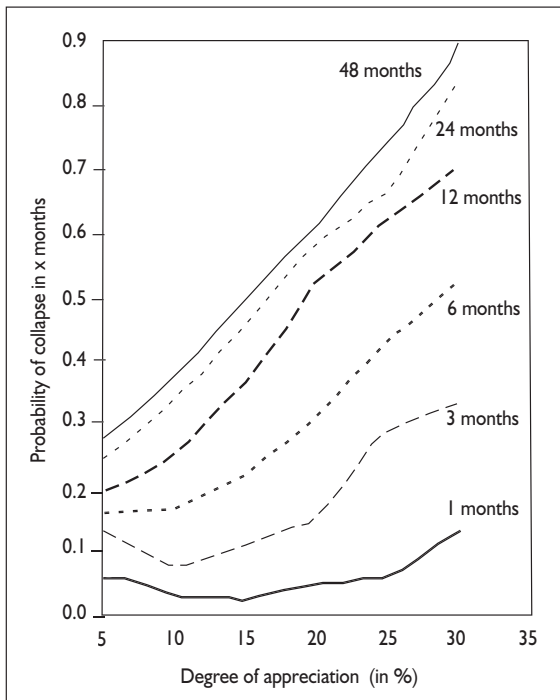
- a change in domestic situation (e.g. supply-side shocks), particularly and most interestingly macroeconomic policy related causes. An exchange-rate-based disinflation program, when economic agents fail to believe the authorities about their targeted inflation and refuse to abandon their (old) inflation expectations is one example. In such cases inflation continues while the exchange rate is fixed what results in real exchange rate overvaluation – a signal, that the policy might have become unsustainable;

- financially related causes, most notably (excessive) foreign capital inflows which put an upward pressure on the exchange rate.

The overvaluation can be undone basically by the exactly opposite processes to the above-mentioned. However, in practice, it seems more difficult to arrange a smooth real depreciation (restore the equilibrium) than to allow the real appreciation. This issue is tackled, for example, in Goldfajn and Valdes (1996). They assume that, after controlling for other macroeconomic fundamentals, the real exchange rate overvaluation can be undone in two ways: by cumulative inflation differentials and by devaluation (among which a currency crisis). Afterwards they calculate the probability

[6] On top of an (justified and sustainable) "overvaluation" (overshooting) predicted by the model itself.

Figure I-1.



Source: Goldfajn, Valdes (1996).

that the overvaluation would end smoothly without a sharp devaluation (crisis) for a large set of countries over the period 1960–1994. They find that the probability of reverting the prolonged (over six month) overvaluation successfully is 32% for an appreciation not exceeding 15%. For 20% the misalignment the probability drops to 24%, for 25% it stands at 10%, for 30% overvaluation it is only 3%, while there is no undisturbed return from overvaluation more than 35%. Goldfajn and Valdes also estimate the timing of a currency collapse. Figure I-1 presents their results – for various levels of initial overvaluation it depicts the probability that a devaluation (a crisis) would come within a given period of time.

There is ample evidence that the real overvaluation can explain currency crises. The simplest reasoning is: if the exchange rate is up it must come down (with or without government approval) – just because it is mean reverting. It has also its indirect impact – first, if it stays high for a long time this means that the authorities do not (want to) take appropriate measures to bring it down, so, most probably their policy is unsustainable. Second it has a negative impact on the current account and if the deficit prolongs this introduces nervousness among investors about the prospects of

debt repayment – they might cut off their credit to the country forcing it to depreciate.

It may sound tautological but since the overvaluation is a leading indicator of devaluation, it should be also a predictor of a sharp devaluation, i.e. a currency crisis. Indeed, the economic research provides strong support for that view. Table I-2 presents the summary of various attempts to predict currency crises – these papers usually included real exchange rate overvaluation as one of explaining variables. In the second column the t-statistics for the null hypothesis that the overvaluation is irrelevant in crisis prediction is presented [7]. Whenever author tests more than one specification additional t-statistics are presented. The result presented in the table indicate strong support for the hypothesis that real overvaluation is linked to currency crises.

In my study the real exchange rate turned out to be the most powerful crisis indicator. This result holds true even when the model specification is changed. Both methods I use – i.e. a normal probability binary choice method (probit) and a panel fixed effect linear regression – produce similar, significant results with respect to that variable.

The advocates of the opposite view have only few arguments. The most often raised is the (above-mentioned) Balassa-Samuelson effect. According to it, real overvaluation (as revealed by price index) shouldn't matter in emerging economies because it does not impair competitiveness (tradable goods sector productivity rise is higher).

The results I obtained confirm that view to some extent. I established that the significance of the real exchange rate to currency crisis prediction is much lower for the emerging economies which would indicate that this effect is present and the exchange rate is usually only apparently overvalued while the external situation is actually sustainable. On the other hand, as Dornbusch (2001) argues, the Balassa-Samuelson model is often used to justify the sustainability of overvaluation in the presence of large current account deficits, while, according to this model the apparent overvaluation shouldn't cause an external deficit.

Some researchers, skeptical about the econometric methodology prefer to use "before-after analysis" which is usually done in graphs and depicts the stylized facts associated with currency crises. Aziz, Caramazza and Salgado (2000) provide a recent example. They categorize crises into subgroups: crises in industrial countries, in emerging economies, crises characterized by currency crashes [8], by reserve losses, "severe" crises, "mild" crises, crises accompanied by banking sector problems, crises with fast and slow recoveries. Afterward, they analyze how the given variable (real exchange rate) behaves on average in the neighborhood of an average crisis.

[7] Values over 1.9 indicate that, in about 95% confidence, the real overvaluation has an impact on the emergence of currency crises. For around 1.6 the confidence level is 10%.

[8] Crises in which currency depreciation accounts of more than 75% of a crisis index.

Table 1-2. The evidence on the significance of real exchange rate overvaluation in predicting currency crises

Study	Results (t-statistics)	Notice
Edwards (2001)	1) 0.03 2) 1.05 3) 0.59 4) 0.12	four definitions of crisis overvaluation as deviations from PPP
Milesi-Ferretti and Razin (1998)	1) 4.75 2) 4.9 3) 3.8 4) 3.04 5) 3.25 6) 3.75 7) 6 8) 5.6 9) 6 10) 2.8	different samples 1-4) during current account reversals 5-10) prediction of overall crash
Ahluvalia (2000)	1) 2.7 2) 3 3) 1.46 4) 2.48	two samples two different set of contagion controls
Caramazza et.al. (2000)	1) 2.17 2) 1.70 3) .62 4) 1.07	different specification of crisis index
Bussiere and Mulder (1999)	1) 1.9	early Warning System with 5 regressors
Frankel and Rose (1996)	1) 1.51 2) 2.53	1) default 2) predictive power
Berg and Pattillo (1999)	1) 15.9 2) 13.5 3) 3.35	1) "indicator model" 2) linear model 3) "piecewise linear model"
Goldfajn and Valdes (1996)	1) 1.69 2) 1.53 3) 2.63 4) 1.51	different models and nominal vs. real devaluation
Kaminsky, Lizondo, Reinhard, (1998)	not t-statistics, but "noise to signal ratio" 1) 0.19 (the best result)	univariate "signal" analysis, "noise to signal ratio"; 0-perfect prediction, 0.5-no information, >0,5 worse than unconditional guess
Sasin (2001)	1) 4.7 2) 5.4 3) 1.6 4) 2.8 5) 4.1 6) 2.6	-1,3,5) fixed effect linear model; 2,4,6) probit; 1,2) full sample; 3,4) emerging markets; 5,6) developed economies -Actually Sasin checks around 10,000 specifications and concludes that an average significance for RER is 4 with standard deviation of about 2.

1.2.4. Trade-link Contagion: Competitive Devaluations

This section explores interrelation between real exchange rate, current account balance and one specific issue that connects them to currency crises, i.e. trade-link-induced contagion.

When other currencies depreciate (devalue), while the domestic currency remains unchanged it actually undergoes overvaluation. The impact of these devaluations on the given country is the stronger, the stronger are links with devaluing countries. Particularly trade links seem to play the major role. If the country belongs to the same trade block as countries with depreciated currencies, or if they compete on third countries' markets for an export share, the devaluation of its partners may be a signal that the country might have to arrange a devaluation as well. Unless its partner's (real) devaluation is not undone by inflationary consequences in sufficiently short time the country's competitiveness would be impaired and external situation become unsustainable. Investors understand it and launch a speculative attack on the given currency in anticipation of its devaluation. As a result the authorities are immediately forced to devalue. After one country has devalued speculators attack another, the most closely linked to the former one. This results in the chain of competitive devaluation. Above-

described pattern is the essence of so-called trade-link contagion.

Economists differ on the issue whether trade links are important in the spread of crises. On one hand, theoretical models allow for it, for example Gerlach and Smets (1994) build a model, which they then calibrate to fit the case of Scandinavian countries. They show in simulation that the devaluation of Sweden forces Finland in a short time to devalue as well. The competitive devaluation phenomenon was used as one explanation of recurrent devaluations within European Monetary System in the period 1992–1994.

The empirical evidence is, however, mixed but to the advantage of the trade-link contagion. Eichengreen, Rose and Wyplosz (1996a) is one of the first papers to deal with the issue – the authors find strong support for the view that trade links play an important role in the spread of crises. Similarly Glick and Rose (1999), using different methodology, try to explain why currency crises tend to be regional – they find that the trade link is the most (or even the only) important factor that can explain the coincidence of crises in regional blocks. The phenomenon that during (recent) crises stock market indexes tended to move together could be given as a proof of contagion. This fact is explored by Forbes (2000) – she finds that, although trade connections do not fully explain stock market returns during crises they

are undoubtedly economically and statistically important. What is worth to notice is the fact that in the above-mentioned analyses other macroeconomic variables are more or less insignificant with respect to contagion. Sasin (2000), in turn, constructs an index of vulnerability to trade-link contagion and proves that this index is highly significant in crisis prediction.

On the other hand, Masson (1998) argues that trade (which he categorizes as a "spillover") cannot explain the coincidence of speculative attacks on Latin America's and Asian currencies during, respectively, Mexican peso and Thai baht crises. Baig and Goldfajn (1998) also reject the importance of trade links in the spread of crises.

Finally several authors [e.g. Caramazza et. al., 2000] take an intermediate attitude and claim that trade effects are actually important but are usually overshadowed by other (notably financial) factors. Apart from the evidence obtained from econometric estimations, the pattern of competitive devaluation is very appealing. This point of view, especially when financial investors subscribe to it, can, of course, become a self-fulfilling prophecy

1.3. Current Account

1.3.1. Evolution of the Point of View on the Current Account

It is interesting to notice that over past decades there have been important changes in the way the economist view the current account – a throughout survey is included in Edwards (2001), on which this section draws. It can be said that with respect to policy implications and/or currency crises this evolution came from "current account deficit matters" through "current account deficit is irrelevant as long as the public sector is balanced" and, again, "deficit matters" finally to "deficit may matter".

1.3.1.1. The Early Views: the Trade/Elasticity Approach

The 1950s up to mid-1970s discussion on country's external position was dominated by the "elasticity approach" and stressed issues like trade flows or terms of trade. During this period most developing countries used to run large and persistent current account deficits – the usual remedies to counteract the problem were recurrent devaluations. Economists, convinced that the external position should be balanced, focused on issue whether devaluations brought an improvement to the situation – the improvement, in turn, depended on export and import price (exchange rate) elasticities. These studies resulted in a so called "elasticities pessimism" – the inferred elasticities were small meaning that

the country had to arrange a large exchange rate adjustment to improve its external position. Nevertheless, after examining 21 major devaluations during 1958–1969 Cooper (1971) argued that on average devaluation succeeded in bringing the current account back to balance. On the other hand, other authors claimed that since developing countries exported mainly commodities and since there was no prospect for a surge in demand for such goods in the world market – the devaluations were ineffective and brought about only recession and income contraction. The answer was not to devalue (one time after another) but to encourage industrialization through import substitution policies. The view – advocated, among others, by prominent UN officials – turned out to be totally wrong.

1.3.1.2. Intertemporal Approach: the Irrelevance of the Current Account Deficit and the Lawson Doctrine

During the second part of the 1970s the world experienced an oil shock and, partially because of that, most countries' current account worsened dramatically – between 1973 and 1979 the aggregate developed countries' external position moved from an US\$11 bln surplus to an US\$28 billion deficit (reflected, of course, in enormous OPEC countries' surplus). These developments forced economists to take a closer look on the determinants of a current account and its further sustainability. The most important progress was dropping the trade-flow/elasticity approach and focusing on intertemporal dimension of the current account. The fact that from the national accounting perspective the current account is just equal to national savings minus investment was rediscovered. On the other hand, both savings and investment decisions are based on intertemporal factors – such as permanent income, expected return on investment project, etc. – so, as a consequence, the current account is an intertemporal phenomenon. The (policy) implication was that as long as (large) current account deficit reflected new investment perspectives but not falling saving rates there was no reason to be concerned about it. The deficit meant only, that economic agents, expecting future prosperity brought by new investment opportunities, were only smoothing their consumption paths – the consumption was moved from the future to the present and financed by foreign sector (i.e. by debt accumulation), which would be repaid later, when growth prospects materialize. The influential paper by Sachs (1981) insisted on this view.

In the beginning of 1980s, the intertemporal approach also gave answers to concerns about mounting debt problem. Sachs (1981) claimed that because this debt reflected increase in investment in the presence of rising (or stable) saving rates it should not pose a problem of repayment. In addition, the new approach made a distinction between the deficits that result from fiscal imbalances and those reflecting private sector decisions. The public sector was thought to act rather on political than on economic and rational

grounds, so the current account deficit induced by the budget deficit was "bad", while private sector's decisions were assumed rational and the current account deficit responding to them was optimal, i.e. "good" – in the future the private sector would be able to make necessary corrective actions (while public sector most probably not). The argument that a large current account deficit is not a cause of concern if the fiscal accounts are balanced is associated with former Chancellor of the Exchequer, Nigel Lawson, and therefore it is known as "Lawson's Doctrine" [9]. It has also become widely accepted paradigm for the external situation analysis – for example, in 1981, when Chile's current account deficit exceeded 14% of GDP senior IMF officials assured that as long as the "twin deficits" do not coincide there is absolutely no reason to be concerned.

The debt crisis of 1982 exposed the obvious inadequacy of prevailing views on the current account. In fact, the crisis erupted in countries, of which most were running large current account deficits simultaneously with balanced fiscal accounts and/or increasing investment rates. The crisis had rather profound implications. In Latin America, for example, the net transfer of resources swung from more than US\$12 billion yearly inflows between 1976 and 1981 to the average US\$24 billion a year outflows in the following five year period. The forced adjustment brought about through import (of capital and intermediate goods) and investment contraction resulted in a serious recession. During much of the 1980s most developing countries were cut from the international capital market and running external surpluses or moderate deficits. The Lawson Doctrine was (by majority) abandoned and emphasis put again on the current account and the (real) exchange rate (overvaluation). The reasoning went, again, that large current account deficits were (often) a sign of troubles and a rationale for devaluation.

1.3.1.3. Surge in Capital Inflows: from the 5% Rule of Thumb to "Current Account Sustainability"

The end of 1980s and the beginning of 1990's witnessed some major changes in the world economy, of which the market oriented reforms in developing countries as well as rapid development in the international financial market and surge in capital flows were the most pronounced. Unprecedented amount of these flows was directed into emerging markets, which were apparently not prepared to absorb such a capital overabundance. The surge in inflows induced a real exchange rate appreciation, loss of competitiveness and, again, a current account deficit. Another problem was that capital inflows in the presence of insufficient investment opportunities crowded out domestic savings to some

extent. These processes were readily visible in Mexico; the current account deficit during 1992–1994 averaged 7% of GDP and, as the World Bank (1993) estimated, about two-thirds of the widening of the current account deficit in 1992 could be ascribed to lower private savings. Eventually Mexico experienced a currency crisis in 1994–1995 [10].

The importance of external balances in limiting country's vulnerability to currency crisis was reiterated after the crisis. The prevailing view was that large current account deficits were likely to be unsustainable, regardless of the underlying factors. The US Secretary of the Treasury Larry Summers explicitly stated that close attention should be paid to any current account deficit in excess of 5% of GDP. This number has been, and still is, very popular in assessing a vulnerability to a crisis. Indeed, studies show [11] that on average a 4% of GDP is a threshold over which current account deficit becomes a concern to private sector analysts. On the basis of this rule of thumb, warning has been addressed to Malaysia and Thailand that they should contain their deficits, which in the second part of 1990s went beyond the safe line.

The overabundance of capital created a problem of its efficient intermediation and in many cases problems of speculation and moral hazard. In addition, as opposed to 1970s capital flows that took form of syndicated bank loans, in the 1990s the capital streamed into equity and bond instruments. Since portfolio flows are quite volatile an apparently underestimated threat of (possible) sudden reversals emerged. The focus on current account deficit was not only with respect to its existence but also to how it was financed. In contrary to short-term flows, the FDI flows were thought to be desirable way of sustaining the deficit.

It is still a controversial and unresolved issue whether current account deficits were a primary cause of the 1997 Asian crisis. Corsetti et.al. (1998) find some support for this hypothesis and argue that a group of countries that came under attack in 1997 appear to have been those with large current account deficit throughout the 1990s. But this support is very limited – for five main Asian countries during 1990–1996 the deficit exceeded an arbitrary 5% only 12 out of 35 possible times, for two years preceding crises this ratio even comes down to 3 out of 10 possible times.

The relatively balanced fiscal and external position of Asian countries before the crisis only confused economists and researchers. I try to distinguish between (generally speaking) two ways of understanding the importance of current account for currency crises. Both are connected with each other and can be described as "current account deficit may matter".

[9] As will be discussed later, the Lawson Doctrine is not (directly) implied by the intertemporal model.

[10] Mexican officials still claim that large current account deficit was not a main cause of the crisis because, what's interesting, the public sector finances were under control.

[11] See, for example, Ades and Kuane (1997).

First, many economists argue that the nature of currency crises has changed overtime. Dornbusch (2001), for example identifies, that the old-style crises involved a cycle of overspending and real appreciation that worsened the current account – usually the external deficit was a counterpart of a budget deficit. The debt rose, foreign reserves declined and finally country had to arrange a devaluation. In this respect they were current-account-crises. The new-style crises are centered on doubts about the solvency of the balance sheet of a significant part of the economy and the exchange rate. The balance sheet may be undermined by the large portfolio of non-performing loans or by maturity (or currency) mismatches. The crisis is triggered by sudden capital flight. This view recognizes that capital markets rather than current account dominate exchange rate issues. The role for real overvaluation and current account deficit is secondary rather – it can act as a focal point in inviting currency crises to the country already having a balance sheet problem. Dornbusch (2001) speculates that it is safe to say that a rapid real appreciation amounting to 25% or more and an increase in the current account deficit to exceed 4% of GDP, without prospects of correction, take a country into the red zone.

Secondly, various authors, suspicious of one-for-all 4% threshold and believing that the current account deficit is a basis and deeply underlying cause for external crises, try to define the notion of "current account sustainability". Because of the lasting improvement in capital market access, persistent terms of trade improvement and productivity growth emerging economies can, as it is predicted by the intertemporal models, finance moderate current accounts on an ongoing basis. The weakest notion of sustainability implies that the present value of the (future) current account deficits (plus debt) must equal the present value of the (future) surpluses, or in other words that a country will (in infinity) repay its debt. This criterion is certainly not satisfactory – the debt repayment prospect may be too distant and it says nothing about the appropriateness of a present deficit – virtually any present deficit can be (somehow) undone by sufficiently large surplus in the (unspecified) future. According to the stronger notion of sustainability, the deficit is sustainable if it can be reverted into sufficient surplus in the foreseeable future and debt repaid on an ongoing basis (in a sense of non-increasing debt/GDP ratio) without drastic policy changes and/or a crisis. This definition is a starting point for a calculation of a sustainable current account – if the actual deficit lasts longer above sustainable level and a country doesn't undertake corrective measures (devaluation or domestic demand restraint) it can perhaps expect an externally forced adjustment.

1.3.2. Models of the Current Account

1.3.2.1. Exchange Rate and Elasticity Approach [12]

It is natural to analyze the current account in the context of (real) exchange rates, that is in the framework of monetary models (variations of the quantity theory of money). For example, it can be shown that in Dornbusch-type models (including covered interest rate parity, money market clearing immediately and slow adjustment of goods market) expansionary monetary shock results in so-called "overshooting", and until the price of domestic goods fully offset the shock the real exchange rate is effectively overvalued – the current account is in deficit.

In terms of elasticity, it is quite easy to derive the so-called Marshall-Lerner condition saying that devaluation brings an improvement to the current account only if a sum of the elasticity of a foreign demand for domestic export and the elasticity of a domestic demand for import is larger than one.

1.3.2.2. Portfolio Approach

According to standard portfolio theory, agents are willing to hold a constant share of each asset and this share depends only on agent's risk aversion and asset's performance (mean return and risk). We can transpose this reasoning to current account context. The net international demand for country's liabilities is then given by

$$D + FX = \alpha^* (W^* - W) - \alpha W \quad (1.9)$$

where D is a stock of country's gross foreign liabilities, FX is a stock of country's gross foreign assets (for example foreign exchange reserves), W^* and W denote respectively world and domestic wealth, α^* and α denote world's desired holdings of country's assets and country's desired holdings of world's assets as a share of respective wealths.

Assuming that the country's wealth is proportional to its (potential) GDP (denoted Y) with proportionality factor θ and that the country's wealth is a δ -proportion of total world's wealth we can write

$$D + FX = \theta \left(\alpha^* \left(\frac{1-\delta}{\delta} \right) - \alpha \right) Y = \lambda Y \quad (1.10)$$

where the complex (but constant) expression adjacent to Y is shorten to λ . It is important to notice, that λ can be interpreted as a net world desired holdings of country's assets as a ratio to GDP or simply debt/GDP ratio.

Taking first differences, dividing by the GDP we obtain

$$\frac{D_t - D_{t-1}}{Y_{t-1}} + \frac{FX_t - FX_{t-1}}{Y_{t-1}} = \lambda \frac{Y_t - Y_{t-1}}{Y_{t-1}} \quad (1.11)$$

[12] I don't include here the Mundell-Fleming model, which is a common tool to obtain (only) qualitative guidance on how the balance of payment is going to behave depending on the exchange rate regime and capital mobility.

which, after and moving foreign exchange to the right hand side, is equivalent to

$$cad = \lambda \gamma - \Delta fx \quad (1.12)$$

where cad is a current account deficit (as a share of GDP), fx is a foreign reserves to GDP ratio, γ is a growth rate of GDP. This simple equation says that in equilibrium the current account deficit (corrected for foreign exchange reserves accumulation) is a constant fraction of GDP growth. In other words, it means that country, other things kept constant, can run a deficit to a tune of its growth. Two things should be made more precise. First, it is reasonable to assume that the economy might want to hold a constant foreign-reserves-to-import ratio (not a constant foreign-reserves-to-GDP ratio). We can write

$$(desired) \quad \Delta fx = \frac{1+\eta}{1+\gamma} fx - fx = \frac{\eta-\gamma}{1+\gamma} fx \quad (1.13)$$

assuming a constant import growth η . Second, improvement takes into account the difference in real exchange rates. Due to world inflation or for example the Balassa-Samuelson effect, the (emerging) country's real exchange rate can get overvalued. Increase in the domestic currency (real) value reduces both debt and foreign reserves, so we have to make respective changes in the equation, which now becomes

$$cad = \lambda(\gamma + \varepsilon) - \frac{\eta + \varepsilon - \gamma}{1 + \gamma} fx \quad (1.14)$$

where ε is the real exchange rate overvaluation. The equation is ready for estimation and/or calibration and inferences about steady state sustainable current account deficit. The main message of (1.14) is that sustainable current account deficit vary across countries and depend on the variables that affect portfolio decision as well as economic growth.

1.3.2.3. Intertemporal Choice Approach

This model is based on a consumption smoothing and permanent income theory and is a straight adaptation of individual choices to the economy as a whole.

Consider a representative consumer that maximizes the discounted value of (lifetime) utility given by

$$U = \sum_{t=0}^{\infty} u(C_t) \quad (1.15)$$

subject to

$$B_t = (1+r)B_{t-1} + Y_t - C_t - I_t - G_t \quad (1.16)$$

where β is the domestic discount factor, u is the utility function [13], B is economy's stock of foreign assets, r is the

fixed world interest rate, Y is GDP, C is consumption, I is investment and G is government spending. This infinite optimization problem has no closed solution in general, but if we assume that the utility function $u(C)$ is quadratic and that the world and domestic discount factors are equal (i.e. $\beta(1+r)=1$) the solution for consumption path is given by

$$C_t = \frac{r}{1+r} E_t \sum_{j=0}^{\infty} (1+r)^{-j} (Y_{t+j} - I_{t+j} - G_{t+j}) + rB_{t-1} \quad (1.17)$$

where $Y-I-G$ i.e. GDP net of investment and government expenditures can be referred to as the net output. The equation states that along optimal path the consumption is equal to the annuity value of expected future stream of net output, or that it is proportional to the permanent income rather than the income at any instant.

Using (1.16) we obtain the result for the current account ($CA=B_t-B_{t-1}$, i.e. positive values indicate a surplus)

$$CA_t = - \sum_{j=1}^{\infty} (1+r)^{-j} E_t \Delta(Y_{t+j} - I_{t+j} - G_{t+j}) \quad (1.18)$$

This links the current account position to the expectations of future (net) output changes. In other words when a country's economic prospect is bright, or if the investment opportunities exceed saving propensity, its residents prefer to move the consumption from the future to the present and finance it externally, being sure of their ability to repay it later – the current account imbalances, consequently, reflect optimal and rational intertemporal decision of economic agents, they are sustainable and should not be a matter of concern.

The second version of the model can be obtain by maximizing (1.15) under assumption that the utility function $u(C)$ has constant elasticity of substitution σ , i.e.

$$u(C) = \frac{C^{1-\sigma^{-1}}}{1-\sigma^{-1}} \quad (1.19)$$

and that the worlds interest rate is a random variable. The current account balance can be presented as

$$CA_t = (r_t - \tilde{r}_t)A_{t-1} + (Y_t - \tilde{Y}_t) - (C_t - \tilde{C}_t) - (I_t - \tilde{I}_t) - (G_t - \tilde{G}_t) + \left[1 - \frac{1}{\left(\frac{\tilde{\beta}}{\beta^w} \right)} \right] (r_t A_{t-1} + \tilde{Y}_t - \tilde{C}_t - \tilde{I}_t - \tilde{G}_t) \quad (1.20)$$

where β^w is a world discount factor (from time t to time s) and tilded variables indicate a "permanent" level of a variable for example

[13] So called felicity or Bernoulli utility funtion to distinguish from overall lifetime utility U .

$$\tilde{Y}_t = \frac{\sum_{s=t}^{\infty} R_{t,s} Y_s}{\sum_{s=t}^{\infty} R_{t,s}} \quad (1.21)$$

where

$$R_{t,s} = \frac{1}{\prod_{u=t+1}^s (1+r_u)} \quad (1.22)$$

is a market discount factor.

The equation (1.20) states, that the current account is primarily driven by the deviation of key variables (net output and the world interest rate) from their permanent levels. The last expression on the right hand side represent a "consumption-tilting" effect: when the domestic impatience rate ($1/\beta$) is larger than the world's one residents want to consume their (permanent) income earlier, so they move consumption from the future to the present causing current account deficit to rise [14]. But the main conclusion of (1.20) is that a country can run a current account deficit in response to exogenous shocks that affect present and/or future growth prospects as well as changes in the rest of the world (reflected in changes of the world's interest rate). Table 1-3 summarizes these implications.

First, net debtor countries in the presence of temporarily low worlds interest rate [15] should save some of benefits from lower debt payment and move (smooth) the consumption into the future. A rise in the rate of savings will improve current account. The opposite is a case for net creditor countries. Consequently, if net debtor countries rise their consumption in response to the temporary drop in the world interest rate they destabilize their optimal consumption paths. Investment is unaffected – only permanent changes in output growth can increase it to assure optimal capital/output ratio. Second, the response to shock improving growth prospects depends crucially on the expectations

whether the improvement is transitory or permanent. The transitory surge in country-specific productivity (growth) induces savings as agents save part of temporarily high income for the future. Investment remains unchanged, so the current account improves. The permanent rise in country-specific growth prospects rises permanent income and induces higher investment. Consumption also increases, so the country moves into a current account deficit. The transitory rise in global productivity increases (total) world savings and put a downward pressure on the world interest rate, which decreases temporarily below average, with above-explained consequences. The permanent rise in global productivity rises the permanent income and gives incentives to consume more in present, but at the same time, the permanent world interest rate goes up. Because the world is a closed economy the current account can't change simultaneously in all countries – the world interest rate rise is sufficient to squeeze (back) consumption in debtor countries and induce saving necessary to pay increased debt service in the future – and do the opposite in creditor countries.

Intertemporal models were further refined by incorporating other relevant variables in order to study policy implications of various shocks. For example Obstfeld and Rogoff (1996) build a model in which demographic factors (fluctuations in the labor force) play role. Their model (after some simplifications) yields

$$CA_t = (wL_t - \tilde{w}\tilde{L}_t) - (G_t - \tilde{G}_t) \quad (1.23)$$

where L is a labor force. The implications of the model have been used to explain the current account deficit after Israel has, during 1989–1997, incurred a demographic shock – a large inflow of (former Soviet Union) immigrants amounting to 800.000 people or almost 20% of the population.

Overlapping generations models have been analyzed in context of the current account deficit to correct for life-cycle considerations, establish its link with labor force composition, etc.

Table 1-3. Current account reaction to various shocks as predicted by the intertemporal approach

Shock		Temporary			Permanent			
		Saving	Investment	Curr. acc.	Saving	Investment	Curr. acc.	
World interest rate below mean	debtor countries	+	0	+	not applicable			
	creditor countries	-	0	-				
Rise in productivity	country's		+	0	+	-	+	-
	global	debtor	+	0	+	+	+	0
		creditor	-	0	-	-	-	0

Note: + at current account position means improvement.

Source: Reisen (1998), extended by the author.

[14] There is evidence that this is a case with emerging economies.

[15] Permanent drop below the average is, of course, nonsense.

In spite of being theoretically well justified the intertemporal models produce, under plausible parameter values, bizarre and unacceptable results. Numerical simulations show that the optimal reaction to external shocks is to run very high current account deficits. After accumulating a very large external debt and as the shock dies out the economy switches to equally implausible surpluses. Obstfeld and Rogoff (1996) demonstrate, that a small open economy with constant return to scale production function, domestic productivity growth exceeding that of the world, constant world interest rate and no borrowing constraints should run a steady state surplus of about 50% of GDP. Similar model developed to understand the impact of financial liberalization for the external position and adapted to the case of Spain show that after a financial reform Spain should have run a deficit peaking at 60% of GDP. Analysis of the economic behavior of a small economy with investment installation costs implies that Brazil should have accumulated a foreign debt of more than 300% of its GDP.

Such current account and debt/GDP ratios are not recorded in reality and prove that relying on the notion of frictionless economy (principally perfect capital mobility and no credit constraints) is of little help in explaining the actual evolution of current account behavior. Other variables that matter, sometimes hardly measurable, as the country's willingness to pay and foreigner's willingness to lend, should be included in the model.

Credit constraint received, particularly after the Mexican crises, special attention. Their main assumption is that the authorities cannot borrow as much as they want on the world market. When this constraint is introduced, the model's behavior improves significantly. It also produces a situation in which a change in the level of the borrowing constrain (a switch in market sentiment for example) can result in a currency crisis.

There is an ongoing research on the links between budget and current account deficits or, in other words, whether the Lawson Doctrine is valid (and to what extent and why not). First, if Ricardian equivalence holds budget deficit should not matter at all [16] and the current account balance is always an outcome of private sector decisions – so people who believe in Lawson Doctrine prove that their don't believe in Ricardian equivalence. On the other hand, the government behavior is distortionary and in practice there is ample evidence that Ricardian equivalence doesn't hold – the estimated so-called Ricardian offset coefficient average around 0.5, which means, that 1% (of GDP) increase in government deficit raises the current account deficit by 0.5% (of GDP). There are more reasons why

Lawson Doctrine shouldn't hold. It can be argued that much of the private sector debt is actually contingent public liability – governments have proven many times that when things go wrong they step in and bail it out. Various deposit insurances are other kinds of the same thing. Moreover private sector may hold excessively optimistic expectations about its permanent income level, financial market bubbles may add to the problem by discouraging private savings through wealth effect.

1.3.3. How to Calculate a Sustainable Current Account Deficit

Generally speaking there are two ways of calculating the sustainable current account. The first one bases on country specific knowledge and involves less quantitative but more narrative (or rather intuitive) methods. The second one is model-based and requires the use (sometimes quite sophisticated) econometric tools and estimations.

1.3.3.1. Underlying Current Account Balance

The former approach is usually implemented in the following way (known as "underlying current account balance"). First step is to estimate (or rather project) how the current account would develop in the near future if no new shocks arrive, i.e. at prevailing exchange rate, when the country and its neighbors operate at usual level of capacity utilization and when lagged effects of past shocks (changes in policies, in the terms of trade, in prices and other temporary factors) die out. This procedure yields an "underlying" current account balance. Second step involves determining the sustainable (or "normal") level of savings-investment gap consistent with a long-run equilibrium when the home country and all its financial partners operate with low inflation and without financial sector disturbances – this procedure yields "normal" capital flows balance. In the third step the two outcomes are compared and if they are far apart it means, that the current account position is unsustainable in the long run. This calculation requires relatively much country specific knowledge – its export structure, policy stance, past events and other factors should be known and used in the procedure.

1.3.3.2. Model-based Calculations

The second approach is usually done in the framework of the theoretical model of the current account. For example, one can exploit the result that the current account (deficit) is equal to the present value of expected declines in

[16] So-called Ricardian equivalence is an outcome of an analysis in a forward-looking rational expectations framework and states that (under some assumptions) the way in which government finances itself does not matter for private sector decisions (consumption path). In this context it implies that in the presence of increased budget spendings financed by bond issues private sector adjust immediately by increase in savings in expectations for future increase in taxes (to buy the debt back).

net output, as in equation (1.18). The only problem is that this expression involves expectations, and the researcher doesn't know how and on what information set does the public sector build its expectations. To get around this problem it can be assumed that the current account itself reflects all information about the future development in the net output. Thus, including the current account in the conditioning information set is equivalent to incorporating all information that private agents use in their forecasting of this variable. Therefore we can write

$$z_t = \Omega z_{t-1} + e_t \quad (1.23)$$

where z is a vector including relevant variables, particularly net output and current account, Ω is a transition matrix and e is a disturbance term. As all variables are stationary [17] vector autoregression method can be used in estimating the transition matrix Ω . When it is done we can calculate

$$E z_{t+k} = \Omega^k z_t \quad (1.24)$$

which can be incorporated directly into (1.18) and finally we obtain an optimal current account

$$CA^* = -[I \ 0] \Omega [I + r] [I - \Omega (I + r)]^{-1} z_t \quad (1.25)$$

if we assume that net output is the first element of z , while current account is the second one and I is an identity matrix.

Ostry (1997) uses this method to calculate the optimal current account for ASEAN countries, and conclude that the development of external balances of these countries followed the consumption smoothing pattern rather closely. Similarly Ghosh and Ostry (1995), using the data for a group of developing countries, show that, overall, the intertempo-

ral model satisfactorily captures the main features of the current account performance in the sample.

Another way to make sustainability operational is to introduce the non-increasing debt/GDP ratio. Having

$$D_t = (1+r)D_{t-1} - T_t \quad (1.26)$$

$$\text{and } Y_t/Y_{t-1} = \gamma$$

where D is foreign debt, T is trade balance and γ is economic growth. In terms of ratios to GDP we can rewrite

$$(1+\gamma) d_t = (1+r) d_{t-1} - t_t \quad (27)$$

The condition of non-increasing debt/GDP ratio is $d_t = d_{t-1}$, so we have that a trade surplus needed to stabilize this ratio is $t = (r-\gamma)d$ (share of GDP), which gives a sustainable current account deficit as

$$cad^* = rd - (r-\gamma)d = \gamma d \quad (1.28)$$

The portfolio approach also uses non-increasing debt/GDP ratio (and yields similar results). Goldman and Sachs Sustainable Current Account Deficit model (GS-SCAD) is one example. Using a 25-country data set it estimated the ratio of external liabilities foreigners are willing to hold as well as each country's potential growth rate. Then the long run sustainable deficit is computed in the above-sketched manner – the results are included in Table 1-4. With an exception of China calculated levels are rather moderate, ranging from 1.9% to 4.5% of GDP.

Reisen (1998) also uses this methodology and controls for a change in international reserves to the tune of import increase. He estimated parameters γ , ε and η (growth rate, pace of overvaluation, increase in import) and calibrated the model assuming that investors wish to hold 50% of GDP of

Table 1-4. 1997 current account deficits (Cad), sustainable Cads (Scad), Steady State Scads (SSScad)

Country	Cad	Scad	SSScad	Country	Cad	Scad	SSScad
Argentina	2.7	3.9	2.9	Mexico	1.7	2.1	1.9
Brazil	4.5	2.9	1.9	Morocco	1.8	0.3	1.3
Bulgaria	-2.6	0.4	2.4	Panama	6.1	0.8	1.9
Chile	3.7	4.2	2.9	Peru	5.1	3.3	2.9
China	-1.4	12.9	11.1	Philippines	4.2	4.5	3.8
Colombia	4.8	2.6	1.9	Poland	3.8	4.7	3.6
Czech Rep.	8.6	2.1	1.3	Romania	0.5	2.3	1.9
Ecuador	2.0	-0.5	1.3	Russia	-2.8	2.5	1.9
Hungary	4.0	0.8	1.3	S. Africa	1.8	3.0	1.9
India	1.8	3.8	2.8	Thailand	5.4	6.0	4.5
Indonesia	3.0	4.0	3.4	Turkey	1.2	2.1	1.9
Korea	3.8	4.9	3.6	Venezuela	-4.6	2.2	1.9
Malaysia	4.1	4.9	3.4				

Source: Goldman and Sachs (1997)

[17] If there is a consumption tilting effect the tilting component (which is nonstationary) should be first subtracted from the current account.

Table 1-5. The FDI to current account ratio in East Asian countries before 1997, in %

Country	1994	1995	1996	Country	1994	1995	1996
Korea	21	21	10	Philippines	54	75	39
Indonesia	76	68	80	Thailand	17	15	16
Malaysia	98	90	111				

Source: Corsetti et. al. (1998)

a given country in its liabilities and the comfortable level of foreign reserves is equal to six months of import. Values obtained are rather modest as well (not included).

Unresolved question is whether foreign direct investment should be included when computing sustainable current account deficits. The experience of Singapore, which during 1970s ran a deficit of average 12% of GDP financed in half by FDI flows (and in the presence of rising saving and investment rates), or a recent case of Estonia speaks in favor of the view that FDI inflows significantly increase current account sustainability and decrease the possibility of a balance-of-payment crisis. Table 5 presents the proportions of a current account deficit financed by FDI inflows for five Asian countries just before the 1997–1998 Asian crisis. This example also seems to support the above hypothesis – only Malaysia had a decent ratio of about one. FDI is special in the way that they are driven by non-cyclical consideration, are less subject to sudden stops or reversals and their stocks are rather illiquid. On the other hand FDI, stimulates the demand for (intermediate and capital goods) import. Fry (1996) argues that the long-run effect of FDI on the current account is positive (through accelerated growth or (increased national) saving effect), while in the short run (three years for six Asian countries) it actually worsen current account. This finding is consistent with intertemporal approach to the current account and speaks in favor of FDI flows. The findings of Frankel and Rose (1996) and Edwards (2001) also support this point.

Sustainable current account deficit calculation is subject to serious limitations. They neglect some aspects of the issue of how the current account adjusts to the shock, i.e. the transition from old (long run) sustainable current account to a new one. Take, for example, the portfolio model and assume that suddenly foreigners wish to hold more assets of the country in question – that can arise due to many factors, such as shift in market sentiments or a productivity-enhancing shock. Using chapter 1.3.2.2. notation and neglecting the foreign reserves adjustment it implies that α^* increases, so λ increases as well (let's say from λ to λ^*). Assume that the current account adjustment follows the process

$$cad_t = \lambda^* (\gamma + \varepsilon) + \phi (\lambda^* - \lambda_{t-1}) \quad (1.29)$$

Due to limited capital mobility and other rigidities the desired change cannot take place immediately – the actu-

al share of domestic assets in foreign hands λ_t increases gradually to reach its desired level λ^* . ϕ is the coefficient of the speed of adjustment. The dynamic behavior of the current account deficit exhibits specific pattern; namely it initially sizably overshoots its new long-run sustainability level. A simulation for Mexico shows that if we assume that (due to, for example, decrease in country risk) the desired holdings of Mexican debt increase from 38.3% to, say, 43%, than, under reasonable calibration, the long-run sustainable deficit will change from 1.9% of GDP to 3.5% of GDP, but initial overshooting of the current account will send the deficit over 5% of GDP – it all happens because of the small change in investors' preferences. This simulation shows that the long-run sustainability ratios computed using the theoretical framework might be very misleading, and it's actually hard to conclude whether in the short-run the current account deficit is really excessive.

This criticism is also related to other computational difficulties like problems with proper estimation of desired debt holdings, of time preference coefficient, utility functions, and other elasticities. The proper extraction of market expectation is exceedingly difficult as well. For this reason caution should be exercised with respect to the results and implications of such calculations.

1.3.3.3. Different Methods for Different Types of Economies

Over years of practice economists and policymakers tend to differentiate between different types of economies and agree that different methods and models should be used with different types. Broadly speaking there are three types of countries: major industrial countries, advanced and investment grade emerging small open economies as well as developing, financially constrained countries. For the first type the sustainability is usually gauged with respect to equilibrium exchange rate explicitly taking into consideration the interrelation with other major developed industrial economies. For the second type treating "the rest of the world" as exogenous (constant) variable and proceeding with properly calibrated intertemporal choice models without borrowing constraints gives quite satisfactory results. Finally, for the third type the limited access to the international capital market and possible "sudden stops" in external financing has to be explicitly incorporated into calculation.

1.3.4. Empirical Evidence

1.3.4.1. Determinants of Current Account and its Empirical Distribution over Time and Countries

With limited guidance from theory researchers turn to empirical evidence to discover the determinants of the current account balance and its impact on the economy.

Edwards (2001) analyses the distribution of current account deficits over time and countries. He is interested how long and to what extent countries were able to run deficits.

What is visible from the country experiences that 1973 oil shock brought important changes to industrial countries' current account balances, which swung into large deficits.. Middle East countries' recorded a surplus; Latin America and Asia were not significantly affected by the oil crisis. On the contrary the 1979 oil shock hit every region. We can also see a strong and successful effort of world's economies to adjust to high oil prices during 1980s. These developments seem to support both consumption smoothing and trade elasticity approaches. It can be also noticed that recently current account deficits are rather modest from historical perspective.

How long were countries able to sustain high external deficits? [18] Table I-6 presents this summary – there were relatively few cases in which the deficit was sustained for more than five years. For ten years there were only eleven such episodes, out of which five in Africa, three in Asia, and two in Latin America. Australia and New Zealand are given as an example that a stable, open and market oriented country with reliable macroeconomic policies and investment opportunities can indeed persistently sustain relatively high current account deficits.

Various researchers tried to establish empirical determinants of the current account. Reisen (1998) tested the intertemporal approach by including theory-predicted determinants into an empirical regression. Out of investment, domestic productivity, world productivity, lagged current account, terms of trade and world interest rate only world productivity (and, of course, lagged current account) proved to be significant. When he controlled for a budget reaction function (a government response to a difference between savings and investment) the world productivity and

interest rate gained some significance, but only at about 20% confidence level [19]. On the other hand, all variables had the predicted sign (as in Table I-3). Reisen also noticed that, as a result of capital inflows in the 1990s, only in Argentina and Peru the productivity of investment rose (as indicated by the incremental capital output ratio), and exactly not in these countries but, most notably, in Asia the current account deficit widened rapidly. So, summing up, there is some, but very limited support for the intertemporal choice model.

Chinn and Prasad (2000) concentrate on the fundamental determinants of savings and investment. In simple regression framework they tried to establish empirical evidence of current account determinants. One of their findings is exceptionally robust; namely, the budget deficit is significantly and positively linked to the current account deficit with a (Ricardian offset) coefficient of 0.6. To some extent financial deepening positively influence an external balance (because it makes savings intermediation more efficient) [20]. Other variables predicted by models or included basing on common knowledge perform inconsistently and rather poorly.

1.3.4.2. The Links Between Current Account and Crises

The phenomenon of sudden and large current account reversals and its link with output decline and currency crises deserve special attention. The question is how often and with what magnitude and effects do such reversals occur and, finally, how costly they are. Milesi-Ferretti and Razin [MFR, 1998] as well as Edwards (2001) undertake a similar study of indicators and consequences of current account reversals on large sample low- and middle-income countries between 1970 and mid-1990s. They distinguish and compare the events of reversals and crises. Their definition of a reversal differs somehow, but the main point is that the external balance should improve at least 3–5% of GDP (in MFR this improvement should last at least for some time). They find that reversals are not an uncommon event – they account for 17% of all analyzed cases. MFR report, that the distribution of the reversals is relatively uniform among regions (they exclude Middle East), while Edwards finds that they are the most com-

Table I-6. Number of countries with sustained high (at least 5 years) current account deficits 1975–1997, by region

Industrialized	Latin America	Asia	Africa	Middle East	CEEC	Total
6	4	5	12	1	0	28

Source: Edwards (2001)

[18] Defined as a deficit exceeding third quartile of the region's average.

[19] As a by-product he obtained a Ricardian offset coefficient of 0.4, which is a common finding.

[20] However the interrelation between financial deepening and savings are not so obvious and more complicated.

mon in Middle East (26%), and the least common in industrial countries (6%). Short-term reversals (not sustained after three years), that point to consumption smoothing explanation, constitute 55% of all episodes, while long-term reversals that can be attributed to policy issues and structural changes account for remaining 45%. Among the determinants of reversals the most important are: current account deficit itself (of course, the bigger the deficit the more probable reversal), (low) foreign reserves level, GDP per capita (the bigger the more probable reversal – this suggest that low income countries experience difficulties in achieving external balance) and (deterioration in) the terms of trade. Among financial variables: higher share of concessional debt, official international transfers and lower international interest rate reduced the probability of a sudden reversal. Most important finding of MFR is, however, that current account reversals and currency crashes are distinct events: currency crashes are associated with output decline while for reversals such relationship couldn't be established – only around one third of reversals are associated with crises (excluding small economies the ratio becomes 1/2). This

result is to some extent dubious because the impact of current account reversal on output decline can be indirect and work through investment channel [21]. Since current account reversal means a reduction in foreign savings and there is evidence that foreign savings only partially crowd out domestic savings – a decline in foreign savings reduces national savings and thus investment. Since the impact of investment on output is well established it means that current account reversals indeed suppress output. Freund (2000) finds that for industrial countries reversals are associated with declining output – she concludes that perhaps for advanced countries they are driven more by cyclical consideration (like business cycles or domestic growth). Moreover, of 21 identified crises in the sample 17 happened within two years from a reversal.

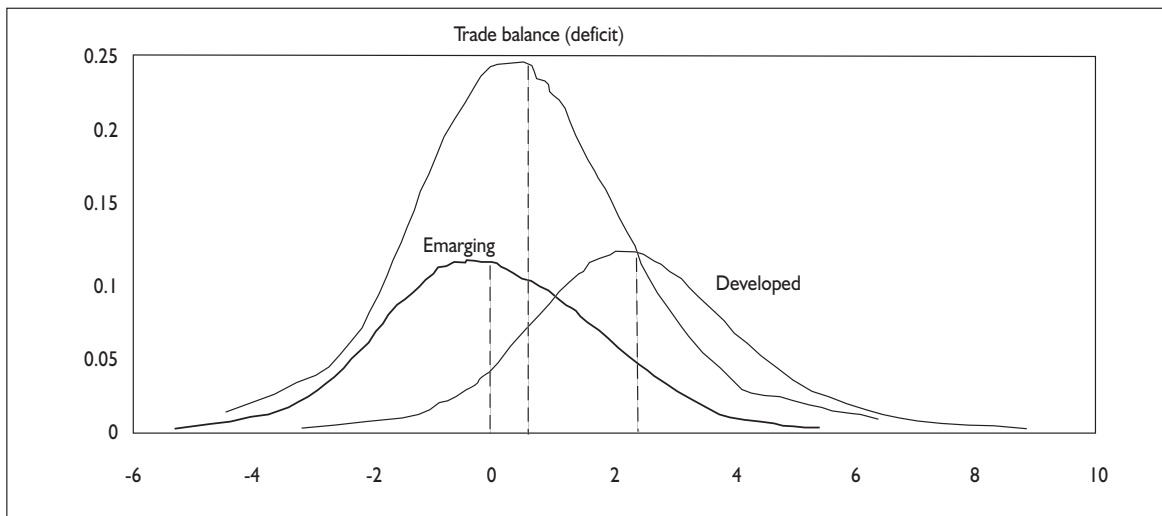
Researchers are generally unable to find strong and significant correlation between (high) current account deficit and currency crises in a proper econometric treatment. Table 1-7 presents the results of some studies on this topic. The t-statistics for the hypothesis that current account deficit does not help explain crises are given in the second column.

Table 1-7. The evidence on the significance of the current account deficit in predicting currency crises

Study	Results (t-statistics)	Notice
Edwards (2001)	1) 1.64 2) 1.64 3) 1.44 4) 0.31	four definitions of crisis and different specifications
Milesi-Ferretti and Razin (1998)	1) 1.25 2) 2 3) 1.65 4) 0.36 5) 1.3 6) 2,25 7) 0.6 8) 0.77 9) 1.71 10) 2.05	different samples 1-4) during current account reversals 5-10) prediction of overall crash
Abhuvalia (2000)	1) 1.94 2) 1.44 3) 1.52 4) 1.43	two samples two different set of contagion controls
Caramazza et.al. (2000)	1) 2.17 2) 2.5 3) 1.84 4) 0.51	different specification of crisis index
Bussiere and Mulder (1999)	1) 2.03	early Warning System with 5 regressors
Eichengreen, Rose and Wyplosz (1996)	1) 0.8 2) 1.9 3) 1.2	different specification of variables
Frankel and Rose (1996)	1) 1.03 2) 0.22	1) default and 2) predictive power
Berg Pattillo (1999)	1) 5.6 2) 9.5 3) 5.5	1) 'indicator model' 2) linear model 3) "piecewise linear model"
Kaminsky, Lizondo and Reinhart (1998)	-not t-statistics, but "noise to signal ratio" - export change: 0.42 (the third best result)	univariate "signal" analysis, "noise to signal ratio"; 0-perfect prediction, 0.5-no information, >0,5 worse than unconditional guess
Sasin (2001)	1) 1.1 2) 3.1 3) -0.1 (wrong sign) 4) 1.2 5) -0.4 (wrong sign) 6) 2.8	- 1,3,5) fixed effect linear model; 2,4,6) probit; 1,2) full sample; 3,4) emerging markets; 5,6) developed economies

[21] MFR control for investment in their regression what (probably) causes the endogeneity bias.

Figure 1-2. Sample distribution of t-statistics on current account deficit (trade balance)



Source: Sasin (2001).

As can be seen, these studies produce mixed results.

The most interesting thing I have established in my computations is the fact that in general (in the full sample with the simplest probit methodology) the current account is an important variable – has both the predicted sign and sufficient significance. We should however admit that different countries have different levels of current account sustainability. The fixed effect method controls for it so, consequently, if we allow for country-specific level of sustainability the implications of the current account for currency crisis prediction shrink to nil.

I also found that, similarly to the real exchange rate overvaluation, the current account deficit is much less important for emerging economies (implied t-statistics are less than 1.6 that is less than 10% significant). This result confirms that the deficit is actually sustainable in developing countries

I also dealt with the problem why different studies produce different and mixed results. By checking around almost 10,000 specifications I formally confirmed the popular explanation that much depends on the sample selection and the specification of the variables included. An average significance for current account was 0.5 – therefore I have to conclude that the current account has no significant impact on currency crises. This is even less so in the case of emerging markets – the average t-statistic was 0.1. Only for developed economies the current account deficit really means economic problems and is a sign of increased vulnerability to a crisis (average significance is 96%, i.e. t-statistic is little over 2).

In Figure 1-2 I present these results – sample distributions of t-statistics for null hypothesis of no effect of the current account (trade balance) obtained from regressions. Densities for developing and developed subsamples have been scaled down by the factor of two, not to obscure figures. Averages are indicated with a dashed line.

As proper econometric methodology is unable to provide strong proofs of the impact of external deficits on crises the narrative approach is taken and case studies analyzed to shed some light on the issue. For example Milesi-Ferretti and Razin (1996) attempt to answer when and why current account problems may end in currency crisis. The cases of Australia (persistent current account deficit, no drastic policy actions, no crisis), South Korea (beginning of 1980s), Ireland, Israel (high deficit, preventive policy reversal, no crisis), Chile, Mexico (deficit, crisis) are discussed. Basing on the improved portfolio approach (with financial constraints included) the main determinants of current account deficit sustainability are ex ante established – they include the size of the export sector, the level of international competitiveness, the level of domestic savings, the composition of external liabilities, strength of financial system, degree of political stability and fiscal consolidation.

The analysis shows that among countries with a current account deficit those who did experience currency crises differ from those who hadn't with: overvaluation of the real exchange rate (with rapid growth of import), relatively small export sector, high external debt burden, low and declining saving ration (especially Chile and Mexico [22]),

[22] Ireland and Israel also experienced a decline in saving rates but it was an effect of public sector imbalances that were much improved upon. Australia's saving rate is low as well but it is seemingly justified by the efficiency of its banking system.

political instability (elections in Mexico) and the composition of capital inflows [23]. All countries arranged devaluation, but some were preventive and successful (Australia, Israel), while some countries were forced to do it by the crises (Chile, Mexico).

1.4. Conclusions

We tried to establish the links between real exchange rate overvaluation, current account deficit and currency crises. The evidence is that real exchange rate helps explain and predict crisis. To some extent this result is intuitive or even tautological. On the other hand, the results on the current account deficit are mixed – proper econometric methodology fails to find strong support that the current account deficit actually is and underlying cause of a crisis. But qualitative analysis and common knowledge views large current account deficits as dangerous. The notion of "new crisis" gives the deficit secondary, but important role. Although financial variables, such as the level of short term debt, the state of the banking sector, moral hazard, balance sheet problems are main causes of sudden capital outflow, which in turn ignites crisis and damages economy – the current account is the signal that the domestic policies can be unsustainable and foreign reserves (a must for foreign debt repayment) could be soon depleted. Recently, it is also not so important if the external deficit is driven by public or private imbalances – rather source of the deficit and its financing matters.

Because of the above-mentioned reasons current account is still an important variable, on which investors base their decisions. We have, however established that the actual size of the current account cannot be the only basis of current account sustainability judgement. What is today sustainable can other time become unsustainable, when international capital markets sentiment changes.

It all can be well summarized using the words of Ostry (1997), who yet before the Asian crisis warned that although Asian current account deficits safely match the consumption smoothing pattern other factors may affect external sustainability. He highlighted the role of the level and composition of external liabilities, the flexibility of macroeconomic policies, the efficiency of investment, the state of the financial system. He concluded that even if the external position seems sustainable in views of all major models and determinants there is a case to reduce current accounts deficits in order to minimize the risk that arise from running these deficits in the presence of the above-mentioned weaknesses.

[23] Australia relied more on equity (significant part of the debt were also denominated in domestic currency, it had a developed bond market). In such case risk shared by foreigner investor. Ireland, in turn, had a large and sustainable inflow of FDI's.

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World Economic Outlook.

Part II.

Choice of Exchange Rate Regime and Currency Crashes – Evidence of Some Emerging Economies

Małgorzata Jakubiak

2.1. Introduction

The paper addresses a set of issues regarding the choice of an exchange rate regime in financially fragile emerging markets. It provides an insight of how different regime choices were connected with currency crashes during 1990s. Fourteen cases of financial crises are examined, and the decisions about the regime choice are discussed in the light of costs associated with ending an arrangement weighted against the costs of further support of a peg.

The analysis starts from the general discussion of what regime choice is better for a "small open and emerging" economy. Specific issues related to the policy choice when domestic currency comes under pressure are discussed next. The issue of empirical measurement of the costs and benefits associated with the regime change is discussed using case studies. The countries under consideration are grouped into these that followed a hard peg regime before the crises, these that followed more relaxed types of pegs, and these that allowed their currencies to fluctuate. The relative flexibility of an exchange rate regime is assessed with the use of an "effective exchange rate flexibility index". Last section tries to quantify the influence of different factors on the duration of exchange rate peg using logit analysis.

In the light of the following discussion, it seems that in the majority of cases, where authorities decided to abandon a peg, the problem was not really associated with the choice

whether to abandon the fixed rate or to stay on. Further support of the exchange rate was in most cases prohibitively expensive, so there was no choice in this respect. Rather, the problems experienced by these economies and magnified by the currency crashes showed inconsistency of pursued policies within the chosen exchange rate regime.

2.2. Old Dilemma: Fixed or Flexible?

The classic principle of the fixed versus flexible rates debate is that of Robert Mundell (1960). Under a high degree of capital mobility, fixed exchange rate may dominate flexible exchange rate, in the sense of better stabilising properties in the face of exogenous shock. Mundell proposed a first explicit analysis of macroeconomic dynamics under fixed and flexible exchange rates. The main logic was that under a fixed exchange rate the interest rate has a direct effect on the external market to which it responds [1], therefore helping to quickly restore equilibrium. While under flexible exchange rate regime the rate of interest has a more direct effect on the external market than on the goods and services market, to which it responds, leading to a cyclical adjustment. However, Mundell also wrote about some limitations of fixed rates. Specifically, he noted that it is important for the fixed exchange rate system to be backed by the sufficient amount of international reserves. Mundell also pointed on the fact that speculative attacks may pose smaller threat for the flexible exchange rate systems.

[1] The actual rate of interest remains near its equilibrium level, and the disequilibrium at the goods and services market is eliminated by the price level changes that affect the balance of payments.

Recent waves of currency crises brought about new literature, which tries to assess what regime choice is better when a currency comes under pressure. And in this light fixed exchange rate arrangements are not automatically superior to flexible ones, especially when we consider the costs of ending a peg.

There are important consequences of a sudden devaluation, when a currency comes under pressure in an emerging market country following a peg. Mishkin (1999) underlines that it is typically for an emerging market country following a peg to have a large amount of debt denominated in foreign currency, because of uncertainty towards domestic money. In this case, devaluation produces high increase of the debt burden. This, in turn, leads to a decrease of net worth, lowers investment and slows down economic activity.

Mishkin (1999) explains that the debt often has low maturity, and when a monetary authority rises interest rates when trying to defend domestic currency, economic agents see their interest payments increasing, which further deteriorates their balance sheets, and brings a fall in lending. Nevertheless, the larger the debt stock, the more valuable the peg becomes for the authorities, and the authorities are more committed to defend it, unless it becomes prohibitively expensive.

Chang and Velasco (1999) explore the topic of an optimal level of international reserves under a fixed exchange rate system. They write that under a fixed exchange rate regime, the possibility of a crisis when a currency comes under pressure depends only on the underlying liquidity of the economy. This is to say, that if a country does not hold a sufficient amount of foreign currency – and it should be remembered that keeping large reserves is costly – and is following a peg, then a currency crisis occurs if only public realise that the central bank cannot meet its liabilities.

Contrary to this, flexible exchange rates can be superior to the fixed rates, but under certain conditions. Floating rates, in the view of the authors, lead to the point, where it is not optimal for the investors to withdraw early domestic currency deposits. Even if a run on domestic currency denominated securities starts it is not optimal to move early, since there is a perception that all the obligations will be honoured, and depreciation punishes early withdrawals. This result holds when the proportion of domestic currency deposits is large in relation to the foreign currency deposits. The flexible exchange rate regime should be accompanied by the appropriate monetary policy, namely the central bank acting as a lender of last resort. Authors stress that the result holds for the floating exchange rate regimes and not in the case of a sudden regime change.

It is also argued that greater integration with the world capital markets reduces benefits from exchange rate stability, increasing the optimal flexibility of exchange rate regime [Aizenman, Hausmann, 2000]. However, emerging market countries are usually not the ones that are characterised by

the large access to the world financial markets. This issue will not be explored later in details, but high degree of integration with the world financial market was certainly not the case of Latin American or the CIS countries considered in this paper. If we take an example of Argentina, it turns out that overall capital flows constituted only 5% of its GDP before the Tequila crisis.

2.3. Costs of a Sudden Shift to a More Flexible Arrangement

If we summarise some of the insights pointed out in the previous section, we can specify certain important costs of a sudden change in the exchange rate regime that are of particular significance for an emerging economy. Here, the emphasis is put on the costs of quitting fixed exchange rate arrangement, which are especially relevant in the light of the case studies described later. Particularly, the costs related to the initial defence and then the abandonment of a peg are underlined. It is irrelevant here whether a fixed commitment is a declared one, or an implicit, but a perfectly known to the public.

First of all, the sudden regime change produces fluctuations of output and investment. These fluctuations are transmitted to the real sector through the changing magnitude of real interest rates. But the determination of the long-term costs of quitting a peg is beyond the scope of this paper, since they depend also on the evolution of a number of macroeconomic fundamentals, specific for a given economy. It is almost impossible to look at these costs only from the perspective of the different behaviour of nominal exchange rate. The more detailed discussion on modelling these dynamics can be found in Cespedes, Chang, and Velasco (2000), Chang and Velasco (1999) – model with banks as intermediates, or Pitt (2001).

Nevertheless, there are several issues that are immediately valid while taking the decision whether to defend a fixed rate or let the currency to adjust, especially within the context of emerging or "transitional" countries described later. These issues are listed below.

Loss of international reserves. Starting from the period when the currency comes under the pressure and the authorities decide to support its value, they use their international reserves in order to ease the pressure. As it will be later shown in the discussion of case studies, when the perception of the currency overvaluation and the attack are strong enough, the loss of international reserves is immediate and substantial. It creates the liquidity cost for the authority, which may undermine credibility of the central bank, and hence add to the expectation spiral. Sufficient reserves are necessary in order to

sustain a peg. And if they are used up, then there is a need to rebuild them later, which may require time and external borrowing.

The importance of keeping high enough level of foreign reserves is emphasised in the model of balance-of-payments crises of Mendoza and Uribe (1999). The currency crashes there occur as the result of prevailing large real appreciation and trade deficits, eventually triggered by the stance of fiscal policy. But the core issue is that the probability of a collapse of an exchange peg depends on the sensitivity of speculative capital outflows to changes in foreign reserves. The probability of a crisis and a currency risk premium are thus a decreasing function of the existing stock of reserves. Authors write that the changes in foreign exchange reserves are formulated endogenously, by the rational choices of private agents. While the peg is in place, they are the result of a government budget constraint regarding fiscal policy variables and the decisions of private sector agents.

Higher price of debt servicing. A rise in debt servicing in terms of domestic currency is an important threat of large depreciation for heavily indebted countries. And, as will be shown later on, emerging economies are usually highly indebted. This higher debt burden substantially weakens fiscal positions. The level of indebtedness and the percentage of foreign currency denominated debt are thus a good indicator of how valuable is stable domestic currency – or a declared peg – for a given country.

Pitt (2001) provides a model, in which the link between institutions and costs and benefits of the fixed exchange rate runs through foreign indebtedness and productivity of investment. When the speculations on the exchange rate start, government trades off the costs of devaluation in terms of higher debt service for the slowdown of economic growth through interest rate increases when defending a peg.

Collapse in the demand for money. Especially visible as a rise in domestic currency substitution. This causes problems in banking sector (or difficulties in the recovery of the banking sector, as, for example, it happened in the Kyrgyz Republic after the Russian crisis). The banking sector in emerging or transforming markets is usually characterised by the high volume of non-performing loans. Adding to this a decline in confidence to domestic currency, which demonstrates itself in the form of decreasing holdings of the treasury bonds and withdrawals of deposits, we have a serious threat to the stability of financial intermediation. This also limits the effectiveness of a monetary policy, and may hamper the necessary development of domestic financial market.

Rise in a country risk premium. This factor weakens access to the international creditors and lowers probability of attracting long-term capital inflows. Even setting aside all the externality-related benefits of long-term foreign capital coming to the growing emerging market, continuous inflows

of foreign funds allow to build exchange reserves and to service external debt, even in a presence of large CA deficits. And as it is described later on, the lack of capital inflows may quickly lead to unstable macroeconomic situation for an emerging economy.

High interest rates. Elevated nominal interest rates tend to limit investment. They result from the previously discussed time-varying country risk-premiums, and induce distortionary effects also on saving. However, if a country is dependent on foreign financing, and its perceived risk is higher, there seem to be no other choice than rise interest rates in order to acquire new external credit.

Lost credibility. Following a sudden change in the exchange rate regime, and the turbulence lasting for some time after, policy of the monetary authority may be perceived as less credible. Economic agents may behave in line with their own expectations, which do not need to fully reflect the authorities' commitment. This affects negatively the process of disinflation, and creates an obstacle for quick recovery. A country may find itself in a situation where the domestic currency cannot be used for a long-term borrowing, even domestic. Domestic investments face either a currency mismatch (projects that generate domestic currency revenues are financed with dollars) or a maturity mismatch (long-term projects must be financed with short-term borrowing). Then a country is permanently in a fragile state, almost independently of a chosen exchange rate regime. If a country follows a float, and a shock occurs, the currency mismatch may cause bankruptcies. But if the authorities are trying to defend a peg thus rising interest rates, this will precipitate defaults on the short-term debts. Eichengreen and Hausmann (1999) propose that in such situation it is advisable to allow for a full dollarisation.

This credibility loss can be measured by the decrease in the maturity of the debt, both foreign and domestic. And, it is often the case, as in some transition countries examined by Ganey et al. (2001), that the dynamics of credibility of the exchange rate policy are mirrored by the dynamics of dollarisation ratios.

2.4. Why Emerging Markets Peg their Currencies

If we know that pegging a currency may become costly for an emerging country, why do these countries peg? First of all, fixed regimes are often introduced in order to "borrow stability". Under the condition that governments' commitments are credible, pegged regimes promote predictability, tend to reduce inflationary expectations by providing a nominal anchor, and – by eliminating exchange rate risk – ease trade and investment relations. If the commit-

ment to keep the rate fixed is perceived as credible, country risk premium falls, facilitating access to world financial markets. Another argument in favour of a fixed rate may be this of lower domestic interest rates. Moreover, the economies that opt for fixing the exchange rate often experience a currency substitution. If such "dollarised" economies are prone to shocks of financial nature, then opting for a fixed rate automatically reduces monetary volatility.

2.5. Choices Faced after a Currency Collapse

It is clear that the decision to continue support for the peg by a monetary authority when high devaluation pressures are mounting depends on the underlying costs. The first choice of whether to keep the commitment to a fixed rate and continue losing reserves (lowering own credibility, and maybe hurting weak domestic banking sector) is weighted against the choice of letting the currency to depreciate with all described consequences. Assuming that sticking to the peg becomes prohibitively expensive at some point and the central bank flows the currency, there comes the next choice – what to do after. This issue is explored later with the use of the case studies, but some general considerations are marked here.

The monetary authority may opt for repegging. The choice may seem questionable at first, but it may be an option in the medium-term, after the exchange rate will reach its equilibrium level after an initial overshooting. The transition period must be long enough for two reasons. If a new peg is set too quickly, the exchange rate may be too depreciated and not consistent with the medium-term fundamentals. Secondly, after running out of reserves during the currency crisis the monetary authority may have problems with gaining enough credibility. From the countries discussed below, it was Malaysia who repeg its currency approximately one year after the crisis.

Repegging may not be an option also for the reason that in many transition countries stabilisation policies have a bad record. And it is difficult for the conventional fixed regime to be credible. Then there may be two ways out: adopting a currency board or even allowing for a full dollarisation, or let the exchange rate to float. The main argument in favour of the first choice is that in some cases it may not be too bad to give up an independent monetary policy. The fully floating exchange rate may also have some advantages, especial-

ly when the level of international reserves is low, provided that there is enough transparency and the anchor for the monetary policy is set in an explicit way.

2.6. Empirical Evidence – Case Studies

This section describes further the issues of costs and advantages of sudden devaluation under a fixed rate regime by the use of several case studies. The majority of reviewed countries are the ones that followed a peg prior to the crisis, and then devalued. There are also three examples of economies that were allowing their currencies to fluctuate before the crises. These are contrasted with one example of an economy that followed the extreme version of a peg – a currency board – and withstood currency pressures.

Since it happens that the declared exchange rate regimes may differ from the "effective" ones, the countries under consideration are grouped according to the so-called "effective exchange rate flexibility index" (*FLT*). The idea of this measure is taken from Poirson (2001). The index is calculated as a ratio of monthly nominal exchange rate depreciation to the monthly relative change in reserves. It is based on the idea that if a country follows a float, the volatility of its exchange rate is relatively large, while the monetary interventions are small. Conversely, if a country is following a peg, the movements in the exchange rate are close to zero.

The indices are calculated using monthly data and then averaged for the 12 months prior to the crisis, in order to get a better picture of what was the pre-crisis situation. Thus, they were calculated for each country using the following formula:

$$FLT = ME / MR = (\sum(|E_{t,k} - E_{t-k-1}|/E_{t-k-1})) / (\sum(|R_{t,k} - R_{t-k-1}|/H_{t-k-1}))$$

where: *ME* – absolute value of the monthly nominal depreciation;

MR – absolute value of the monthly change in reserves normalised by the monetary base in the previous month;

$E_{t,k}$ – end-period exchange rate in month *t*;

$R_{t,k}$ – net international reserves [2], minus gold, in month *t*;

$H_{t,k}$ – monetary base in month *t*.

[2] Net international reserves are calculated as the difference between the gross international reserves excluding gold expressed in domestic currency and foreign liabilities of the monetary authority. This is only an approximation for the net international reserves in some countries, but is nevertheless used here, given the data constraints.

The index may take the values between zero (no exchange rate movements) and infinity (completely intervention-free policy). The small values of the index mean that the authorities are intervening heavily on the foreign exchange to offset market forces and a country follows a relatively hard peg.

Since the measurement and dating of currency crises may pose some difficulties, episodes of significant currency pressures were identified ex ante, based on existing information in the economic literature on the subject. [3]. Only then statistical tools were applied to describe their characteristics. The analysis covers 14 emerging economies that experienced episodes of currency crises during the last decade. The countries are clustered into three groups: hard pegs, moderate pegs, and floats. Characteristics of the Argentinean 1995 crisis are described after. The detailed timing of each crisis is specified in the Appendix.

2.6.1. Group First – Hard Pegs: Brazil, Thailand, Mexico

the widening of the trade and the current account deficits. It is claimed that this widening of trade deficits was driven mainly by consumption. Nevertheless, the CA deficit accounted for 8% of GDP in 1994. In spite of this, Mexico had a weak banking system (which underwent a series of reprivatisations in early 1990s). The commercial credit expanded and non-performing loans jumped in 1994 to 8% of the total loans. The rise in the U.S. interest rates initialised a sudden capital outflow, and the government was left with the few degrees of freedom. On the top of this, there have been domestic political tensions, which originally triggered reserve losses. Continued selling pressures on the peso forced the government to stop its interventions on the foreign exchange market, after the Central Bank of Mexico lost 11.4 billion USD of its reserves in two months. The reserves fall by 64.5% from October to December 1994. On the 20th of December, the peso band's ceiling was devalued by 15%, and on the 22nd the authorities abandoned the crawling band exchange rate mechanism and moved to free float. Peso depreciated by 71% for the whole 1994. The balance-of-payments type currency crisis

Country name	Declared exchange rate regime prior to the crisis	Exchange regime into which the country switched after the crisis	FLT index over 12 months prior to the crisis	FLT index over 12 months after the crisis
Brazil	adjustable band with dual exchange rate structure	independently floating	0.080	0.505*
Thailand	basket peg	independently floating	0.081	0.437
Mexico	crawling band	independently floating	0.081	0.360

Note: * over 11 months

Source: IMF Annual Report on Exchange Arrangements and Exchange Restrictions, various numbers, and author's calculations

Very stable nominal exchange rates during the 12 months preceding the crisis resulted in the low scores on the FLT index for the three economies, indicating rather rigid forms of the fixed exchange rate arrangements. In the case of Mexico additional role was played by the large monetary interventions in November 1994.

Since November 1991, **Mexico** was following a crawling band exchange policy, and there was a belief that its macroeconomic fundamentals have been steadily improving. The country had managed to bring down inflation to single digit levels, have been achieving moderate rates of growth, and was controlling fiscal balance. However, the significant increases in capital inflows added to the continuous (since 1991) real appreciation of the peso, and thus to

developed hand in hand with the banking crisis.

Pressures on the **Thai** baht have been in place since late 1996. Similarly, to the case of Mexico, the country's exchange rate has been appreciating in real terms, and the economy was dealing with high and unsustainable current account deficits. Public sector balance has been deteriorating, and there were difficulties in the financial sector. There was a rise of the foreign indebtedness, especially of the short-term maturity. When the Bank of Thailand started to provide liquidity for the weak financial institutions, base money growth jumped. During the first half of 1997, the authorities responded to the pressures by exchange market interventions, by restrictions on some capital account transactions, and by efforts to limit the worsening of the fiscal sit-

[3] This classification of the episodes of currency crises poses some problems. For example, the date of the currency crisis in Bulgaria was set a year after the banking crisis erupted, during which national currency has been already depreciating in nominal terms. This is why Bulgaria recorded relatively high score of the FLT index, in accordance with the declared exchange rate regime. However, when we look at the FLT index prior to the banking crisis, it describes a perfectly pegged arrangement, even though the country was declaring an independently floating exchange rate.

uation. However, the speculative pressures continued and the baht was floated on the 2nd of July 1997. The Bank of Thailand lost 23% of its international reserves – that is 8.8 billion U.S. dollars – from the beginning of the year. The baht continued to depreciate in the subsequent months, as the Asian crisis was spreading out in other countries, and the market waited for better policy packages. It reached its all-time low value against the U.S. dollar in January 1998, but since then it began to strengthen [Lane et. al, 1999].

The **Brazilian** real has been under pressure since the collapse of the Russian ruble in August 1998. From the beginning of 1998, the country followed an adjustable band regime. The ceilings have been set periodically (on January 22, 1998 of 1.12-1.22 real per USD, on March 31, 1998 of 1.137-1.142 real per USD, on April 30, 1998 of 1.1435-1.1495 real per USD; this time the spread of the band was widened), and the authorities managed to maintain a continuing crawling peg within them. There were two exchange rate market; one called "official", where both the imports and exports proceeds were transacted plus some of the portfolio capital transactions. The other market – "floating" – was intended for capital account transactions. As foreign institutional investors were losing confidence in the real, and there was a massive outflow of capital (around 8 billion U.S. dollars on average per month during August-December 1998), the Central Bank of Brazil has been defending the currency. The monetary policy was tightened, and

interest rates went up and reached the levels comparable with the ones during the Asian crisis. International reserves were falling since April 1998, and until January 1999, Brazil lost over 39 billion USD of its liquidity. This meant that the reserves fell by 53.3%. The central bank widened the band of the exchange rate fluctuation of the real to 1.20–1.32 real per USD on January 13, 1999. It allowed for the gradual depreciation of the currency. The new band allowed for a 10% variation within the band. Nevertheless, the real was floated five days later, on January 18, 1999 (Baig and Goldfajn, 2000; IMF, 2001). It depreciated by over 64% in January only. From early January to June 1999, the real lost over 30% of its value.

The countries that followed one of the most tight exchange rate arrangements among all considered here, were also characterised by the high amount of external debt denominated in foreign currency. Total external debt of Thailand was at the level of 63% of its GDP, and nearly 95% of this was denominated in foreign currencies. This number indicates a high value of a fixed exchange rate arrangement for Thai authorities, suggesting a strong commitment to this regime. Mexico's total external debt was almost half this size in relative terms. In 1994, it amounted to 33% of GDP, and the majority of it was of a long-term nature. Weak access to the world capital markets (private capital inflows amounted to 8.0 and 3.1 percent of GDP in 1993 and in 1994, respectively [Chang, Velasco, 1998] may prove justification for this

Table 2-1. Foreign indebtedness, hard pegs

	1994	1995	1996	1997	1998	1999
Brazil						
Total external debt, in % of GDP		30.7%	45.6%	40.0%	38.2%	37.6%
Short-term debt as % of total external debt	20.8%	19.2%	19.8%	18.6%		
Thailand						
Total external debt, in % of GDP	45.4%	49.3%	49.0%	62.7%		
Short-term debt as % of total external debt	44.5%	49.5%	41.5%	37.3%		
Foreign currency denominated debt, in % of total external debt	94.1%*			94.4%*		
Mexico						
Total external debt, in % of GDP	33.3%	58.3%	47.9%	37.3%		
Short-term debt as % of total external debt	28.1%	22.4%	19.1%	19.0%		

Note: * as of end June.

Source: author's calculations on the basis of IFS and WDI data, Chang and Velasco (1998), IMF (2001).

Table 2-2. Reserve coverage, hard pegs

	Reserves/Monetary Base					Loss of reserves (in percent)
	6 months before	3 months before	At the crisis date	3 months after	6 months after	
Brazil	1.10	0.92	1.11	1.25	1.19	53.5%
Thailand	2.14	2.06	2.00	2.41	2.71	23.0%
Mexico	1.23	1.18	0.55	0.78	1.17	64.5%

Note: * Monetary authorities' reserve loss is calculated from the month the stock of these reserves peaks until the crisis date.

Source: author's calculations based on IFS data.

regime choice. Total external debt of Brazil amounted to 38% of GDP in 1998–1999, while outstanding external debt rose from 23% in 1996 to 45% of GDP in 1999.

While these economies were defending values of their currencies, they lost large amounts of international reserves. When we compare the percentage reserve loss at the crisis dates of all of the countries described here, it is clear that Mexico and Brazil lost the most.

If we were to assess costs and advantages associated with the decision of quitting the peg of these countries, there seems to be a reason in abandoning the fixed arrangement in Thailand and Mexico, in the sense that continuation would have become too expensive. Mexico's international reserves were not even covering half of its short-term external debt. Thailand had a level of reserves roughly equal the amount of its short-term debt 3 months before the devaluation, but was losing its reserves quickly, so that in June 1997 the reserves to its short-term external debt ratio was 0.85. Relevant ratio for Brazil was not that bad, but when we look at the more precise indicator of gross reserves to the residual maturity at the end of 1998, it is clear that reserves were covering only 53% of the debt.

Both Brazil and Thailand allowed its currencies to float, and tightened monetary policies, avoiding inflation-depreciation spirals. These moves were costly for the real economy, but it seems that the alternatives would have been much more expensive. However, this was not the case of Mexico, where there was a passthrough of depreciation on prices, but nevertheless, the economy returned to its growth path about a year after the crisis.

2.6.2. Group Second – Moderate Pegs: Russia, Georgia, Ukraine, Korea, Indonesia, Malaysia, Moldova

This classification groups seven countries that declared different types of their exchange rate regimes before the crisis. Even if they officially did not change their declared arrangements after the crises, they certainly allowed for a greater flexibility of their exchange rates over at least one year after.

From all Asian economies hit by the crisis, **Korea** appeared initially to be less affected. From 1993 the country followed an exchange rate band, with the currency fixed to the U.S. dollar, and won managed to oscillate within the permitted range of fluctuations of +/- 2%. The exchange rate remained broadly stable until October 1997. However, the country had a large stock of debt of short maturity, and its international reserves were only moderate. The macroeconomic fundamentals remained generally favourable but the financial institutions and large corporations began to experience problems earlier this year. As the crisis was spreading out, external financing conditions begun to worsen, and the won fell by over 5%. The authority started to intervene, but the reserves were depleted very quickly. Monetary policy was tightened, but soon released because of its impact on the highly leveraged corporate sector. By December 1997, won depreciated by over 20% against U.S. dollar, and usable foreign reserves fell to 6 billion U.S. dollars; from over 22 billions at the end of October 1997 [Lane et al., 1999]. Balino and Ubida (1999) write that at the end of 1997 usable foreign reserves were at the level equal to 0.6 month of imports. One year earlier, the reserves amounted to 2 months of imports. The exchange rate was allowed to float freely on December 16, 1997, and reached its lowest value against the dollar on December 23, 1997 [Balino, Ubida, 1999]. By mid-1998 won remained generally stable after the initial appreciation in January and the country made progress towards overcoming financial crisis.

Country name	Declared exchange rate regime prior to the crisis	Exchange regime into which the country switched after the crisis	FLT index over 12 months prior to the crisis	FLT index over 12 months after the crisis
Russia	exchange rate band	managed float	0.124	1.093
Georgia	conventional peg	independently floating	0.185	0.566
Ukraine	horizontal band	horizontal band	0.202	0.558
Korea	exchange rate band	independently floating	0.256*	0.530
Indonesia	crawling band	independently floating	0.271	0.495
Malaysia	managed float	managed float**	0.285	1.221
Moldova	managed float	independently floating	0.358	0.672

Note: * counted back from the beginning of the Thai crisis. It is commonly agreed that the crisis in Korea erupted in December 1997, but won was under serious pressure from the summer of 1997. For this reason period from July to November 1997 was excluded from the pre-crisis calculations.

** Malaysia switched to the conventional peg arrangement in September 1998, a year after the currency crisis started.

Source: IMF Annual Report on Exchange Arrangements and Exchange Restrictions, various numbers, and author's calculations

Intensified pressure on the **Indonesian** rupiah started in July 1997, soon after the Thai baht was floated. Key macro-economic indicators were stronger in Indonesia than in Thailand, but the economy had a very high amount of short-term private sector external debt. Until 1997 Indonesian GDP was growing at rates no lower than 6.5% per year, the current account deficit has been modest, export growth reasonably well maintained, and there was a budget surplus. However, the financial sector was small even when compared to other economies in the region, was characterised by the maturity mismatch of banks portfolios, and experienced several liquidity problems during the 1990s. The Bank of Indonesia was following a crawling band exchange rate mechanism, with predetermined, constant rate of depreciation. The exchange rate band was widened in mid-1995, then in mid-1996, and to 8% in September 1996. Following the intensified pressure on the rupiah, the exchange rate band was first widened (July 11, 1997), and on August 14, 1997 rupiah was floated. The authorities did not use its reserves on such a scale as Thailand, and later Korea, did to defend its currencies. International reserves of the Bank of Indonesia fell during the July-August only by 1.1 billion U.S. dollars that is by 5.2%. However, as the banking crisis erupted, and the monetary policy was of the "stop-and-go" type, changing between support for the exchange rate and injecting liquidity for the declining financial sector, the currency have been unstable for several months. The economy found itself falling into a circle of currency depreciation and hyperinflation. The banking system nearly collapsed during the November 1997 – January 1998 period. There was a severe civil unrest, which led to the resignation of the president Soeharto in May 1998. There was also inflation, fall of overall economic activity, banking sector was paralysed, and the unemployment was rising. The exchange rate hit its all-time low value in June 1998 [Lane et. al, 1999; Sasin, 2001a].

Malaysia had generally stronger fundamentals than other Asian economies. Federal budget recorded surpluses, and its external debt stayed manageable. Large current account deficits (10% of GDP in 1996 and 5% of GDP in 1997) were financed by the huge inflows of capital, both short term and FDI. International reserves were also growing due to capital inflows. However, its banking sector suffered from some weaknesses, such as rapid credit expansion and deterioration of asset quality of banks. The corporate sector was highly leveraged. When the crisis in the region spread out, the ringgit came under significant depreciation pressure, similarly to other currencies in the region. The currency has been appreciating in real terms for around two years before summer 1997, and it is claimed that it was significantly overvalued (IMF, 1999b). The crisis in Malaysia was triggered by the sudden capital outflow. The government was trying to deal with this by imposing some capital restrictions and by rising domestic interest rates. Nevertheless, the pressure persisted, and the authorities lost over 18% (4.9 billion USD) of its

international reserves when trying to defend the currency. On July 14, Bank Negara Malaysia abandoned its peg to the dollar. The currency depreciated by 4% this month, and continued to depreciate as investors were further losing confidence in Malaysian economy. It hit the lowest all-time value in January 1998, which meant the depreciation of 80% in five months. After the market calmed down, in September 1998, the monetary authority announced the introduction of a new, fixed peg of the ringgit versus the U.S. dollar.

Economic situation in **Russia** started to weaken in mid 1997, as the gas and oil prices declined and stayed low. GDP started to contract due to the fall in investment. Fragility of a Russian banking system was growing, as many large banks become reliant on GKO's and other securities whose prices were falling rapidly. Market sentiments towards emerging economies deteriorated after the eruption of the Asian crisis. Moreover, the country was having persistent fiscal problems and there was a political uncertainty. From mid-1995, Russia followed a currency band regime, introduced in order to stabilise market expectations. The bands were flat over the course of one year, and later, in 1996, they were sliding, with a predetermined monthly depreciation. The new bands were set for the year 1997, and the ruble stayed inside, depreciating by 6.7 % over the whole year. In November 1997, the authorities announced a new exchange band for the period 1998–2000, with permitted deviations of +/-15% from the central rate. At the same time, a narrower daily intervention band was introduced, which was set around the mid-point rate of the day. In summer 1998, the daily band was +/- 0.7%. The first tensions in economic fundamentals were visible in 1997, but the Central Bank of Russia encountered successfully first wave of instability. However, it happened at the cost of increased vulnerability of exchange rate regime (by huge sales of its exchange reserves) and – through higher interest rates – the weakening of commercial banks, whose ruble portfolios were composed mostly of federal government securities. Large scale capital outflows started in May 1998, as the investors became unwilling to roll-over the maturing GKO's. The central bank started to defend the ruble (lost over 40% of its international reserves i.e. 5.6 billion U.S. dollars in one month), but at the same time provided support for both banks and the government. When it became clear that the exchange rate regime was unsustainable, the band was widened on August 17, 1998. There was also a unilateral conversion of ruble treasury bills into long-term papers, which intensified the financial turmoil and the ruble was allowed to depreciate. In fact, it depreciated by 19%. On September 2, the exchange rate band was eliminated and the authorities introduced a managed float with no pre-announced path [IMF, 1999c].

The eruption of the Russian crisis spread over quickly to the neighbouring countries. **Ukraine**, with its fiscal problems and the lack of progress in reforming its economy,

experienced a halt in the capital inflows in 1997. With the lack of foreign and domestic capital and the need to finance budget deficit and repay maturing external obligations (1.4 billion of USD during the first half of 1998), the National Bank of Ukraine had to provide financial resources to the government, at the same time trying to ease pressures on the exchange market. On January 1998, the exchange rate band was widened. Interest rates were raising from the beginning of the year. The government, while trying to keep hryvnia within the declared limits intervened heavily, and, from March until September 1998 it lost 1.5 billion USD of its reserves (over 58%). In early September the exchange rate band was moved upwards, and the monetary policy was tightened, but nevertheless hryvnia depreciated by over 50% in one month.

The lack of structural reforms was also visible in **Moldova**. Privatisation and restructuring were conducted at a slow pace. At the end of 1997, the country had unsustainable external and internal positions. Continuous real appreciation of the leu caused large and rising trade and CA deficits. There was excessive public borrowing. Budget deficit was financed by external borrowing, which led to the rapid accumulation of debt. Similarly to other countries in the region, Moldova experienced relatively large capital inflows that reversed after the Asian and the Russian crises. The country followed a managed float exchange rate regime, with the leu remaining broadly stable since 1993. When the capital flight started, the National Bank of Moldova decided to defend its currency, even after the devaluation of the Russian ruble and the Ukrainian hryvnia. And in fact, the leu has been stable until November 1998. However, at a cost of losing 198 million USD, that is over 50% of its international reserves from November 1997. From August to October 1998, the National Bank of Moldova was intervening heavily on a daily basis. The costs of expected large depreciation were high in the case of Moldova – firstly because of its huge stock of external debt denominated in hard currency, and secondly – because the stability of the exchange rate through the preceding five years was the only visible sign of economic stabilisation, and the proof of credibility of the central bank [Lubarova et al., 2000]. Finally, when the reserves were severely depleted, on November 2, 1998, the National Bank of Moldova stopped its interventions in support of the leu, and let the currency to depreciate by around 50%. At the end of 1998 foreign reserves of the central bank were at the 1994 levels. The non-intervention policy proved to be successful, as the exchange rate settled at its new equilibrium value in March 1999.

The Russian crisis and the fragile fiscal position of **Georgia** adversely affected financial deepening and monetary developments, in place since 1997. Georgia has been running fiscal deficits of no less than 6% of its GDP during 1995–1997. The current account deficits were during this time in the range of 14–21% of GDP. In spite of this, gross

international reserves were mounting, mainly as the effect of substantial foreign aid. The country followed a conventional peg regime, with lari/USD rate stable for at least two years preceding the Russian crisis. When the pressures on the currency started, the National Bank of Georgia responded with the net sales of 25 million USD of its international reserves in September 1998 only. The NBG maintained its support for the currency through October and November. Net sales of reserves amounted to around 10 million USD and 20 million USD in each of these months, respectively. Nevertheless, the NBG let the lari to depreciate by 10% in November. On December 7, 1998, the central bank stopped its interventions, and allowed the lari to float. There was no intervention during the first two months of 1999, and later, the NBG focused on rebuilding its reserves.

Moldova, Russia, and Georgia had a quickly growing debt burden. Nearly all this debt was public or publicly guaranteed, and of the long- or medium-term nature. And in the case of Russian Federation, the significant part of it was the past Soviet-era obligations. The external debt to GDP ratio increased by over 50% from 1993 to 1998 for Georgia and Moldova. Currency crises contributed visibly to the increase in the domestic value of the external debt. For example in Moldova, external debt servicing amounted to nearly 42% of government revenues in 1998, while earlier, at the end of 1997, it was about half this ratio. Total external debt of Russian Federation rose from under 30% of GDP in 1997 to over 80% of GDP in 1998, and there was a decrease in its average maturity. Similar trend has been observed in Ukraine. It is claimed that most of the increase in the debt burden after the Russian crisis in Moldova and Georgia is attributable to the adverse exchange rate movements [IMF and WB, 2001]. The same can be probably said about Ukraine.

High amount of foreign-currency denominated short-term external debt can justify the need for exchange rate stability in Indonesia, Malaysia, and Korea. The depreciation costs have been reflected in the increased debt/GDP ratio, but not on such a scale as in the described CIS countries. The most heavily indebted was Indonesia, hence Indonesia probably valued its peg the most. And actually it seems that it lost the most in terms of the domestic currency value of its debt, experiencing skyrocketing nominal depreciation at the beginning of 1998. External debt to GDP ratio grown further, but it is hard to assess what amount of this magnitude can be attributable to the initial depreciation alone, and how much to the bad management of the crisis, and the post-crisis turmoil.

The reserves coverage of the monetary base imply a low credibility of pegs in Russia (even half a year before the crisis) and Ukraine. In fact, these two countries spend significant amount of its liquid reserves on unsuccessful defence of their currencies. In addition, the reserve coverage of

Table 2-3. Foreign indebtedness, moderate pegs

	1995	1996	1997	1998	1999
Russia					
Total external debt, in % of GDP	35.3%	29.7%	26.2%	~80%	
Short-term debt as % of total external debt	8.6%	9.7%	4.9%		
Georgia					
Total external debt, in % of GDP	40.8%	30.6%	27.5%		
Short-term debt as % of total external debt	7.2%	4.7%	1.6%		
Ukraine					
Total external debt, in % of GDP	17.4%	21.6%	18.5%	28.7%**	34.4%**
Short-term debt as % of total external debt	2.7%	4.7%	10.0%		
Korea					
Total external debt, in % of GDP	23.5%	25.3%	30.1%		
Short-term debt as % of total external debt	51.3%	49.9%	37.5%		
Foreign currency denominated debt, in % of total external debt			94.5%*		
Indonesia					
Total external debt, in % of GDP	61.5%	56.7%	63.1%		
Short-term debt as % of total external debt	20.9%	25.0%	26.4%		
Foreign currency denominated debt, in % of total external debt			97.8%*		
Malaysia					
Total external debt, in % of GDP	39.3%	39.3%	47.1%		
Short-term debt as % of total external debt	21.2%	27.9%	31.6%		
Foreign currency denominated debt, in % of total external debt		74%	89.7%*		
Moldova					
Total external debt, in % of GDP	58%	63%	66%	82%	129%
Short-term debt as % of total external debt	0.9%	3.2%	2.1%		

Note: * as of end June; ** own estimates.

Source: WDI, author's calculations on basis of IFS and WDI data, Jarociński (2000), Chang and Velasco (1998), Sasin (2001b), Siwińska (2000).

Russian external short-term debt has been falling rapidly in months preceding the crisis, indicating that the support of the ruble became too expensive.

Reserves to the short-term debt ratio seem to explain well the decision of quitting the peg in Korea and Indonesia. A couple of months before depreciation, the reserves were

Table 2-4. Reserves coverage around crisis, moderate pegs

	Reserves/monetary base					Loss of reserves (in percent)
	6 months before	3 months before	At the crisis date	3 months after	6 months after	
Russia	0.33	0.31	0.35	0.61	0.61	40.6%
Georgia	0.69	0.71	0.85	0.87	0.68	24.5%
Ukraine	0.70	0.49	0.47	0.30	0.30	58.1%
Korea	1.46	1.25	1.53	1.86	2.70	32.2%
Indonesia	1.26	1.12	1.50	1.38	2.54	5.2%
Malaysia	0.88	0.89	0.73	0.92	0.98	18.4%
Moldova	1.43	1.32	2.02	1.50	1.77	35.0%

Note: * Monetary authorities' reserve loss is calculated from the month the stock of these reserves peaks until the crisis date.

Source: own calculations based on IFS data.

covering only about a half of the short-term external obligations in these countries, and this ratio was increasing steadily. This pattern does not apply to Malaysia. Although Malaysia was not covering its base money with its reserves, it was still able to cover about 1.5 of its short-term debt with its reserves.

2.6.3. Group Third – Floats: Kyrgyz Republic, Czech Republic, Bulgaria

fiscal stance, debt accumulation, very low monetization of the economy, and the scarcity of monetary instruments. Banking sector was underdeveloped, and remained fragile, with almost half of its deposits denominated in hard currency. Since the introduction of the national currency, the som, the National Bank of Kyrgyz Republic has been conducting a managed float exchange rate policy. In fact, there were periods when NBKR intervened heavily. During 1997, the national currency was fairly stable, fluctuating within the range of 17 to 17.5 soms per U.S. dollar [IMF, 2000b]. How-

Country name	Declared exchange rate regime prior to the crisis	Exchange regime into which the country switched after the crisis	FLT index over 12 months prior to the crisis	FLT index over 12 months after the crisis
Kyrgyz Republic	managed float	managed float	0.683	0.414
Czech Republic	horizontal band	managed float	0.943	0.796
Bulgaria	free float	currency board*	1.048	0.128

Note: * Bulgaria adopted a currency board arrangement in July 1997 that is 4 months after its currency collapsed.

Source: IMF Annual Report on Exchange Arrangements and Exchange Restrictions, various numbers, and author's calculations.

High scores on the flexibility index accounted by the economies in this group emerged by different reasons. First of all, the relative flexibility of the exchange regime in Bulgaria resulted from the author's decision about the choice of the start date of the currency crisis. It was set for February 1997 that is around one year after the banking crisis erupted. Hence the magnitude of the effective flexibility index does not correspond with the earlier "tranquil" period low levels (0.0 FLT during 12 months preceding the banking crisis, irrespective of the same declared floating regime). The Czech Republic scored so high not because of fluctuations of the exchange rate (which was, in fact, relatively stable before the spring of 1997), but because of the relatively small interventions of the monetary authority, involving use of its international reserves. Finally, the relative flexibility of the exchange rate regime of the Kyrgyz Republic seem to correspond more or less with the declared managed float. However, when we look at the value of the FLT index for Kyrgyz Republic during the next 12 months after the crisis, it is clear that the regime became "better managed" than before.

Kyrgyz Republic was among the leading reformers in the region in mid-1990s. Its output started to grow in 1996, and there were some signs of monetary stabilisation up to the summer of 1998. The country has been running huge budget deficits, which during two years preceding the crisis amounted to 9–10% of GDP. External debt has been also mounting. It rose from 51% of GDP in 1995 to nearly 80% of GDP (1.4 billion USD) in 1997 [Brudzyński and Mamirov, 2000]. Thus, monetary policy was highly constrained by the

ever, this stability was achieved by over 35% decrease in international reserves during the first half of 1997. When the pressures connected with the Russian crisis strengthened, the NBKR intervened, but not as much as in 1997. The reserves were down only by 19%, and the national currency depreciated by over 19% in November 1998. Over the 1999, the som was depreciating further despite significant interventions, as domestic and external events lowered the confidence in domestic currency. The banking sector suffered severe setback.

Some signs of worsening of economic performance of quickly growing **Czech Republic** started to be visible in 1996. These were mainly the widening current account deficit, caused partly by the appreciating real exchange rate, and a considerable slow down of economic growth. It is argued that the combined effect of a slower growth, very high current account deficit, a governmental crisis, and possibly some contagious effects from South-East Asia led to the currency crisis in May 1997 [Horváth, 1999]. However, it should be noted that although fiscal balance moved to a deficit in 1995, the budget deficits accounted in 1995 and 1996 were of magnitude of 0.7% and 1.0% of the Czech GDP. Monetary policy started to be contractionary more than 12 months before the crisis, and there was no asset bubble as in the case of Asian economies. Nevertheless, the reserves of the central bank that were accumulated during 1994–1995 due to large capital inflows started to decrease at the end of 1996. Up to early 1997, the economy was following a tight exchange rate regime, with a +/- 0.5% band of permitted fluctuations. The koruna was pegged to the

basket consisting of DEM (65%) and USD (35%). The band was considerably widened in February 1997 to $\pm 7.5\%$. The koruna began to weaken in February, and the market started to exhibit nervousness, when the government introduced a policy package to deal with slower growth in April 1997. The currency was depreciating, but stayed within the band. On May 26, 1997, the Czech National Bank announced a change in the exchange rate regime and moved to a managed float. The currency then depreciated by over 9%, and the interest rates jumped high. The country lost 23% of its international reserves in 9 months, and 1.5 billion USD of this in one month between April and May 1997.

During 1996 **Bulgaria** went through the banking crisis, which laid grounds for the early 1997 collapse of its currency. It is also argued that the banking and the currency crises occurred together, caused by common factors, and that they lasted from mid-1996 until February 1997. However, the date for the currency crisis in this paper is set for February 1997, when the lev depreciated over by 100% against the U.S. dollar. Fiscal problems were not uncommon for Bulgaria, either. Only in 1996, state budget deficit amounted to 10% of GDP. The public debt burden was large, and it allowed to build inflation and depreciation expectations. Appreciating – since 1994 – real exchange rate was one of the reasons behind the trade and the CA deficits. Mounting macroeconomic imbalances precipitated the emergence of financial crises. Weak banking system experienced a run on deposits, and the central bank responded by injecting liquidity into the system. But this resulted in the acceleration of inflation. Then, the stabilisation program of July 1996 that followed a money-based approach failed. One of the key reasons for it was lack of financial discipline. The domestic currency started to depreciate in April 1996. The attempts to halt this depreciation with the help of an agreement with the IMF proved to be unsuccessful, and January and February 1997 witnessed a collapse of the currency. In two first weeks of February, lev depreciated by nearly 200%. The country has been at that time following an "independently floating" exchange rate regime. In fact, lev was kept stable by the central bank, and sharp depreciations were allowed only when it was impossible to defend the currency. When

we look at the flexibility index during the mid-1995 to mid-1996 period, its value equals zero, as in the perfectly fixed exchange rate arrangement, reflecting successful efforts of the monetary authority to preserve external value of the currency, under the declared name of "independently floating" exchange rate regime [Ganev, 2001].

Countries that were not using exchange rate as a nominal anchor policy had enough reserves to cover monetary base at the crisis dates, as one might have presumed. What was specific for two of them, mainly to Bulgaria and the Kyrgyz Republic was the heavy burden of external debt. Gross foreign debt of Bulgaria was well over 100% of GDP during 1991–1996 (with the exception of the year 1995). External debt of the Kyrgyz Republic jumped for 80% to over 90% of GDP in 1997–1998. This huge indebtedness was not only feeding inflation and depreciation expectations but also enforced domestic currency substitution. Both Bulgaria and Kyrgyz Republic were, to high extent, dollarised and respective currency substitution indicators significantly increased after the financial crises of 1997 and 1998.

It seems that the stability of exchange rate had been of great value to the monetary authorities of Bulgaria and Kyrgyz Republic, but conventional pegs would have not gained enough credibility during several months preceding currency crashes. After the crises happened the confidence to domestic currencies was even lower, and this was one of the reasons to adopt a currency board in Bulgaria in 1998. It should be remembered that these economies could not have enjoyed additional gains from the flexibility of the exchange rate regime, because of the lack of strong links with other capital markets. In fact, their financial links with external world were poorly developed. In 1996 net capital inflows to Bulgaria were at the level of 3.1% GDP, and in Kyrgyz Republic of 2.6% GDP. It is claimed that in order to gain credibility and to stabilise the economy, the Kyrgyz Republic should follow Bulgaria and also adopt the "corner solution" that is the currency board or even allow for a full dollarisation [Brudzyński, Mamirov, 2000].

The Czech Republic had stronger fundamentals when the koruna depreciated. Its hard-currency denominated debt to GDP ratio was about 41% of GDP at the end of

Table 2-5. Reserve coverage, floats

	Reserves/monetary base					Loss of reserves (in percent)
	6 months before	3 months before	At the crisis date	3 months after	6 months after	
Kyrgyz Republic	0.94	1.08	1.45	1.68	2.51	18.71%
Czech Republic	0.98	0.99	1.08	1.05	0.97	23.0%
Bulgaria	0.64	0.69	1.61	2.36	2.08	16.8%

Note: * Monetary authorities' reserve loss is calculated from the month the stock of these reserves peaks until the crisis date
Source: author's calculations based on IFS data

1997, and as the depreciation was not that high, it increased from the previous year by 4 percentage points only. But the recovery of the real economy has been rather slow.

2.6.4. Currency Board: Argentina in 1995

The advantages of withstanding a currency pressure and maintaining a fixed arrangement can be shown with the example of Argentina in 1995. Argentina, which suffered a form of Tequila crisis, did not devalue its currency at the cost of a significant loss of international reserves, one year long recession, rising unemployment and a crisis in the banking sector. The importance of maintaining the commitment was crucial for this country, since on the basis of it the authorities reformed the economy and managed to reduce inflation and gain credibility after a long period of instability and financial turbulence. Clearly, potential costs of leaving the regime (if one knows how) outweighed possible gains from devaluation. But it should be noted that the currency pressure was not directly related to the economic fundamentals, and had roots mainly in the low credibility in the currency board regime. The authorities' move toward strong commitment in support of the peso was interpreted correctly, and the pressure started to ease just when the reserve coverage of the monetary base was at the lowest allowed level (2/3 of the base money). If Argentina had decided to devalue its currency in 1995, the credibility of an anti-inflationary policy would have been destroyed and the country risk would have been much higher indicating higher vulnerability to subsequent economic shocks. Besides, there were positive changes in the banking system towards more transparency, and more effectiveness, brought about by the crisis.

The discussion on advantages and disadvantages of keeping exchange rate fixed when financial turbulence occurs with the use of the case studies can be summarised in the following way:

- Declared regime is not always the pursued one. As an example may serve Bulgaria in 1995 with the "perfectly managed" regime.

- The most spectacular regime change happened in Malaysia, Russia and Bulgaria, as measured by the effective exchange rate flexibility indices over a year prior and following a crisis. Malaysia and Russia floated the currencies. Bulgaria did this in 1996, and one year later it again opted for a rigid arrangement.

- Three countries that followed hard pegs valued high their fixed arrangements in terms of the alternative cost of a rise in the domestically valued debt in the case of a sudden depreciation. However, finally they abandoned their anchors because of the very high liquidity costs of keeping the peg.

- Two Asian countries classified as "moderate peggers", namely Korea and Indonesia, had large amount of short-

term foreign currency denominated debt, and this was making the fixed arrangements of a special value for them. The most heavily indebted was Indonesia, and it also suffered the most after the crisis. The debt of Malaysia was smaller, but still substantial. In addition, it seems that this peg was not very credible, and that it was not so costly for Malaysia to stay on. Nevertheless, the country decided to let the currency to depreciate and did not suffer as much as other economies in the region.

- Russia, Ukraine, Moldova, and Georgia were harmed by the rise of the domestically valued external debt, yet decided to devalue. It seems that credibility of pegs in Russia and Ukraine was particularly low since the Asian crisis, but there was no alternative than to stay on due to the high costs of quitting, which led them to the point when a peg ended when it was already too late.

- Two of the economies – Bulgaria and the Kyrgyz Republic – that allowed for a flexibility of the exchange rate probably were doing this not because they did not value the stabilisation of their currencies, but because the conventional peg arrangement would not have been credible enough to sustain. Also, because of high degree of currency substitution and weak international financial links they could not enjoy advantages of the flexible regime. The crisis further undermined the confidence to their domestic currencies, and "managed float" do not seem to be an option for them either. Bulgaria gave up its monetary policy and introduced a currency board a year after its currency heavily depreciated.

2.7. Probability of Ending a Peg. Logit Estimation

Monthly data on 13 countries over 9 years were used to estimate a model describing the probability of quitting a peg. The approach is taken after Klein and Marion (1997). They identified factors that influence the duration of currency pegs in a panel of monthly data for 17 Latin American countries and Jamaica over the 1957–1991 period. Potential determinants included both variables that vary across the course of a spell like real exchange rate and international liquidity, and also variables that change slowly like openness and geographical trade concentration. Authors performed logit analysis on the pooled data controlling for peg durations, existence of multiple exchange regimes, regular executive transfers and coups. They found that sharp real appreciations and losses of foreign currency reserves predate devaluations. Probabilities of a system collapse one month before devaluation were as high as 0.89. In this paper, the probability of ending a peg was initially set to depend on the underlying liquidity, bilateral real exchange rate, trade openness, and a number of months spent on a peg.

The degree of misalignment of a real exchange rate from its equilibrium value is an important cost of maintaining a peg to a policy maker, and hence should influence its duration. However, as the equilibrium value is difficult to observe, it is assumed that quickly changing real exchange rates of emerging or transforming markets vs. U.S. dollar are the good approximation of a misalignment itself, and a good predictor of when a peg ends. The real exchange rate index used here is calculated on the basis of CPIs, and in such a way that an increase denotes appreciation. The importance of enough levels of international reserves is captured by the inclusion of the relative reserve measure, namely international reserves excluding gold expressed as a percent of monetary base. The role of structural factors in determining the peg duration is brought about by the inclusion of the measure of trade openness, expressed as a ratio of the sum of trade flows to GDP. Additionally, the probability of ending a spell was presupposed to depend on time spent on a peg.

The dependent variable equals one when a period of at least three months of relative stability of an exchange rate ends. This stability is defined with the use of the relative effective flexibility index. The exchange rate is defined as fixed, or stable, if the FLT index for a given month is below 0.3.

The countries used in the estimation are the ones that were described in the previous section, with the exception of Georgia. These are, namely: Argentina, Brazil, Bulgaria, Czech Republic, Indonesia, Korea, Kyrgyz Republic, Malaysia, Mexico, Moldova, Russian Federation, Thailand, and Ukraine. After adjusting for the missing data, this gives

a sample of 970 monthly observations during the 1992–1999 period. The model included 67 peg spells, with the average duration of 15 months. Average monthly appreciation of the bilateral exchange rate versus the U.S. dollar was 0.4%. Average openness: 18% of GDP.

After the initial estimation, trade openness was dropped from the model, because its inclusion was highly insignificant, and the more parsimonious model yielded better results. In fact, this structural variable allowed for the differences among economies, and it proved to have no influence over the dependent variable. Finally, the probability of ending a peg was tested against three explanatory variables: liquidity measure, real exchange rate, and a number of months spent on a peg. The results of the estimation are given in the table below.

The results indicate increasing probability of ending a peg when real exchange rate appreciates and with more time spent on a peg. The coefficient of the liquidity indicator is of correct sign, but nevertheless, it is not significant at 90% level. The reserve coverage of base money does not seem to play a role in increasing probability of quitting a fixed exchange rate arrangement.

2.8. Conclusions

When comparing between fixed and flexible exchange regimes, there is a need to examine the degree of the

Table 2-6. Logit estimates of the probability of ending a peg

Dependent Variable: EPEG				
Method: ML - Binary Logit				
Sample(adjusted): 3 1330				
Included observations: 970				
Excluded observations: 358 after adjusting endpoints				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-8.757621	2.350957	-3.725131	0.0002
LOG(RES)	-0.253666	0.192520	-1.317608	0.1876
LOG(RER)	0.997642	0.491258	2.030792	0.0423
Time on peg	0.724268	0.104344	6.941180	0.0000
time on peg ²	-0.037390	0.007095	-5.270219	0.0000
Mean dependent var	0.065979	S.D. dependent var		0.248374
S.E. of regression	0.237099	Akaike info criterion		0.399483
Sum squared resid	54.24819	Schwarz criterion		0.424623
Log likelihood	-188.7490	Hannan-Quinn criter.		0.409052
Restr. log likelihood	-235.8191	Avg. log likelihood		-0.194587
LR statistic (4 df)	94.14009	McFadden R-squared		0.199602
Probability(LR stat)	0.000000			
Obs with Dep=0	906	Total obs		970
Obs with Dep=1	64			

exchange rate flexibility empirically. The flexibility index used here allowed to difference between the declared and pursued exchange rate regimes and set ground for deeper analysis.

Case study approach allowed for a detailed analysis of the exchange rate regime changes in some emerging markets. It is clear that the eruptions of the currency crises were not caused by the fixed regime choices themselves, but rather by the inconsistent macroeconomic policies within this financial framework. If a fixed arrangement is to be sustainable, not only monetary policy must be directed towards supporting its parity, but also trade, regulatory and fiscal policies must be geared towards maintaining the exchange rate stability.

The results of the econometric estimation further support this argument. They point on the importance of the real exchange rate misalignment magnified by longer peg duration in explaining the probability that a fixed regime ends. However, smaller reserve coverage of the base money does not seem to influence the probability of ending a peg spell. This fact probably reflects the inter-country differences in levels of monetization, irrespective where currency crises were happening.

It is difficult to recommend one particular regime for all described economies. However, it seems that with increasing capital mobility, countries nowadays face the choice of two corner solutions of possible exchange rate regime. If an economy decides for a floating arrangement, its exchange rate should be really free to move in response to market forces. The additional requirement for the floating exchange regime to be effective is that the monetary policy must establish a credible alternative nominal anchor. Then if a country opts for a rigid form of an exchange rate arrangement, this is for a currency board or a full dollarisation (euroisation), it should create sound and transparent institutions, and rules guaranteeing that the commitment is credible. Giving up monetary policy may be even a good solution for countries that need to stabilise their economies and have very bad record of their economic policies.

Still, it should be remembered that a conventional peg arrangement is difficult to sustain for a longer term in high inflation countries, where the credibility of the monetary authority is not high, and where the financial system is underdeveloped. The exchange rate anchor adopted when economic conditions are favourable, but not supported by the appropriate set of other policies, cannot last for long. And it is important that realignments of the pegs should be considered when it is not already too late, and that expansionary monetary policy is not in line with a currency peg for a longer period of time. In addition, this type of exchange rate regime may promote short-term foreign currency borrowing on a large scale, as happened in Asia.

Appendix: Crisis Dates

Country	Crisis date	Nominal monthly depreciation against USD at a crisis date
Mexico	Dec 1994	54.6%
Argentina	Mar 1995	0%
Bulgaria	Feb 1997	100.98%
Czech Republic	May 1997	5.44%
Thailand	Jul 1997	24.34%
Malaysia	Jul 1997	4.19%
Indonesia	Aug 1997	16.78%
Korea	Dec 1997	45.64%
Russian Fed.	Aug 1998	26.72%
Ukraine	Sep 1998	51.11%
Moldova	Nov 1998	55.41%
Kyrgyz Republic	Nov 1998	19.40%
Georgia	Dec 1998	16.8%
Brazil	Jan 1999	64.08%

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Part III.

International Liquidity, and the Cost of Currency Crises

Mateusz Szczurek

3.1. Introduction

Calls for higher foreign liquidity holding [Feldstein, 1999; Mishkin, 1999; Radelet and Sachs, 1998] require a serious theoretical and empirical analysis of benefits and costs of maintaining high liquidity. The paper aims at evaluating the optimal level of foreign exchange reserves with respect to currency crises in emerging markets. Simple policy optimisation model is presented, which is then evaluated empirically.

The crises (including big crises) are nothing new [see excellent survey in Bordo and Schwartz, 1999, which describes currency crises since 1830], but they appear to elude the attempts to model them. Many crises of the 1930s, speculative attacks of the late Bretton-Woods era and the ones troubling Latin American economies in 70s and 80s could well be explained by early, "first-generation" models [1] in which crisis erupts as a result of a macro-economic policy incompatible with fixed exchange rates. The catastrophes of the 1990s often require a different apparatus. Thus appeared "second-generation" models in which rational government chooses (or not) to devalue, in an utility optimising process and in which rational agents try to predict government choices [2]. Other models (generation not yet given) started also to appear: liquidity models [e.g. Chang and Velasco, 1999], moral hazard [Dooley, 1997; Krugman, 1998; Corsetti, Pesenti and Roubini, 1999] and others. Second generation, as well as later models often allow for analysing new features, crucial for understanding the currency crises of the 1990s. They include contagion, multiple equilibria, self-fulfilling attacks, and crisis propagation.

As always, along formal models aiming at explanation of what happened, post mortem accounts of the crises, together with policy advice were being published [3]. The policy recommendations stated in these papers are surpris-

ingly similar. They can be summarised in the following points:

- Fixed exchange rates are dangerous (country can have only two out of capital mobility, freedom of monetary policy and fixed exchange rate),
- Banks should be very closely supervised, foreign participation in the sector would help,
- In the absence of international lender of the last resort, and with a possibility of self-fulfilling attacks, international liquidity is the key to self protection.

The last point indeed seems to make perfect sense: even with less-than perfect macro policy, the government could survive any speculative attack, provided it has enough "foreign exchange ammunition". What is more, if the reserves are high enough, the attack (bound to fail) will never happen. The simple argument for higher reserves is not obvious, however.

First, in monetary terms sterilised intervention (and foreign exchange interventions are very often sterilised) should not matter that much for the exchange rate. The main problem here is that sterilisation increases the potential for hot money outflow – "multiplies the enemy with the same amount of ammunition" to stick with the military parable. If the foreign exchange intervention is not sterilised, the economy (and the banking sector in particular) must be able to survive a serious liquidity squeeze (which could have worse effects than devaluation itself).

Second, in fixed exchange regime "sufficient liquidity" may mean foreign exchange reserves close to money supply. Any level of reserves smaller than this does not fully eliminate the "attack" equilibrium, as not only foreign investors, but also residents could choose to exchange domestic for foreign currency. It may well be that relationship between foreign exchange reserves and probability of a crisis is not linear at all – it would be plausible that a country with very high reserves would enjoy almost zero probability of a speculative attack. Reserves even marginally smaller than that could warrant much higher risk.

[1] Including Krugman (1979), Flood and Garber (1984).

[2] See e.g. Obstfeld (1994, 1996), Velasco (1996) Ozkan and Sutherland (1998), Drazen (1999).

[3] Feldstein (1999), Mishkin (1999), Obstfeld (1998), Edwards (1999), Kamin (1999), Radelet and Sachs (1998) are just a few.

Finally, liquidity is costly. Even if the government issues international debt solely for the purpose of building up the war chest of international reserves (with the annual cost of the spread over the US Treasuries) the gain in terms of liquidity will be limited because of the additional build-up of obligations. If the proper measure of liquidity includes the level of short-term debt, borrowing short to build up reserves will make little sense. Still, provided the international reserves are built up with the long-term bonds, an increase of international liquidity is feasible.

The problems indicated above should not lead to a conclusion that reserves do not matter. Empirical studies suggest that there is significant evidence that international liquidity was a good predictor of the recent crises [4]. So far, however, there has been little research done to link theoretical models with econometric research.

Thus, the following chapter tries to establish the theoretical relationship between foreign exchange reserves and currency crises. Existing currency crisis models are reviewed, starting from Krugman (1979) "first generation" crisis model through several "second generation" optimising government models. New models dealing explicitly with international liquidity [like Chang and Velasco, 1999] are then evaluated.

The paper will then include a short survey of empirical study in which international liquidity plays a role.

After the review of the theoretical, as well as the empirical literature, a simple model of optimising government will be presented. In the model, international reserves are the only variable under the direct control of the policy-maker, which tries to minimise the probability of a currency crisis, having in mind the costs of foreign exchange reserves. Using the structure presented it is possible to estimate the implicit reputation cost of the prospective currency crash to the policy-maker.

The final step was empirical testing of the model. Pooled logit regression study was performed to check if different measures of international liquidity help in surviving emerging market crises [5], and an attempt was made to approximate a reasonable amount of foreign exchange reserves in such countries. Developed markets currency crises rarely seem to be resulting from poor liquidity nowadays. Not only the level of international reserves they hold is usually higher than in the emerging economies, but more importantly, the solvency of industrialised countries' governments is never in question, therefore such countries enjoy easy access to international credit even in times of distress. Other equa-

tions of the model were also estimated, which allowed for a numerical estimation of reputation costs of the crisis to emerging economies' authorities.

The results confirm the appropriateness of the model's foundations. Almost all the parameters of the model (estimated over the sample of emerging market countries) behave as predicted by the theory. It allowed for estimation of the curve of reasonable holdings of the foreign exchange reserves. Assuming that a currency crisis costs only 1% of the GDP, the FX reserves should be 1.64 times higher than the foreign short-term debt (as reported by BIS). Given the conservative estimation of the crisis cost, this recommendation clearly exceeds the IMF's prescription of reserve/short term debt ratio equal to one. Another result was the evaluation of the weight the governments/central banks of the countries give to the risk of a currency crisis. The results show that the policy makers of the emerging economies "value" a currency crisis at between 5 and 0.3% of the GDP. Surprisingly, the actual number does not seem to be correlated with the exchange rate arrangements.

3.2. Foreign Exchange Reserves in Crisis Models

3.2.1. A Survey of Literature

Beginning of the currency crisis literature is attributed to Krugman (1979) classic, later simplified and extended by Flood and Garber (1984) and surveyed in Agenor et al. (1992) [6]. So called first generation crisis models base on exhaustible resource literature originating in Hotelling (1931). The first generation crisis occurs as a result of an unreformable macroeconomic policy incompatible with fixed exchange rate. In Krugman's example the policy is the one of excessive fiscal deficits, monetised away. The international reserves are quite central to the analysis: they take the role of exhaustible resource in the equivalent model of Salant and Henderson (1978). Incompatible macroeconomic policy causes gradual depletion of reserves. Fixed exchange regime can last only until foreign exchange reserves reach certain critical level. The model predicts, however, that the end comes earlier than that. Rationally thinking speculators attack and buy all remaining stock of reserves as soon as the shadow price – the price which

[4] Radelet and Sachs (1998), Tornell (1999), Bussiere and Mulder (1999), IMF Early Warning System.

[5] The literature on the subject is vast. Excellent survey of pre-1997 results is provided in Kaminsky, Lizondo and Reinhard (1997). New research include: Tornell (1999), Rodric and Velasco (1999), Bussiere and Mulder (1999), Glick, Reuven and Rose (1999), Radelet and Sachs (1998), Chinn, Doo-ley and Shrestha (1999), and Tanner (1999). Still, each new crisis (and each new theory) provide some more scope for further research.

[6] Balance of payments models are older than that though. Mundell (1960) shows an example of a general equilibrium model in which abandonment of a peg depends on the level of international reserves.

would prevail without central bank fixing the exchange rate reaches the official rate. The regime turns smoothly to a float (exchange rate does not jump, only the level of reserves).

Second generation models (a good example is shown in Obstfeld 1994) addressed serious drawbacks of the first generation models [7]. First, the governments and central banks of the models building on Krugman (1979) were like lemmings: once engaged in a policy incompatible with fixed exchange rates, they were heading for the disaster of reserve depletion. In reality, the governments have more options: for example, they can change their policy when balance of payments gets worse, or devalue without depleting the reserves first. The second-generation models allow the governments to optimise. The loss function usually includes the exchange rate and some variable dependent on both actual depreciation and the prior public expectations of depreciation. In two models presented in Obstfeld (1994), the variable is a level of taxation (dependent on nominal interest rates, and thus on public expectations of nominal depreciation), or unemployment (dependent on agents' wage setting decisions, and thus nominal depreciation).

The circular causality indicated above gives rise to fascinating properties of second-generation models. Exchange rate regimes that at first glance may seem to be perfectly viable may suddenly collapse simply because they are expected to. The possibility of multiple equilibria and self-fulfilling attacks fits very well with crises like 1992 ERM collapse. Important feature of most of the second-generation models (which is often overlooked) is that self-fulfilling attacks cannot occur for any value of fundamentals. Usually, there is a range of fundamentals for which an attack is impossible, a range for which the attack is certain, and a range in which both "attack" and "calm" equilibria are possible.

What is the role of international reserves, so central to first generation models, in the second-generation alternatives? Many models of the second kind, and indeed the ERM crisis itself seem to suggest that reserves do not matter at all. The British problem of 1992 was not about being able to defend the currency, but about Britain not wanting to do it. Britain had plenty of reserves, could borrow more from other European central banks, or could decrease the money supply and defend the pound a long time (as it had been doing before the 1st World War). ERM crisis erupted because the speculators believed Britain would have found defending the pound unprofitable if attacked.

A simple explanation of the possible role of the international reserves is shown in Obstfeld (1996), and reproduced in Figure 3-1.

In a simplified model, Obstfeld envisages three agents: the government (selling foreign reserves to fix the currency's exchange rate), and two investors who either hold to their local currency assets, or sell them draining reserves. When the reserves (which serve as a measure of the government's commitment to the peg) are high enough to sell absorb both investor's selling-out of the domestic assets, the only Nash equilibrium in the one-shot non-cooperative game is the "no crisis" equilibrium. When the reserves are insufficient to satisfy even one of the traders, then it is optimal for each one of the investors to force devalue the currency and get some profits. The most exciting situation is when the currency is devalued only when both traders sell. Then two equilibria exist – it is optimal for trader 2 to attack the currency only when trader 1 does so. Without the attack, the peg may last forever, when attack occurs, the peg fails.

The simple model above served only as an example of multiple equilibria in foreign exchange markets. But other, full-fledged, second generation models exist, which stress the importance of international liquidity. Sachs et al. (1996)

Figure 3-1. Reserves determine the range of possible equilibria

		Trader 2				Trader 2					
			Hold		Sell				Hold	Sell	
Trader		Hold	0,0		0,-1	Trader		Hold	0,0	0,2	
I		Sell	-1,0		-1,-1	I		Sell	2,0	½,½	
(a) High Reserve game						(b) Low Reserve game					
		Trader 2				Trader 2					
			Hold		Sell				Hold	Sell	
Trader		Hold	0,0		0,-1	Trader		Hold	0,0	0,-1	
I		Sell	-1,0		3/2,3/2	I		Sell	-1,0	3/2,3/2	
(c) Intermediate Res. game											

Source: Obstfeld (1996)

[7] For other models of this kind see e.g. Obstfeld (1996), Velasco (1996) Ozkan, Gulcin, and Sutherland (1998), Drazen (1999). A survey is provided in Eichengreen, Rose and Wyplosz (1996).

provides one example, in which the fundamental, which governs the possibility of a successful attack, is the net level of debt the government holds. Thus, sufficiently high level of reserves (net of government debt) makes an attack impossible to succeed. Such a model seems to explain the stylised fact of relative crisis immunity of highly liquid developing countries.

Asymmetric information was quite early identified as an important factor behind financial crises. Asian crisis provided another example of how moral hazard (resulting from implicit government guarantees) can cause over-investment, excessive risk taking and a currency crisis. One of the advocates of the asymmetric information roots of many financial crises was Mishkin (1998).

Right after the eruption of the Asian crisis, Paul Krugman (1998) suggested a moral hazard explanation to the crisis. His idea, in principle, was that implicit public guarantees for the private enterprises generated excess demand for risky investments. The firms (and their foreign creditors) were confident that if their project fails the government would bail them out. Of course, such logic cannot work in the economy-wide scale. When things went badly for East Asia (depreciation of the yen against the dollar, fall in semiconductor prices, etc.) too many projects started to fail. The government was not able to bail out everyone, short term foreign financing dried out and the currency plunged. Pesenti and Roubini (1999) present a formalised version of this model.

Dooley (1997) shows a similar story in his "insurance model." The latter model is especially interesting as it suggests that high international liquidity can actually cause a deterministic cycle resulting in a violent crisis. The mechanism suggested by Dooley works as follows.

Once (1) the government of a country has incentives to bail out domestic borrowers, (2) the government has a positive net worth, and (3) capital account is sufficiently liberalised, the crisis cycle starts. Domestic residents compete to borrow foreign money (knowing that the government will provide free insurance, and will bail them out anyway if they fail to pay – see 1 above), driving the domestic yield upwards. Foreign creditors seeing that the government is (1) willing and (2) able to pay the insurance premium if their borrowers fail to pay use (3) the liberalised capital account to pump in the funds. As soon as the overall liabilities (including the implicit liabilities) of the government exceed available assets (these are not growing in line with liabilities because of moral-hazard induced excessive yield), the foreign creditors rush to claim their insurance premium. Regardless of the exchange rate regime, resulting sudden outflow of capital causes severe fiscal costs.

Recent years brought to the light several models dealing explicitly with (lack of) international liquidity as a factor behind foreign exchange crises. Typical model of this kind is presented in Chang, Velasco (1999). The model is based on

the work on bank runs of Diamond and Dybvig (1983). In the models, the banking sector works as a term-structure transformer, and as such has a structural asset-liability term mismatch. Because banks deal with many clients, they can use law of large numbers to optimise their term structure, amount of reserves held, and long-term investments undertaken. The optimised (in terms of expected profit) amount of reserves, however, usually gives rise to a multiple equilibrium solution. Either an outcome superior to the private competitive (without bank inter-mediation) equilibrium prevails, or run on banks happens. Because the small liquidation value of the non-liquid assets, this outcome is usually worse than the private competitive solution.

The translation of such a model of a bank run to the world of foreign exchange crises is then quite straightforward. If foreign depositors decide to run on the (insufficiently liquid) banking sector, either banks fail (if the central bank does nothing), or fixed exchange system collapses (if the central bank provides liquidity to the sector by printing money after using up insufficient foreign exchange reserves). The level of international liquidity is crucial, the more international reserves the central bank has, the less severe banking/currency crisis is. Floating exchange rate regime does seem to ease some problems of insufficient liquidity, but only if majority of debt in the economy is in local currency. The problem faced by most of the emerging markets, however, is foreign debt denominated in foreign currency (also, foreign exchange crisis influences the quality of domestic-currency debt, as it can hit the value of collateral, see e.g. Mishkin, 1998).

The class of models does not only explain how runs on insufficiently liquid banking sectors can translate into currency crises. It also shows that the overall liquidity level held by the sector may be optimal from expected return point of view, but it may still give rise to a switch to a crisis equilibrium. While it is quite easy to remain liquid, it is rational (certainly for individual banks, but also often for the economy as a whole after taken into account the social cost of the systemic crisis) to have some maturity mismatch. Similar argument applies to the term structure – high short-term indebtedness may be individually rational (although it can be socially inferior to long-term debt) – see Rodric and Velasco (1999).

Other models explicitly dealing with liquidity include: Goldfajn and Valdez (1997), Chang, Velasco (1998ab), and Krugman (1999).

3.2.2. A Survey of Empirical Results

The importance of the international liquidity in preventing or easing the currency crises shown in the theoretical models was also confirmed in many empirical studies. In an extensive research of 117 currency crashes Frankel and

Rose (1996) concluded that variables important for predicting currency crises (defined as 25% depreciation of the local currency) include FDI/debt ratio, level of international reserves, high domestic credit growth, increase in world interest rates, real exchange rate overvaluation, and recessions. Current account and fiscal deficit were found to be insignificant.

A study in a similar, univariate spirit was conducted recently by Aziz, Caramazza and Salgado (2000). In the study based on 50 countries in a sample spanning from 1975 to 1997 they found that out of the most of the 157 crises recorded were preceded by a fall in international liquidity (M2/international reserves).

Sachs, Tornell, and Velasco (1995) also show that M2/international reserves coupled with weak fundamentals rendered the countries vulnerable to contagion effects following the Mexican crisis.

In another study, Tornell (1999) presents three determinants of the vulnerability of economies to the currency crises: weakness of the banking sector, real appreciation of the local currency and international liquidity. Tornell found that some non-linear dependencies between the variables. For example, if international liquidity is high enough, than even significant real appreciation or banking sector fragility do not matter.

Bussière and Mulder (1999) point to the importance of international liquidity (defined as short term foreign debt to reserves ratio) in predicting the depth of a currency crisis. This variable, together with real appreciation of the local currency over the preceding four years, current account deficit and lack of an IMF support programme was able to explain much of the depreciation of the emerging markets' currencies during the recent contagious crises. What is more, multiplicative specification of the model (where international liquidity dominates the overall vulnerability index when it is very low or very high) seemed to perform even better.

Rodric and Velasco (1999) present yet another proof that low international liquidity actually welcomes a currency crisis (defined as a sharp reversal of capital flow) [8]. Their probit analysis shows that short term debt/reserves ratio (especially short term debt to foreign banks) significantly increases the probability of a crisis. Interestingly, the level of long-term and medium-term debt is significantly negatively correlated with the probability of a crisis. The explanation for this could be that long-term debt is associated with other, positive, country attributes (omitted from

the analysis). Rodric and Velasco also find out that short-term debt to international reserves ratio helps in explaining the severity of the foreign exchange crises (measured as a GDP cost or depreciation).

The above survey of the literature touched upon an important problem in measuring the crisis vulnerability – definitions of the crucial variables. The problem starts very early: how do we define a currency crisis? Table 3-1 summarises how different authors defined a currency crisis.

Similar "definitional" problem relates to the international liquidity. In a sense, the problem is deeper here, as it involves not only subjective view of what we call a crisis (as in the previous case), but also the economic theory. We can broadly define international liquidity as the ability of a central bank / economy to survive a temporary capital flow reversal without serious macroeconomic (e.g. exchange rate or GDP growth) consequences. Translating such a definition into the world of available indicators is difficult. One side of the equation (international assets available on short notice) is quite easy to determine – in a vast majority of cases it is defined as the stock of international reserves [9].

The problem starts with the definition of "hot" liabilities. How many obligations the central bank may be forced to honour depend on many factors. For example, under a fixed exchange rate regime the central bank should theoretically be able to buy all the money stock for dollars (or other reserve currency) from the public. How much the central bank should actually be ready to buy out depends on e.g. the level of dollarisation of the economy. In countries like Bosnia and Herzegovina, DM can easily be used for transactional purposes, thus in times of foreign exchange distress, the transactional demand for local currency will be close to zero. Therefore in such country the central bank must be prepared to buy out the entire money stock from the public.

Weak banking sector enlarges the potential liability of the central bank (banking sector panic requires a boost in money supply, which may lead to depreciation). Similarly, the implicit guarantees towards the private corporate sector increase requirements for the overall liquidity of the government/central bank. Asian difficulties, modelled in Krugman (1999), and Dooley (1997) are a good example of this. Thus, while it seems plausible that sovereign short-term debt should carry slightly bigger weight than private sector liabilities, the latter should be far bigger than zero. The private sector debt is likely to drain the

[8] Radelet and Sachs (1998) reach similar conclusions in their study, which employs similar methodology.

[9] Sometimes an international support may effectively increase the international liquidity (see the regression results in Bussière and Mulder who show that IMF support programmes reduce the vulnerability). On the other hand, the official foreign exchange reserves are sometimes more than the actual available assets. For example, central banks do not report their off-balance sheet obligations. Simple forward transactions (an obligation to e.g. sell foreign exchange in the future) are not represented in official reserves statistics. Central banks may also invest their foreign exchange in illiquid, or excessively risky assets. Blejer and Schumacher (1998) advocate the use of Value-at-Risk approach to assess the central bank vulnerability. For some statistics on discrepancy between official reserves and actually available assets see Aizenman and Marion (1999).

Table 3-1. Definitions and measures of a currency crisis in empirical literature

Article	Discrete/ Continuous	Definition
Rodric and Velasco (1999)	Discrete/ Continuous	1 if net private capital flow/GDP changes from positive to negative by at least 5 percentage points. Also, fall in GDP in the year of the crisis, and depreciation (both conditional on the crisis).
Bussière and Mulder (1999)	Continuous	Weighted average of nominal depreciation and reserve outflow
Frankel and Rose (1996)	Discrete	25% depreciation vs. US\$ + 10% higher depreciation rate than a year before
Meese and Rose (1996)	Discrete	As above
Tanner (1999)	Continuous	Depreciation + reserve loss/money supply
Eichengreen, Rose and Wyplosz (1996)	Discrete	Crisis when an index of weighted average of exchange rate, interest rate differential and reserve/M1 differential change (weights to equalise variance of the three components), reaches mean + 1.5 std. Deviation
Aziz, Caramazza and Salgado (2000)	Discrete	crisis when an index of weighted average of detrended fx and reserve change (weights to equalise variance of two components), reaches mean + 1.5 std. Deviation
Glick and Rose (1999)	Discrete	Financial Times, journalistic and academic histories suggesting if the country was, or was not a victim of a particular crisis episode.
Ötoker and Pazarbasoglu, (1997)	Discrete	Crisis if there is a regime change (devaluation, widening of the band, a switch to flexible rates)
Goldfajn and Valdés (1997)	Discrete	Three measures: 25% depreciation (as in Frankel and Rose, 1996), 2 std.dev from the mean jump in real effective exchange rate, exchange rate market pressure index, as in Kaminsky and Reinhart (1996)
Van Rijckeghem and Weder (1999)	Discrete/ Continuous	binary variable (as in Glick and Rose, 1999), or market pressure (weighted average of depreciation, % decline in reserves, and normalised change in interest rates)

Source: author

reserves in any case, especially if the exchange rate regime is rigid.

Probably, the most often used measure of hot liabilities is Bank for International Settlements' (BIS) statistic of short-term debt in the foreign banking sector. This measure is available for most of the emerging market countries in semi-annual frequency, which makes it the statistic of choice for most of the cross-country estimations of international liquidity [Bussière and Mulder, 1999; Tornell, 1999; Radelet and Sachs, 1998; Rodric and Velasco, 1999]. Even disregarding the domestic liabilities of the central bank, this short-term debt measure is obviously biased downwards. For example, a five year treasury bond held by a foreign fund is not included (the liability is more than one year, and moreover it is not versus the foreign banking sector). Similarly, portfolio equity investments can flow out of the country in minutes, but they are not included in the BIS statistic as a short-term liability.

Money stock is clearly the upper limit for the short-term liabilities of the central bank, provided the M2 does not grow during the crisis as a result of sterilised foreign exchange interventions [10].

3.3. International Liquidity: Simple Model

3.3.1. Crisis and its Costs

The model stands on somewhat "empirical" assumption, which, on one hand, may be questionable from the strictly theoretical point of view, but on the other, are the most widely used formulation in the literature on the leading indicators of the currency crises. The assumption is that the probability of a currency crisis happening in time t ($y_t = 1$) is equal to:

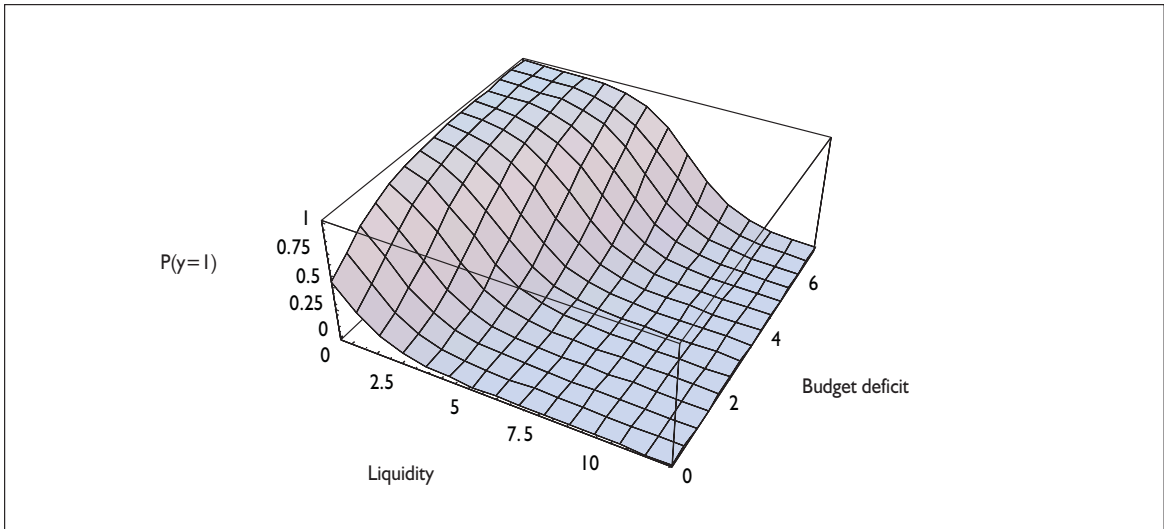
$$prob(y_t = 1) = \frac{e^{(\alpha + \beta I_{t-1} + \gamma REER_{t-1} + \delta G_{t-1})}}{1 + e^{(\alpha + \beta I_{t-1} + \gamma REER_{t-1} + \delta G_{t-1})}} \quad (3.1)$$

where I is international reserves, $REER$ is real effective exchange rate overvaluation, and G is the budget deficit. α , γ , $\delta > 0$, $\beta < 0$.

While no foreign exchange crisis model yield the exact probability function, the formulation above can be justified on two grounds. First, it is not incompatible with neither of the two generation of currency crises, and it has much in

[10] Sarno and Taylor (1999) try to measure the degree of capital flows persistence, or "hotness" of different types of capital flows. Not surprisingly they find portfolio flows (bond and equity) the least persistent, and FDI flows the most long-term.

Figure 3-2. Probability of a crisis vs. international liquidity and a budget deficit



common with the liquidity models based on bank-run literature [see e.g. Chang and Velasco, 1999]. Secondly, because the function is so widely used in the empirical study, it can be claimed that it is believed by both policy-makers and the creditors to be true representation of the currency crisis risk. It suffices for the analysis of the policy-maker's optimization that follows.

The functional form of the crisis probability function has powerful implications for the policy options faced by the government/central bank. In particular, regardless on how bad the fundamentals are, the central bank could come up with liquidity in $t-1$ sufficiently high to prevent the crisis in time t , as shown in Figure 3-2.

A crisis in period t results in real depreciation in the same period. This is the only effect of the crisis on the fundamental variables. The scale of the crisis-triggered depreciation is a function of the liquidity and the other country-specific variables in $t-1$.

$$REER_t = \begin{cases} REER_{t-1} & , \text{if } y_t = 0 \\ REER_{t-1} - (\phi + \lambda l_{t-1} + \mu REER_{t-1} + \theta G_{t-1}) & , \text{if } y_t = 1 \end{cases} \quad (3.2)$$

where $\mu, \theta > 0; \lambda < 0$

A crisis and devaluation/depreciation is possible even with undervalued real exchange rate, provided international liquidity, or other fundamentals are bad enough. Formulation above ensures that the two consecutive crises in a country are possible, yet unlikely – the worse the fundamentals leading to the first crisis, the bigger the depreciation, and bigger the improvement in the external stability outlook in the following period.

A crisis in time t results in certain costs χ_t to the economy and the policy makers. One could argue that the cost

should be some function of the severity of the crisis (or misalignment of the fundamental variables and insufficient liquidity), reflecting the adjustment costs (presumably higher with high current account deficit, high public debt growing in line with real exchange depreciation), distress to the banking system, etc. This type of cost can be observed empirically as, e.g., the deviation of the post-crisis GDP growth from its long-term trend.

The overall crisis cost to the policy-maker, however, includes a second type of cost: reputation loss. It is much more difficult to assess empirically in an explicit way, no explicit form of the total crisis cost function will therefore be considered here. Presumably, the reputation cost is the function of the degree of the rigidity of the foreign exchange regime, and the length for which the regime was maintained, past inflation experience, but also personality of the central banker, etc.

The actual expected gain from the additional unit of reserves in $t-1$ is therefore:

$$\frac{\partial E(\chi_t)}{\partial l_{t-1}} = \frac{\partial P(y_t = 1)}{\partial l_{t-1}} \chi_t = \frac{\beta e^{(\alpha + \beta l_{t-1} + \gamma REER_{t-1} + \delta G_{t-1})}}{(1 + e^{(\alpha + \beta l_{t-1} + \gamma REER_{t-1} + \delta G_{t-1})})^2} \chi_t$$

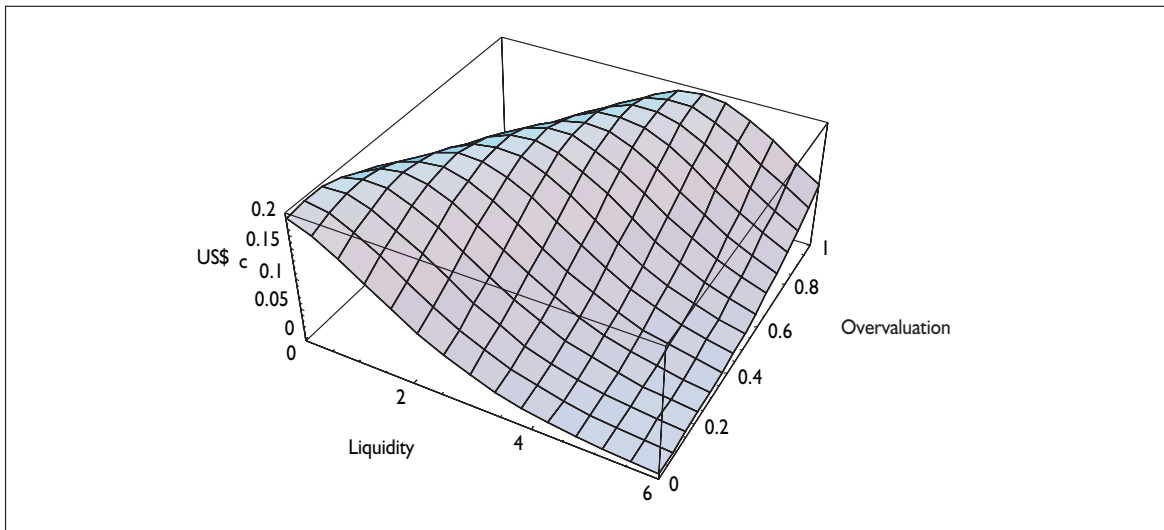
where $\chi_t < 0$, (3.3)

which is the decrease in expected value of the policy maker's crisis cost in t as a result of the higher international liquidity in $t-1$. Apart from the liquidity's influence on the financing costs (considered in the following section), this is the only benefit from international reserves in the model.

The marginal gain reflects the shape of the probability surface, and looks as in Figure 3-3 (assuming cost independent of REER).

The peak of the marginal return to reserves is reached for higher levels of liquidity as the fundamentals get worse.

Figure 3-3. Marginal return to international liquidity vs. liquidity and REER



The reason is that when fundamentals are really bad, a marginal increase in liquidity from zero will not markedly reduce the probability of the crisis. Alternatively, if the fundamentals are really good, an increase in already high liquidity will not reduce the probability of a crisis, because it is very close to nil anyway.

3.3.2. International Liquidity and its Cost

At each non-crisis point of time, the policy maker faces the following choice: he can either keep his foreign exchange reserves (receiving international yield i^* and benefiting from the increased security it brings), or he can get rid of them using the cash to pay off its foreign debt, avoiding paying interest i . We assume that when there is no run on the currency, the policy maker can both easily borrow on the international bond markets and get down with its international debt up to the size of foreign exchange reserves (to allow a possibility to vary international liquidity between zero to infinity).

The real alternative cost of the foreign exchange reserves is thus the difference between the country's international bond and US treasury yield, equal to $i-i^*$, which is the country risk premium over the international borrowing rate. This is the only cost of holding foreign exchange reserves. The way the reserves are acquired does not mat-

ter, to the policy maker's choice – it can always run down or increase his reserves holding afterwards [11].

The risk premium faced by the policy makers depends on the credit assessment by the foreign investors, which is directly related to the probability of the crisis:

$$i - i^* = \varepsilon + \xi P(y_t = 1) \tag{3.4}$$

Because an improvement of the credit assessment makes servicing the existing foreign debt cheaper, the marginal, immediate cost of reserves π_t is:

$$\pi_t = \frac{\partial[(i - i^*)(l_{t-1} + D_t)]}{\partial l_{t-1}} = (\varepsilon + \xi e^{\alpha + \beta l_{t-1} + \gamma REER_{t-1} + \delta G_{t-1}}) \frac{[1 + e^{\alpha + \beta l_{t-1} + \gamma REER_{t-1} + \delta G_{t-1}} + \beta(l_{t-1} + D_t)]}{(1 + e^{\alpha + \beta l_{t-1} + \gamma REER_{t-1} + \delta G_{t-1}})^2} \tag{3.5}$$

where D_t is the amount of foreign debt to be rolled over in t . Because β is less than zero, it is possible that π_t falls below zero, given the existing debt is high enough.

We assume the level of taxation constant, so an increase in international liquidity in $t-1$ increases G_t by π_t .

The immediate cost of reserves is not the only cost faced by the policy maker. Second round effects also play a role. There are two dynamic problems to worry about.

[11] Somewhat more subtle point is how international liquidity is defined. If it is just foreign exchange reserves, or foreign exchange reserves scaled by M2, the annual cost of "a unit of liquidity" is $i-i^*$ (possibly scaled up by a constant). If it is the ratio of foreign exchange reserves to the foreign short-term debt (as in most of the recent empirical work), the cost is higher, because the bonds become a short term obligation one year ahead of the maturity. The average annual cost then becomes larger by $\frac{m}{m-1}$, where m is the maturity of the benchmark international bond of the country. The effect becomes insignificant when the bonds are sufficiently long maturity, and does not change the overall results qualitatively.

First, is the obvious negative impact of debt servicing costs on budget deficit in the subsequent period [12]. This negative effect can be counterbalanced by reserve borrowing higher by $\frac{\delta\pi_t}{\beta}$, at a cost of $\frac{\pi_{t+1}}{1+r}$, where r is the policy maker's discount rate.

Second cost is much less straightforward, and is related to the fact, that crises in t and $t+1$ are not independent events. A crisis in t makes the subsequent crisis less likely, because of the real depreciation assumed in (3.3) [13]. Therefore, by borrowing reserves in order to protect the country from a crisis in t , we make the crisis in $t+1$ more likely, because the probability of the "cleansing" effect of the crisis in t decreases. The amount of the reserves needed to counterbalance the effect is equal to:

$$\frac{\partial P(y_t = 1)}{\partial l_{t-1}} \gamma \frac{[\phi + \lambda_{t-1} + \mu REER_{t-1} + \theta G_{t-1}]}{\beta}$$

To complete the analysis one should take into account higher debt service cost in subsequent periods caused by the above-mentioned additional borrowing. The marginal total cost MTC of reserves, therefore, is equal to:

$$TC = \pi_t + \pi_{t-1} \frac{-\frac{\partial P(y_t = 1)}{\partial l_{t-1}} \gamma (\phi + \lambda_{t-1} + \mu REER_{t-1} + \theta G_{t-1}) + \delta}{-\beta(1+r)} * \sum_{n=0}^{\infty} \left(-\frac{\delta\pi}{\beta(1+r)} \right)^n \quad (3.6)$$

Quite clearly, the discount rate r matters. Large r means that the effects of future budgetary costs, and the lack of cleansing effect of the quick crisis do not bother the policy maker much. One could argue that the optimal r , which should be close to the inter-temporary consumption discount rate (probably related to the average real interest rate), may be completely different to the policy makers' r . For example, if the government is on its way to loose the elections, it could risk postponing the (almost) inevitable currency crash, by borrowing foreign exchange reserves at a large cost, and making the crisis virtually certain, but only after the elections. In such case (3.6) collapses to (3.5).

3.3.3. Optimisation Problem

Combining (3.3) and (3.6) we are able to complete the analysis. Optimising policy maker tries to minimise the following loss function by targeting the liquidity level:

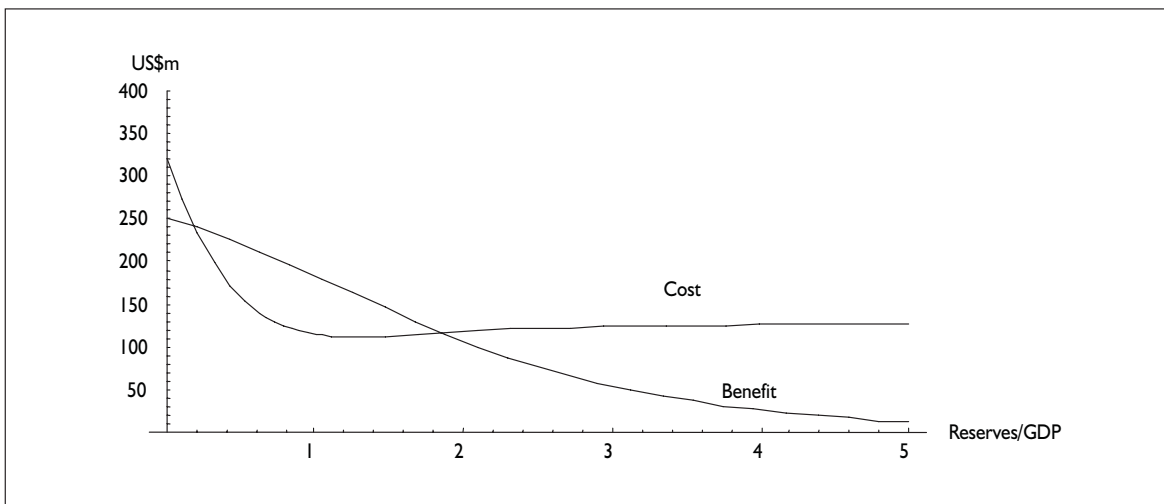
$$L(l_{t-1}) = \int_0^{l_{t-1}} MTC dl_{t-1} + \int_0^{l_{t-1}} \frac{\partial E(\chi_t)}{\partial l_{t-1}} dl_{t-1} \quad (3.7)$$

First term of (3.7) is the total cost of reserves (the area below the cost curve in Figure 3-4), while the second is (minus) total benefit from reserves.

Unfortunately, the problem is not solvable analytically.

There are two possible equilibria. One is at international liquidity equal to zero. Increasing liquidity costs more than it brings (fundamentals are too bad for a slight improvement of liquidity to change the probability of a cri-

Figure 3-4. Evaluating optimal international liquidity - marginal cost and benefit



[12] Clearly this cost can be negative in a special case, when marginal costs are also negative, i.e., when the benefits of cheaper financing outweigh the cost of the additional unit of reserves.

[13] Here, we explicitly assume lack of two effects which make a crisis in subsequent period more likely after a crisis in t . First is the feedback effect on the reserves (crisis in t results in the outflow of reserves and higher probability of the crisis in $t+1$). Second effect is the loss of reputation, which is more common than major reforms after the crisis.

sis much). The second equilibrium is in the point where downward sloping marginal benefit and marginal cost curves cross. The second equilibrium is a global minimum only if $L(l_{t-1}) < 0$. In the example above, it is clearly the optimal level of liquidity: the total gain (which is the surface below the marginal benefit curve) exceeds the total cost.

The model has several advantages:

1. It takes into account not only the obvious costs of liquidity, but also the dynamic effects – the costs of postponing the crisis.

2. It is relatively straightforward to estimate. The benefit function (logit analysis of the reserves' impact on the probability of the crisis) is deeply rooted in the existing literature on leading crisis indicators. Similarly, data for the depth-of-crisis function, and interest rate premium relationship is widely available for a wide range of countries.

3. The model allows for an estimation of the reputation cost of the foreign exchange crisis (which is the only missing data in the whole structure).

3.4. Empirical Application

The above model was used for two applications. First, we tried to estimate what is the optimal (safe, and reasonably cheap – "best value for money") holding of international liquidity. This requires certain assumption regarding the perceived cost of the currency crisis.

Second application involve finding out what is the perceived cost of the currency crisis to the policy-maker. By assuming the countries analysed hold optimal (from the point of view of the policy maker) international liquidity, we are able to estimate "how much the crisis is feared", or the total cost the currency crisis (including the reputation cost), as viewed by the policymaker.

3.4.1. Data

The macro data for the empirical section comes mostly from the IMF IFS CD-ROM. The variables used were:

Y, crisis dummy, calculated as in Eichengreen and Rose (1997). *Y* equals to one when weighted average of nominal depreciation versus US\$ and foreign exchange reserve loss exceeds 1.5 times standard deviation of the pooled exchange market pressure index.

REER, a measure of exchange rate overvaluation. It is calculated as a percentage deviation from the long-term (1980–2000, or shorter when early real exchange rate data not available) quarterly trend. Positive number means appreciated real exchange rate.

LLBIS, a measure of international liquidity, calculated as a ratio of foreign exchange reserves to foreign bank debt

maturing within one year (taken from BIS/OECD/WB/IMF database).

G, budget balance as a percentage of GDP.

SPREAD, benchmark bond spread over US treasury of the same maturity. This variable was taken from ING Barings' *Emerging Markets Weekly Report* tables.

The participation of a particular country in the global financial markets was the main factor in the sample selection process. Developed countries were skipped from the sample, and only emerging market countries dollar-denominated bonds of which were quoted at some stage in the 1990s were considered. The list of the countries in the sample is in the Appendix.

Two assumptions should be made for the estimation: first, the policy maker's discount rate *r* was set to 10% (the results were not very responsive to the changes in this variable), and the "reasonable" cost of the currency crisis. The latter was much more difficult to choose, as indicated in the *Crisis and its cost* section above. We avoided the problem by presenting the whole curve of optimal liquidity holding, dependent on the estimation of the prospective crisis cost.

3.4.2. The Results

The results of Equation (3.1) estimation are shown in Table 3-2.

All the parameters have right signs, but the significance of the budget balance in influencing the probability of the crisis is dubious. This allows us to drop the budget balance from the crisis probability equation, but also, we can ignore the first of the dynamic effects from the total cost equation (the impact of the debt servicing costs on the subsequent budget deficits).

International liquidity is the most significant variable in the model. The model suggests that a country with foreign exchange reserves at 30% of the short term debt, and 30% overvalued real exchange rate has over 42% chance of experiencing a currency crisis.

Next step is estimating the scope of depreciation in case of the crisis, conditional on the fundamental variables. The results of the OLS estimation are given in Table 3-3.

Again, all the parameters have correct signs, apart from the budget surplus variable, which is also not significant.

The final step is evaluating how sovereign spreads depend on the fundamentals and international liquidity. For this purpose *MODEL* variable was created from the fitted values of the crisis probability equation. The results are again consistent with the theoretical model; higher fitted probability of the crisis leads to higher spreads over US Treasuries well ahead (one year) of the prospective crisis (Table 3-4).

The overall results are satisfying, i.e. consistent with the model priors. They prove that international liquidity does matter very much in averting currency crises. The higher

Table 3-2. Probability of currency crisis function

Logit Maximum Likelihood Estimation. The estimation method converged after 6 iterations			
Dependent variable is Y			
80 observations used for estimation from 1 to 80			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	-1.1402	.57917	-1.9687[.053]
LLBIS	-.80637	.38436	-2.0979[.039]
REER	3.3720	1.8849	1.7889[.078]
G	8.6119	6.4455	-1.3361[.185]
Factor for the calculation of marginal effects = .10755			
Maximized value of the log-likelihood function = -31.3216			
Akaike Information Criterion = -35.3216			
Schwarz Bayesian Criterion = -40.0857			
Hannan-Quinn Criterion = -37.2317			
Mean of Y = .17500			
Mean of fitted Y = .025000			
Goodness of fit = .85000			
Pesaran-Timmermann test statistic = -59.4574[.000]			
Pseudo-R-Squared = .15571			

Table 3-3. Depth of the crisis function

Dependent variable is DEPR			
13 observations used for estimation from 1 to 13			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	-.20678	.064084	-3.2267[.010]
LLBIS	.14495	.051945	2.7904[.021]
REER	-.66769	.13472	-4.9560[.001]
G	-.14869	.28864	-.51513[.619]
R-Squared	.77827	R-Bar-Squared	.70436
S.E. of Regression	.10170	F-stat. F(3, 9)	10.5297[.003]
Mean of Dependent Variable	-.14778	S.D. of Dependent Variable	.18704
Residual Sum of Squares	.093085	Equation Log-likelihood	13.6585
Akaike Info. Criterion	9.6585	Schwarz Bayesian Criterion	8.5286
DW-statistic	1.4847		

Table 3-4. Domestic-foreign interest rate spread as a function of crisis probability

Ordinary Least Squares Estimation			
Dependent variable is SPREADS			
60 observations used for estimation from 1 to 60			
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CONST	166.4071	227.7070	.73079[.468]
MODEL	2840.6	947.1194	2.9992[.004]
R-Squared	.13427	R-Bar-Squared	.11934
S.E. of Regression	1124.7	F-stat. F(1, 58)	8.9954[.004]
Mean of Dependent Variable	692.5000	S.D. of Dependent Variable	1198.5
Residual Sum of Squares	7.34E+07	Equation Log-likelihood	-505.6353
Akaike Info. Criterion	-507.6353	Schwarz Bayesian Criterion	-509.7296

probability of a crisis is also (implicitly) reflected in higher yield spreads of the countries involved.

What is the right level of international liquidity to hold? The answer depends very much on the cost of the crisis – on how much the policymakers risk. While the GDP cost of the crisis

may be similar in all exchange rate regimes – capital outflow, real depreciation costs, etc. are also dangerous in a float (yet one could argue that some sort of FX risk illusion keeps the real economy's exposure to the foreign exchange risk larger in fixed exchange rate countries), the reputation cost should be

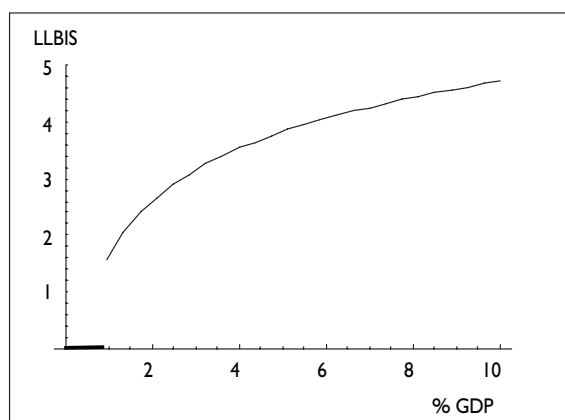
different. In the extreme float case, the central bank ignores the foreign exchange fluctuations, however rapid and large they are, the reputation cost should thus be set to zero. Another complication arises due to the fact that the government's loss function is something completely different to the "economy's loss function". One could argue that what really matters in influencing the policymakers' liquidity preferences are expected fiscal and quasi-fiscal costs of a currency crisis.

Surprisingly, the results of the next section do not support expectations of the strong influence of currency regime on the policymakers' aversion to the currency crises.

The results for the average (from the pool) country are shown in Figure 6. Vertical scale represents optimal liquidity (as a reserves/short-term debt ratio) corresponding to the assumed cost of the currency crisis (as a percentage of GDP).

The results indicate that the IMF's recommendation of keeping foreign exchange reserves stock equal to the short-

Figure 3-5. Optimal liquidity holding versus cost of the crisis



term foreign debt is insufficient. Assuming the cost of the crisis at just 1% of GDP, optimal international liquidity is 1.6 times the short term foreign debt. If we believe the crises are more costly than 1% of GDP, the reserves held be a multiple of the short-term foreign debt. It is important to stress that this prescription is applicable to the average country from the sample, and may be sub-optimal for some of the analysed economies (which, for example, suffer from excessively high budget deficit, or exchange rate overvaluation).

3.4.3. How Much the Policy Makers Fear the Crisis?

The final empirical application of the model involves finding the cost of the crisis as seen (or expected) by the policymaker. Assuming that the amount of international liquidity held by the central banks is rational (in the model sense),

we can find out how much the policymakers fear the currency crisis. The process involves finding out the value of χ (implicit estimation of crisis cost by the policymaker) for which marginal cost curve of the liquidity crosses marginal benefit curve of the liquidity at the level of actually held international reserves.

In the following analysis it sometimes happens that the cost curve has such a shape that it is impossible to find a χ , which would minimise the loss function at the desired level of the international liquidity. In such cases to gain some insight of the possible range of reputation cost χ , we assumed the largest χ for which the total benefit exceeds total cost (both integrated between 0 and the actual international liquidity held).

Table 3-5 shows the summary of the results, cost of the currency crises expected by the governments and central banks of the countries listed, as of end-99. Figure 3-6 shows graphs of the 4Q99 liquidity's marginal cost and benefits curves of the countries in the sample, as well as implicit expected crisis cost – χ (in US\$m).

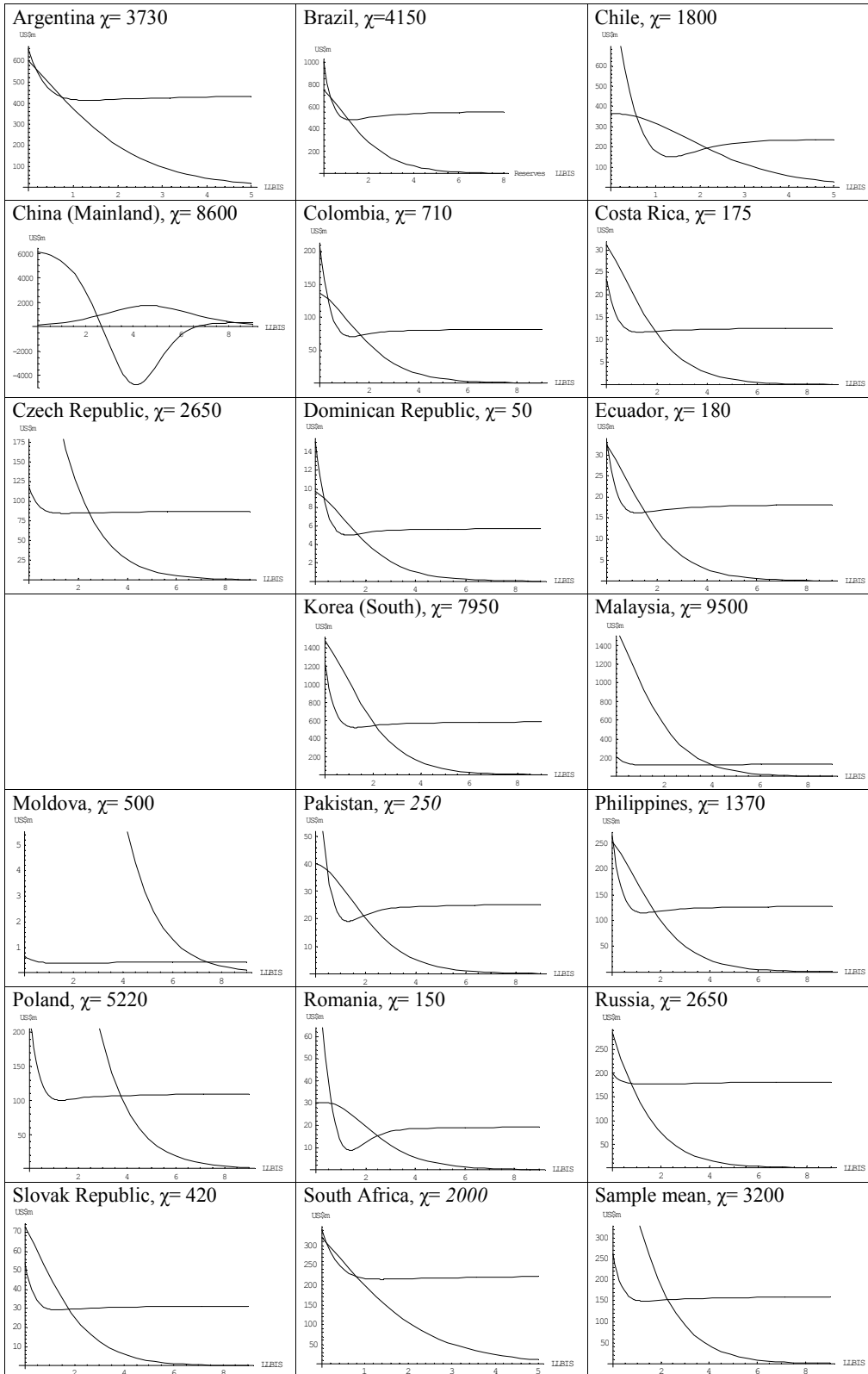
The results show quite a wide disparity of implicit currency crisis cost to the policy makers. Discarding the

Table 3-5. Crisis cost to the policy maker, as of end-99

Country	% of GDP	US\$m
MOLDOVA	43.1%	500
MALAYSIA	12.1%	9500
CZECH REPUBLIC	5.0%	2650
POLAND	3.3%	5220
CHILE	2.7%	1800
SLOVAK REPUBLIC	2.1%	420
KOREA	2.0%	7950
PHILIPPINES	1.8%	1370
SOUTH AFRICA	1.5%	2000
RUSSIA	1.4%	2650
ARGENTINA	1.3%	3730
COSTA RICA	1.2%	175
ECUADOR	0.9%	180
CHINA, P.R.: MAINLAND	0.9%	8600
COLOMBIA	0.8%	710
BRAZIL	0.8%	4150
ROMANIA	0.4%	150
PAKISTAN	0.4%	250
DOMINICAN REPUBLIC	0.3%	50

Moldova's outlier (which, most probably results from extremely low amount of short term BIS reported debt), the implicit cost estimation by the policymakers varies from 5% of GDP (Malaysia) down to 0.3% (Dominican Republic). The results seem to have little to do with the exchange rate arrangements, which is somewhat disturbing: apart from Malaysia, the first nine countries on the list have a floating or managed floating exchange rate.

Figure 3.6. Marginal liquidity cost and benefit curves in emerging markets



Appendix

3.5. Conclusions

The paper presents review of the literature on the influence of international liquidity on the incidence of currency crises. It then presents a model of optimal liquidity holding by the policy maker, in which optimal liquidity held depends on the fundamentals, international borrowing costs, and the potential cost of the crisis to the policy maker.

The model presented in the paper appears to be a promising way to deal with costs and benefits of international liquidity. Almost all the parameters of the model (estimated over the sample of emerging market countries) behave as predicted by the theory. It allowed for estimation of the curve reasonable holdings of the foreign exchange reserves. Assuming that a currency crisis costs only 1% of the GDP, the FX reserves should be 1.64 times higher than the foreign short-term debt (as reported by BIS). Given the conservative estimation of the crisis cost, this recommendation clearly exceeds the IMF's prescription of reserve/short term debt ratio equal to one.

Another set of results received thanks to the model was the weight the governments/central banks attach to the risk of a currency crisis. We found out that the policymakers of the countries analysed, behave, as if they predicted the prospective crisis would cost the budget between 5 and 0.3% of the GDP. This result includes not only explicit budgetary costs of the currency crisis, but also the reputation loss of the central bank, political losses of the government etc. To our knowledge it is the first estimation of this kind. Surprisingly, the actual number does not seem to be correlated with the exchange rate arrangements.

In case of some policy-makers the assumption of rationality (in the model sense) does not seem to hold. Given the model's specifications, some international liquidity holdings are too small to find any crisis cost value, which would make them optimal.

The paper leaves some scope for further research. Main issues worth addressing are:

- The simplicity of the foreign financing cost function;
- Enlarging the data sample. It was limited to the IMF IFS data in the paper, which reduced the sample to 24 in some equations.
- Dealing with continuous, instead of binary, definitions of a currency crisis.

Countries in the data sample:

ARGENTINA
BRAZIL
CHILE
CHINA, P.R.: MAINLAND
CHINA, P.R.: HONG KONG
COLOMBIA
COSTA RICA
CROATIA
CZECH REPUBLIC
DOMINICAN REPUBLIC
ECUADOR
HUNGARY
INDIA
INDONESIA
KAZAKHSTAN
KOREA
LEBANON
MALAYSIA
MEXICO
MOLDOVA
PAKISTAN
PANAMA
PHILIPPINES
POLAND
ROMANIA
RUSSIA
SLOVAK REPUBLIC
SLOVENIA
SOUTH AFRICA
THAILAND
TURKEY
URUGUAY
VENEZUELA

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Part IV.

Financial Systems, Financial Crises, Currency Crises

Marcin Sasin

4.1. Introduction

Many economists, among them, for example, Dornbusch (2001), stress the distinction between old-style and new-style crises. The country's external position used to be in the center of the old-style crises. The limited access to the world financial market, the cycle of overspending and excessive budgetary deficits together with the government policy to control the exchange rate quickly led to real overvaluation and unsustainable current account deficit. The foreign reserves depleted gradually. At one point the country had to undergo the external adjustment – devaluation – just because there were no more financial resources to carry on with the policy. Such crises were slow-motion events; the build-up of unsustainable situation was gradual and more or less obvious – to this extent they were highly predictable. There are also some doubts if they can be called real crises – because they usually happened in the situation of financial repression the devaluation had little consequences for the economy and the crisis was banned from spreading.

The new-style crises are characteristic to an environment of capital mobility and financially liberalized markets and are fundamentally different – their central issue is a balance sheet problem. They also involve the private sector rather than the public one. Typically, due to a mismanagement on behalf of the corporate and financial sectors the quality of the national balance sheet deteriorates – this include the imbalanced nature of asset and liabilities with respect to maturity and denomination as well as increased exposure to market and national credit risk. The country becomes vulnerable to a crisis – temporarily the balance sheets are solvent; problems are offset by high international liquidity. But when the conditions change, triggered by some minor event or market sentiment shift external, funds are suddenly withdrawn and banks and corporations not only become unable to service their obligation but the value

of their liabilities may exceed the value of their assets indicating insolvency and eligibility for bankruptcy. Such crises spread quickly and have severe impact on the entire economy – sharp growth slowdown, a currency collapse (currency crisis), the financial system breakdown are examples of possible consequences.

Financial institutions are pivotal to the problem [1]. Their unsound and irresponsible behavior makes the country vulnerable to the crisis. Therefore, the analysis of the condition of the banking system and its relationship to the rest of the economy and, in particular, the issue of the banking crisis should contribute much to the explanation of a crisis phenomenon in general.

4.2. Theoretical Aspects of Banking and Financial Crises

4.2.1. Definitions

Formally a distinction can be made among various types of crises:

- Currency crises – they are said to occur when a speculative attack on the exchange rate forces authorities to use up large amounts of foreign reserves or/and sharply rise interest rates in defense of the currency – the attack may, but not necessarily, result in a devaluation.

- Banking crisis (or a financial crisis) – indicates the situation where a number of banks (or a financial system) fails to respect (or experiences difficulties in respecting) their liabilities. The disruption of the financial system impairs markets' ability to function effectively – balance sheets of these institutions collapse and many fall into insolvency. Usually the government intervenes with a bailout.

- Foreign debt crisis – regarded sometimes as a variety of the financial crisis, happens when country stops (or there is a threat that it may stop) servicing its foreign debt. Usual-

[1] Corporate sector problems are, to large extent, a by-product of financial institutions' behavior - no bank should lend money to the corporation known to be over-leveraged and overexposed to various kinds of risk.

ly international financial institutions intervene with liquidity help and assure prompt recovery from international default.

Elements of financial and currency crises may be present simultaneously [2]; actually some researchers do not distinguish between them and treat them as a manifestation of similar economic weaknesses. Even if actually there are no direct links or causalities between them they share common causes, such as economic recession, worsening of the terms of trade, overvalued exchange rate and, in general, unsustainable course of macroeconomic policy as well as microeconomic deficiencies of the economy. Banking and currency crises tend to cluster and have come to be called "twin crises". In fact, the causality goes both ways.

4.2.2. The Relationship between Banking and Currency Crises

There is a sound theoretical basis why both crises should be interrelated.

4.2.2.1. From a Banking Crisis to a Currency Crisis

First, economic agents have good reason to expect that authorities will prevent the financial system from collapse and bail it out by monetary expansion – this means choosing inflation over exchange rate stability and leads to a classic currency crash due to excessive money creation. Second, domestic agents can run on domestic banks, withdraw deposits and then convert this money into the hard currency. This puts a pressure on the exchange rate and usually leads to devaluation. Third, and most important, the banking crisis is going to impair credit relations, worsen the state of domestic corporations, bring about an economic slowdown. The number of profitable investment opportunities is going to decrease, so foreign investors would want to withdraw their assets. They don't want to leave their money left in hand of presumably insolvent bank neither. They know, however, that other investors want to withdraw as well, hence they expect massive capital outflow and currency collapse – as a result they withdraw as quickly as possible to avoid losses and sharp devaluation indeed occurs.

4.2.2.2. From a Currency Crisis to a Banking Crisis

First, foreign exchange liabilities constitute a part of banks' balance sheets. If deposit money is used to speculate in the foreign exchange market and there are large unhedged foreign open positions, a currency crisis (devaluation) directly and usually very significantly increases the value of (foreign exchange) liabilities and, thus, worsens the balance sheet. If the denomination mismatch is common to

financial institutions, the devaluation can cause systemic banking system distress. The second and probably less important channel is the impact of devaluation on the short-term interest rate through higher import prices and higher expected inflation. Because the banking system is funded on short-term money the increase in the respective interest rate poses an increased burden on their balance sheets. The balance sheets of shortly indebted corporations also deteriorate and negatively affect the banking system through an increase in non-performing loans.

4.2.2.3. Join Causality

There are common factors to both crises – they manifest themselves through financial market reactions. If the state of the economy is bad, prospects for future profitable investment are weak, politicians or economic agents act irresponsibly, foreign creditors are not secure whether exchange reserves are sufficient to cover potential short term obligations – in such case there can be a shift in the market sentiment and a sudden capital outflow. Investors can stop rolling over the debt and demand immediate repayment. There are only two alternatives at the authorities' disposal to counteract the situation, i.e. a rise in the interest rate or a devaluation. Both actions have a very harmful impact on the unhedged and imbalanced financial and corporate sectors. Usually both take place, so a currency and banking crises – the twin crises – coincide.

4.2.3. The Theory and Practice of a Banking System Crisis

Banks are financial intermediaries whose primary function is maturity transformation – their liabilities are mainly short-term deposits while assets are usually long-term loans. It must be stressed that banks are highly leveraged institutions – a small change in the balance sheet performance translates into very large changes in banks' capital. When the value of their assets less liabilities falls below some point banks are believed to be undercapitalized; when it turns to be negative, banks are insolvent (negative net worth).

Given the nature of the bank it faces the following risks:

– credit risk – a possibility that a borrower wouldn't be able to repay principal and interest, nor the eventual collateral would cover the claims in full. This can happen because of the poor financial status of the borrower (due to unexpected shocks to its business) or because of its (un)willingness to pay. The risk can be reduced by screening, loan monitoring, diversifying the loan portfolio and proper collateralization – among other methods.

[2] As happened in Mexico 1994–95 and Asia 1997–98. The 1992–93 ERM crisis was a currency crisis, although some Nordic countries that time were experiencing a banking crisis as well.

– interest rate risk – usually the short-term interest rate is lower than the long-term one, so because bank's liabilities are short-term, while its assets are long this situation is to the bank's advantage. Nevertheless, the opposite can happen (the so-called inverted yield curve) and the bank has to pay higher interest on its liabilities than on its assets and incurs losses. Such situation cannot last indefinitely – soon the bank will become insolvent.

– exchange rate risk – emerges when foreign liabilities and assets are not balanced – any move in the exchange rate translates into a direct change in the balance sheet. If the change is in undesirable direction (net foreign exchange liabilities and devaluation or net foreign assets and an appreciation) the bank incurs losses.

– market risk – affects the non-financial part of the bank's balance sheets. When a bank invests in the real estate sector or in equity, the change in asset prices (a collapse in the stock or real property market, for example) directly affects the bank's capital.

Banking problems can be classified according to various criteria. For example, we can distinguish between a distress caused by adverse developments in the liabilities and in the asset side of the balance sheet. The liabilities-side distress is usually associated with large deposit withdrawals, or bank runs. The asset side is relevant, for example, in so-called boom-bust cycle. Other authors [e.g. Honohan, 1997] differentiate between crises caused by "epidemic" macro- and microeconomic factors as opposed to endemic system failures usually associated with government involvement.

In any case, given the complicated structure of the banking process, a game-theoretical approach is the relevant framework in analyzing banking system crises.

4.2.3.1. Liabilities-Side Crises – a Bank Run

There are two players; in the first period each of them has a deposit D in the bank. The bank has invested total deposits ($2D$) in a project, which matures the second period with an outcome $2R$. Assuming that there are no deposit withdrawals the "bank-game" ends with each player receiving R ($R > D$). If any of the players decides to withdraw in the

payoff of: player 1 / player 2		player two's strategy	
		withdraw	hold
player one's strategy	Withdraw	r / r	$D / 2r - D$
	Hold	$2r - D / D$	R / R

first period the project has to be liquidated; it yields $2r$, the bank goes bankrupt ($D > r$) and the game ends. If only one player withdraws he gets his deposit back ($r > D/2$), if both withdraw they both get r . The players move simultaneously.

The game looks as follows:

Because $D > r$ and $R > D$ it is obvious that the game has two (Nash) equilibria, notably "hold"- "hold" and "withdraw"- "withdraw": no player would want to hold his money in the bank if he expected his opponent to withdraw.

This simple reasoning is a serious challenge to the banking business – it proves that due to coordination failure, i.e. the bank run ("withdraw"- "withdraw" equilibrium) and despite the otherwise project's success, the bank sometimes would have to collapse and liquidate the project.

A run on an individual bank shouldn't threaten the whole banking system. However, one run is often taken as a signal that the condition of a banking system is bad in general, so another runs may follow and the system is likely to collapse (contagion effect – the run on one bank coordinates the expectation in other "bank-games"). Alternatively, individual bank problems can spill over through interbank market to other banks. To remove the possibility of the bad equilibrium there is a need for a perfect public confidence in the system. Some methods for reassuring this confidence are discussed in the section 4.2.3.6 dedicated to deposit insurance schemes.

It is worth noticing that recent crises do not have liability-side (bank run) character. Neither the Nordic banking crisis in end-1980s-early-1990s, nor earlier banking problems in industrialized countries, nor the recent crisis in Japan were associated with a bank run. Among emerging economies large withdrawal of deposits (mainly by large creditors) are more frequent [3], however, they are not accidental manifestations of a bad equilibrium in a banking game – they usually follow the disclosure of some bad news concerning the asset side of the financial system. This was a case in recent crises in Bulgaria in 1996, Indonesia (Asia in general) in 1997–1998, Russia in 1998 and Turkey in 2000–2001. Accordingly, they are not run against otherwise solvent financial institutions but typically against presumably insolvent banks suffering from the asset deterioration – or at least a combination of both.

4.2.3.2. "Boom-bust"-Type Endogenous Banking Crises

The asset-side crisis emerges from the poor quality of bank assets, such as high non-performing loans ratio, dangerous maturity and denomination mismatches, etc., and can bring the expected value of the bank below the safe line or even below zero. The asset-side crisis usually takes a form of and endogenous boom-bust cycle with over-lending.

Typically in the beginning of a cycle banks, on the wave of optimism, over-lend to projects of poor long-term prospects. The short term success of these projects – high interest and fast economic growth in general – are, to large

[3] The 1980s and 1990s crises in Argentina, Philippines Thailand, Turkey, Uruguay and Venezuela, to name a few.

extent, results of the very process of lending. There is an abundance of capital and, therefore, investment projects as well. Also the asset prices go up fuelled by real estate and equity investment. The wealth effect increases consumption; demand and the profitability of most economic activities temporarily rise in general. Gradually the asset price increase transforms into a bubble reinforced by the endogeneity of credit limits [4]. Banks either excessively invest in equity itself (market risk) or lend to such investment (credit risk). Then the bubble bursts, the economy comes into a downturn, bad loans portfolio increases, and the financial system's condition worsens.

Of course, no bank is able to generate an asset price boom only by itself – the situation has something to do with the behavior of bank management in general and the herding behavior phenomenon [5]. For example managers adapt their behavior to what other bankers do. This can be individually rational – they might want to avoid criticism or take advantage of the economic boom, no matter how sustainable it is. The rational assessment of economic perspectives is blurred by the tradition of success (especially when success' origins are misunderstood) and, to some extent, by a "disaster myopia" [6]. The results are poor lending decisions based on misjudgment of borrowers' creditworthiness, their ability and willingness to pay, recoverability of loans and a loan concentration in particular sectors. Lack of coordination and informational problems create a situation where the externalities of individual lending decisions are not adequately taken into consideration and where a shift in expectations about some sector of the economy (particularly property sector) become self-fulfilling.

A credit expansion involved in the boom stage of such cycles requires adequate base money – this is achieved by significant capital inflows. Such inflows are usually induced by the capital account liberalization and are attracted by high yields (large interest rate differential) and seemingly stable nominal exchange rates (effectively overlooked by the authorities). The appropriate policy response to sterilize these inflows may not be easy. Tightening of monetary policy usually raises the interest rate, thus attracting the inflows even more. On the other hand, it is sometimes politically hard to resist widespread optimism and tighten the policy in the midst of an economic boom.

The reversal of such a boom, if not amortized by the appropriate policy, is usually sudden and brings dire consequences. Asset bubble bursts, foreign capital withdraws and banks are placed under severe liquidity pressure, the exchange rate tumbles – the financial system experiences significant balance sheet deterioration.

This endogenous boom-bust over-lending cycle is very common and is sometimes thought of as an archetypal banking crisis.

However, here we have a theoretical puzzle. Banks are institutions prone to asymmetric information problems (the borrower is better informed about the investment project than the banker is). According to a classic Stiglitz-Weiss (1981) model and its extensions in the environment of significant asymmetric information, there shouldn't be the so-called over-borrowing (over-lending) syndrome with a rapid credit expansion. On the contrary, the theory-predicted equilibrium on such a market is the low one – the lending is sub-optimal and so-called credit rationing takes place. Because banks know that raising interest rate will induce adverse selection, i.e. only low quality and risky projects will apply, they choose not to raise the interest rate and to ration its credit. As a result not all enterprises willing to pay the prevailing interest rate can obtain funds. Why then, given such asymmetric information problems, credit expansion and over-lending are common features of recent crises in emerging economies? One plausible answer points to the microstructure of the financial market, in particular the emergence of a moral hazard problem [7].

4.2.3.3. Moral Hazard and Other Microeconomic Deficiencies

The above-described classic model of boom-bust banking troubles involves rather minor imperfection on behalf of agents' behavior. Without other adverse components the distress it generates is quite manageable – there is usually a need for some restructuring, intensified asset recovery and moderate re-capitalization. Now we proceed to explain particular types of behavior of economic agents – most notably financial institutions' executive officers – which can be described at least as irresponsibility if not as serious mismanagement.

It is important to realize that the amount of risk that a bank manager chooses to take is likely to exceed what is

[4] Real assets are used as collateral, while borrowed money speculatively invested in the asset sector. The resulting increase in asset prices (asset bubble) increases in the value of the collateral as well – the borrower obtains higher credit limit, accordingly, and again invests it in the asset sector.

[5] There is a saying that "bankers hunt in herds".

[6] The situation where economic agents neglect events with large negative payoffs because of their extremely small probability. Nevertheless, this negative payoff multiplied by the probability can significantly reduce the expected total outcome. For example, if the investment gives a payoff of 1 with a probability of 99.9999% but the payoff of minus 1,000,000 with a probability 0.0001% the economic agent is likely to engage in it despite the negative expected outcome ($0.999999 \cdot 1 - 1.000.000 \cdot 0.000001 < 0$) – justifying it by a common "this would never happen to me".

[7] Accordingly, the distinction of so-called "third-generation" models of currency and financial crises is the emphasis on microeconomic factors.

socially optimal because of limited liability. The manager usually receives bonuses proportional to profits he secured to the bank, while he is not financially responsible, to the same extent, for the losses he incurs for a bank – the only consequence he can face is an outplacement [8]. Since his incentives are based on a skewed distribution (negative pay-offs are cut off) he prefers to take high-risk and high-return investments, and under-price the risk. Such behavior is called a moral hazard and is the very reason for bank regulation, imposition of capital adequacy, loan provisioning, bank supervision and a proper design of incentive schemes and institutional environment. The very roots of the mismanagement and irresponsible behavior that cause the real banking collapses are precisely in the inadequate prudential rules, supervision and institution design.

The term moral hazard refers to a reckless behavior by the party of the contract that is granted a limited liability – the behavior takes place after the contract giving the limited liability is signed. Originally, it was used to describe the behavior of an insured in the theory of insurance. For example, an insured car owner loses incentives to respect the contract and drive carefully because the insurance company is going to cover the eventual losses. In the context of banking business, it refers to the behavior of a borrower after having received a loan – he gains incentives to misuse the loan or demand a change in the contract.

But there are efficient tools in bank's disposal to counteract the borrowers' moral hazard; screening, monitoring and proper collateralization minimize borrower's misconduct. The real threat is a moral hazard on behalf of bank executives. They also have signed a contract with bank owners and (more or less implicitly) with depositors to prudently invest the money and care about long-term profitability. But to maximize their own benefit and bonuses (proportionate to bank's short-term profits) they may engage in increasingly risky (and thus profitable) activities. Such activities usually include:

- assumption of excessive net foreign open position in order to exploit the interest rate differential (denomination mismatch). Even if the fund borrowed abroad by the bank are on-lent in hard currency to domestic agents the management doesn't seem to realize that it only transforms exchange risk into credit risk. When an unexpected devaluation takes place, apart from an increase in the value of the liabilities bank is going to experience a decline in the value of assets in the form of bad loans. This happens because bank's borrowers experience a rise in their debt and some of them might not be able to service it any more.

- assumption of excessively short-term liabilities (maturity mismatch). Since short-term capital is cheaper bank

might want to finance itself by it excessively but then it becomes vulnerable to the interest rate risk. To avoid the risk the bank might want to lend in floating rate but, again, the protection is illusory. The interest rate risk is transformed into credit risk.

- excessive asset sector investment. Asset market rises disproportionately fast during the economic boom and makes a good investment but only to the point of its collapse.

- over-lending – because lending is primary bank's activity – and is of course profitable – banks have incentives to expand it as far as possible. Over-lending syndrome often arises when profit margins decline – for example, in the highly competitive, liberalized and poorly regulated banking sector. New entrants into the banking system in order to make profit may prefer to expand lending at prevailing interest rate than compete by attracting deposits at lower rates. Similarly, the success in inflation stabilization also decreases profit margins and induce higher lending.

- "looting" where the management receives direct benefits from the otherwise ineligible borrower in exchange for a loan. Although looting is usually an isolated incident it can sometimes become a serious problem leading to a banking crisis (e.g. presumably in Venezuela in the 1994 banking crisis).

The problem of moral hazard becomes serious in a weak legal environment where property rights are unclear, contracts, in particular bankruptcy procedures, are not enforced, etc. The irrelevance of "bankruptcy threat" is especially evident in countries where political connections of the bank management and their notion of being "too big to fail" decrease their concern with possible failure. High ownership concentration, the oligopolistic structure and especially the situation where firms directly control banks ("connected lending") contribute to poor or irresponsible lending decisions. If the bank is a part of an industrial group it can be treated as a source of cheap capital to finance risky enterprises. Although it is not in an interest of the conglomerate to drive the bank to bankruptcy, the management's assessment of their own projects may be too optimistic. Usually neither the proper risk calculation, nor the loan monitoring takes place.

The above-described behavior makes a bank very vulnerable to common sources of risk. The dubious and risky loans are usually not adequately provisioned and under-priced – consequently the banks capital base erodes, sometimes to the point of insolvency.

The problem of moral hazard is made even worse by the existence of explicit or implicit government deposit guarantees – not only the bank management but all agents involved in the banking process can engage in moral hazard. Depositors, who know that their deposits are guaranteed, have little

[8] The 1995 case of the Barings bank provides a good example. Due to the recklessness of only one dealer pursuing high bonus payments the whole bank collapsed.

incentive to discriminate between sound and unsound banks. On contrary, they would prefer to deposit their money in banks engaged in high-return, high-risk activities. On the other hand, foreign creditors can exercise moral hazard with twice as much confidence. Even if they are not covered by the borrower country deposit insurance they can count on such guarantees in their home countries. Even if not – on the quite certain IMF bailout ("global moral hazard"). Accordingly, due to the existence of implicit or explicit, domestic or international guarantees all parties of the banking contract are, in a sense, responsible for a banking system collapse.

The following simple illustration of how the moral hazard works is a variation on Krugman (1998). Lets assume that the world interest rate is 4%. There are two financial intermediaries (banks) who are known to have government guarantees. If a bank goes bankrupt the government repays the principal (i.e. 0% interest). The minimal cost of intermediation (minimal bonus for the banker) is 1%. The bankers have access to two domestic investment opportunities: a safe asset that brings 5% real interest and a risky asset (say, real estate) yielding 20% ("success") or minus 20% ("disaster") with equal probabilities (0.5). If foreign creditors (or domestic depositor) know in what asset the bank invests (transparency rules) they would demand at least 4% if it were in the safe asset or at least 8% if it were in the real estate:

$$8\% \cdot 0.5(\text{success}) + 0\% \cdot 0.5(\text{disaster}) = 4\% \text{ (i.e. the world interest rate).}$$

Bank manager knows that he has to give depositors at least 4% to attract funds provided it is known that he invest in the safe asset. His profit is then 5%–4%=1%. Therefore, the risky asset is a perfect investment for the bank manager. When things go well he gets 20%, gives 8% to depositors and cashes in 12%. When things go wrong he proclaims bankruptcy and walks away with his 1%. His expected profit is 12%*0.5+1%*0.5=6.5%, a great deal above 1%. So both banks invest in the risky asset – it happens at a heavy social loss: the investment yielding 5% is abandoned while the investment giving expected 0% (for the society) is undertaken.

Since there are two banks and they compete. The bank offering higher interest rate gets all the deposits and makes huge profits (even 1% times all deposits is a big amount of money). So the interest rate both banks offer is driven to the maximum, i.e. 19%:

$$(20\% - 19\%) \cdot 0.5(\text{success}) + 1\% \cdot 0.5(\text{disaster}) = 1\% \text{ (minimal cost of intermediation)}$$

The high interest rate differential 19%–4%=15% attract large capital inflows and deposits – the economy is over-invested. The demand for real estate increases, so does the price: the "success" scenario is validated ex post. But a large amount of deposit means high contingent cost of the guarantee and reduces its credibility.

The end to the game is brought either when the "disaster" happens or when depositors start to worry about their deposits. When suddenly they realize that the guarantee is only 40% credible their deposit become worth:

$$0.5 \cdot 19\%(\text{success}) + 0.2 \cdot 0\%(\text{disaster, guarantees}) + 0.3 \cdot (-21\%)(\text{disaster, no guarantees}) = 3.3\%$$

which is less than 4%, so they immediately withdraw their funds and the system collapses.

This simple example depicts the dangers of moral hazard. All relevant components are present: asset price boom, over-investment, capital inflows and their sudden reversal and the irresponsibility on behalf of all market participants. In the words of Krugman, this game can be shortened to "heads I win, tails the taxpayer loses".

4.2.3.4. The Government Intervention in Banks

In many countries the authorities are involved in the banking sector – they just try to take advantage of their power over the financial sector to finance their short-term needs. The involvement generally includes: the government ownership, interventions in the management, programs of various distorting tax and subsidy policies, encouraging or forcing lending and investment in designed sectors, directing and subsidized credit, etc.

In the early stages of economic development, government intervention in the investment decision-making may actually be desirable, given the severe asymmetric information structure of the market and the size of required infrastructure projects. But as the country develops the government should relinquish its power over the banking sector, since in more sophisticated economies the decentralized private sector is much more efficient in processing information and discovering the desirable and profitable investment opportunities. Nevertheless, it is hard to remove the government from its large direct or indirect intermediation role [9]. In this case the system functions not as profit-oriented efficient intermediation mechanism but rather as a quasi-fiscal device, in which private, leveraged funds are used to finance government projects.

There are many dangers of such a situation. First, the public sector deficits become hidden in banks' balance sheets [10]. Second, the capital allocation is impaired. The

[9] The case of Japan is an example.

[10] The huge magnitude of restructuring costs of a banking system may be partly explained by the fact that the balance sheets of the banking system have been a place to hide a budget deficit. When a bank collapses the cumulated deficit has to be actually paid by the government.

private entrepreneurs' access to bank funding becomes limited (higher interest rates). The government involvement discourages the development of market based credit risk analysis, appropriate screening and monitoring culture, and weakens a financial discipline and the quality of law enforcement in general. For example, a government support extended to an insolvent bank is a precedent on which expectations of future bailouts are built. Bank managers might act as having an implicit government guarantee with all the consequences. The government also often encourages banks to borrow abroad in foreign currency (by which they assume an exchange rate risk) because it eases the pressure on official foreign reserves and postpones the need of policy adjustment. Also it is to the authorities' advantage (although not to the banking system's advantage) not to encourage the transparency and prudent disclosure practices – the less the public knows about the distortionary government involvement, the more funds it is willing to provide for the system. In the same manner, supervisors are often discouraged by the government from intervening as it would bring problems out and cause expenditure (to fix the system and recapitalize it). As a result, due to lack of transparency and improper supervision, it is difficult to assess the true condition of corporations and banks. Profits are overstated while the scale of bad loans underestimated.

The government involvement significantly increases the vulnerability of the system, although the magnitude of this vulnerability is not usually known until it is too late. In good times, such a system can function without any obvious problems: economic growth induce steady inflow of new deposits but when the downturn comes the condition of the banking system deteriorates rapidly due to a rise in non-performing loans and a general deterioration of the asset quality.

4.2.3.5. Financial System and Financial Liberalization

Financial system failures are often the effect of an increased vulnerability that is connected to some regime change, induced by a policy change or by external conditions. One type of such regime change is privatization but the most important one is financial system liberalization and deregulation. This is usually associated with simultaneous capital account liberalization.

In regime of financial repression, the authorities force financial institutions to maintain low or even negative real interest rate. There are limits on deposit and lending rates. It is impossible for the bank to charge large risk premia and the opportunities for optimal but more risky investment are foregone. Constraints on the financial sector reduce (private) savings, distort investment and decrease the availabil-

ity of resources to finance capital accumulation and growth. On the other hand, well developed and liberal financial markets help diversify risk (making high-risk and high-return investment attractive to investors), pool liquidity risk, properly screen and monitor loan applications and bring about general improvement of resources allocation. There is ample evidence that financial development is positively correlated with contemporaneous and future growth rates.

The bank life is actually very easy in the state of financial repression. Because interest rates are artificially low there are more possible borrowers than credit available – credit rationing takes place and banks comfortably cash in their profits. When the liberalization comes, the whole situation changes. Bank management lacks experience necessary to run the business in the new environment. The nature of the regime change is the fact that it alters the incentives facing banks and increases the risk of traditional behavior. First, by removing interest limits and allowing new entrants, the liberalization drastically increases sector's competitiveness: traditional monopolistic profit disappears and banks have to struggle for market share. Deregulation is often accompanied by a rapid growth of little regulated, aggressive non-bank financial institutions. Because they are allowed to conduct activities, which banks are restrained from engaging in, they quickly outperform domestic banks both in attracting deposits and lending expansion. As profit margins narrow, managers start to favor risky lending practices. Indeed, financial liberalization increases the risk-taking opportunities significantly – not only there are new banking products and derivatives available but the system is open to yet unknown and unfamiliar types of opportunistic behavior facilitated by temporary relaxed law enforcement.

The overall level of interest rates can become very volatile after liberalization (the removal of the interest rate ceilings) – often the rate remains high in the period after liberalization [11] and thus banks become more vulnerable. As a result, they might prefer to borrow abroad and on-lend the hard currency to its customers (changing the exchange rate risk into a credit risk, as it was mentioned above). The problem is aggravated by a significant capital inflow induced by the parallel process of capital account liberalization. In the environment of capital abundance, inexperienced banks expand risky activities beyond their ability to manage them properly. Both regulators and banks usually have limited knowledge concerning the complex instruments of the financial market what causes hardships with evaluation of the asset quality and poses a threat to balance sheets.

The popular term "sequential liberalization" is given as an answer to the problem. In this view, the liberalization should

[11] This was the case in some transition economies and also, for example, in Chile where real lending rates averaged 77% in the period 1975–1982.

come in an orderly, gradual and well-sequenced manner. When liberalization comes, the constraint on excessive risk taking must be already present – prudential regulation, proper supervision, adequate incentive scheme, enforceable law are the basic prerequisites. On the other hand, keeping tight restrictions on the capital account until banks are fully developed is not a good alternative – external and domestic liberalization reinforce each other and benefit by developing parallelly. Advises given usually include:

- allowing foreign ownership – FDI's are less prone to reversals and usually foreign-owned banks can, in times of distress, count on help of the mother (foreign) institution,
- dealing first with weak institutions (with a mixture of closures, recapitalization and mergers), before new entrants are allowed in,
- assuring adequate law enforcement, transparency rules, accounting and audit standards, private ownership, well-designed deposit insurance scheme, and relevant institutional framework.

4.2.3.6 .Deposit Insurance Schemes

The banking game presented in section 4.2.3.1. has two equilibria – the good one in which agents hold their money to the second period and receive their bonus and a bad one – a bank run where both agents withdraw their funds and everyone loses. But there is a method to counteract the problem. A perfectly credible government can introduce a deposit insurance scheme (DIS) – if the bank goes bankrupt every depositor would be repaid in full. The game becomes:

payoff of: player 1 / player 2		player two's strategy	
		withdraw	hold
player one's strategy	Withdraw	D / D	D / D
	Hold	D / D	R / R

Although the game still has two Nash equilibria we can use weaker (i.e. better) solution concept, namely iterated elimination of weakly dominated strategies, to obtain only one solution: "hold"- "hold". Each player can see that he cannot play any better than "hold" regardless of what the opponent does. Thanks to a deposit guarantee not only the good equilibrium is achieved but also the bank would never go bankrupt and the guarantee would never be called.

In general the deposit guarantee can be explicit or implicit. The implicit guarantee is present when economic agents have good grounds to believe that in the case of distress (a bank run) their deposits would be repaid by the government. Agents can bet that the authorities would not let the financial system collapse, especially when in past the government has actually engaged in an emergency bailout or other kind of support to the banking sector.

There is one fundamental problem with deposit insurance: it offers a limited liability to economic agents – to depositors, creditors, bank management and to borrowers altogether. This situation results in moral hazard behavior with all the previously discussed consequences. The guarantee is more valuable to bad banks – there is a possibility that they would dominate the sector. Explicit or implicit guarantees are also often used by the authorities to compensate for the inadequacy in the financial sector's transparency. Unclear disclosures on behalf of the financial institutions make them vulnerable to runs – to avoid such a case the government prefers to (implicitly or explicitly) back deposits.

The benefits and costs of a DIS should be, therefore, cautiously calculated. Various studies discover that (for most DIS) the extent of moral hazard is greater than the benefit from bank run protection. This result does not necessarily mean that the DIS institution itself is deficient – it may as well point to its improper design.

Garcia (2000) notices that countries have roughly six options concerning deposit insurance:

- an explicit denial of any guarantee and reliance on transparency and market discipline (as for example in New Zealand),
- legal preferences of depositors over other claimants in the liquidation process after a bank's failure (as for example in Australia and Mongolia),
- ambiguity concerning insurance,
- implicit guarantee (present in 55 countries as counted by Kyei, 1995),
- explicit limited coverage (74 countries),
- explicit full guarantee (existing usually in post crisis countries).

First and second options are "legitimate" but rare, often infeasible, politically undesirable and, especially if confidence is weak, they leave the system open to runs. Third option also doesn't protect from bank runs. Option four and six assure continuous functioning of the banking and payment systems but they induce excessive moral hazard – the incentive disruption can be more costly than a possible bank run. The fifth option, i.e. explicit limited deposit coverage, seems to hold an optimal balance between the bank run and moral hazard components and is chosen by most countries and preferred by some international institutions (e.g. the IMF). According to this option only a fraction of deposits (usually those of small depositors) are insured – the system seems to work well. It contributes to stability and reduces government contingent liabilities but, on the other hand, usually large depositors run first. Therefore, as a rule, the DIS should be implemented in a sound environment and be complemented by a strong legal system, well-operated lender-of-last-resort facility (which provides liquidity only to solvent banks), strong prudential regulation

and supervision [12]. Most importantly the DIS has to have public confidence.

The situation changes somehow during crises. Limited coverage cannot be expected to support the stability of the system in the presence of a large shock. In this case authorities should offer a full but explicitly temporary guarantees to assure the continued functioning of the financial system.

4.2.3.7. The Basle Capital Accord

The so-called Basle Capital Accord was initiated in 1988. Originally regarding the G10 countries' banks (only those operating internationally) has since become a widely accepted standard for the evaluation of banks' financial soundness and is applied to all banks. Accord has been designed to counteract the decline of banks' capital observed for much of the 20th century. It is based on the risk-weighted assets. The simple risk measurement includes four risk-categories with assigned weights ranging from 0 to 100%, depending on the credit risk of the borrower. For example, loans to commercial companies are weighted 100%, interbank lending 20% while loans to central government in local currency (virtually riskless) – 0%. The Accord requires banks to maintain its capital equivalent to at least 8% of such risk-weighted assets. This framework has the advantage of being a simple and comparable measure of bank soundness but, on the other hand, it neither makes any adjustment for risk diversification, nor is sophisticated enough to adequately price the new complex banking instruments. Since the Accord was designed for stable industrialized countries with developed and well-established financial systems, countries with volatile and risky macroeconomic environment should accordingly implement higher capital adequacy ratios – indeed, most of them do.

The Accord has been, in general, successful in reversing the trend of banks' decapitalization in most of G10 countries and assuring the (relative) bank soundness elsewhere.

4.3. Assessing the Condition of a Banking System

The theory offers guidance as what are the determinants of banking crisis and allows building the framework to assess the quality of a banking sector and its vulnerability to a crisis.

The "bottom-up" approach analyzes each individual bank and then sum up the scores to obtain the result for the

whole banking system while the "aggregate" approach measures the probability of systemic insolvency using the aggregate banking sector data with similar methodology as in the case of individual bank. As a complementary method, the "macroeconomic" approach can be applied – it relies on the fact that bank's solvency depends on the state of their customers what in turn depends on the condition of the economy – it therefore tries to establish links between macroeconomic indicators and bank soundness.

Typically the bank's condition would be assessed by identifying the relevant indicators that are correlated with variables responsible for bank's solvency. These indicators, generally, fall into five categories:

The first is exposure to risk – among this group a useful indicators include:

- Loan to deposit ratio, as a measure of bank's leverage and the extent to which bank relies on other, nontraditional sources of funding. When times are good banks would seek to increase its leverage to maximize profits, but a reversal of economic trend is much more dangerous for highly leveraged companies.

- The ratio of non-performing loans is a (somehow ex-post) measure of an exposure to credit risk – increase in NPL means that a bank would have to provision for expected losses – its capital base erodes. High ratios points to inadequate lending practices and bad risk pricing – Sheng (1996) notices that a collapse is rather inevitable when this ratio exceeds (provisioning by) 15%.

- Exposure to real estate and equity market measures the extent of market risk a bank is taking. In the event of a sharp decline in asset prices the bank can easily go insolvent. The difference between current and trend values of asset prices multiplied by the exposure provides a good measure. High ratios also indicate that the bank's core business is less profitable.

- Net open foreign exchange position measures the exposure to exchange rate risk. In an event of unexpected devaluation the bank is going to incur heavy losses.

The second includes solvency conditions – they explicitly take into account the adequacy of banks capital – the (risk weighted) capital adequacy ratio (actual and projected) should be sufficient (minimum 8% according to the Basle Committee) to assure that the bank has enough capacity to absorb possible losses [13].

The third consist of liquidity criteria:

- Lender of last resort indicator – the more often a bank has to resort to the central bank's credit the more probable is its insolvency. Sound banks shouldn't have systemic prob-

[12] Another question is whether the DIS should be public or private. The United Kingdom has a private system while the US has government-run system which is privately funded but has explicit government support. Other countries have mostly public guarantees.

[13] Interestingly enough, the run-up to the Mexican financial crisis was accompanied by the almost perfect capital adequacy in the banking system.

lems with liquidity and should be able to fund themselves on the interbank market. If the bank is cut from the interbank funding or faces above average interest rates it is a clear sign that something is wrong with the bank (the manager, for example, may be known to the market to be an excessive risk taker). Also compliance to statutory reserve requirements or liquid asset requirements is a good indicator of the same kind.

The fourth is profitability – usually measured by return on assets. The likelihood of remaining solvent depends, of course, on bank's profitability. A decline in that indicator should be an important warning signal. Low interest margins also indicate problems. Similarly a significant share of non-interest income in total income may point to the weakness in the core banking business. The performance of bank's shares can reveal much about the future prospects of the bank as well.

Finally, there is a "supervisory assessment" criterion – the official assessment of banks' condition should be taken into account. The evaluation can be in a form of a standard CAMEL rating (based on Capital adequacy, Asset quality, adequacy of Management, Earnings, Liquidity); alternatively, some supervisory bodies construct a so-called watch list incorporating banks that should take corrective measure to improve their standing.

Judging from the macroeconomic and aggregate approach, a rapid growth of aggregate bank lending to real estate and equity sectors is a classic leading indicator of a crisis. Similarly, the aggregate inflow of portfolio capital exceeding, say, 10% of GDP over a couple of years also indicates increased vulnerability. The dim prospects for the economy and the expected growth slowdown contribute to the worsening of the banking system through its impact on banks' clients. The microeconomic structure should also be taken into account: the design of the DIS, the quality of supervision, and the degree of ownership concentration are relevant variables. The involvement of the government in the banking system, political and connected lending, management's reckless or fraudulent behavior are almost always accompanied by market gossips and rumors and through this can be incorporated into the analysis.

High liquidity can offset financial system problems – as long as there is a capital to intermediate the system can function. The possible monetary tightening in major developed countries should be a particularly important indicator [14].

The above-sketched framework is frequently used to construct the so-called early warning systems [15].

4.4. Empirical Evidence and the Determinants of Banking and Currency Crises

4.4.1. Banking Crises in the Real World

The endogenous boom-bust cycle banking sector crisis theory is consistent with the experiences of Argentina, Chile, Uruguay 1979–1983, Japan in the 1990s, Nordic countries 1987–94, Mexico 1994 and Asia 1997–1998. In every country there was a significant economic boom accompanied with rapid increase in credit.

The so-called "debt crisis" in early 1980s was preceded by a surge in international lending to emerging markets at a very low interest rate. The heavy lending caused consumption boom (financed by expansion of bank credit), an asset price bubble, a real appreciation, a current account deficits, etc. When industrial countries engaged in tight anti-inflationary policies the debtors could no longer respect their obligations, defaulted and went into a crisis.

The Asian crisis included similar dynamics, but rather instead of the consumption boom there was an excessive investment. Over-lending, over-investment and moral hazard were engraved by the initial success of this policy – widely shared optimism about future growth based on a long tradition without a single year of negative growth. Last year with growth rate of significantly lower than 5% was in Indonesia in 1985, in Malaysia in 1986, in Korea in 1980 and in Thailand in 1972. The crisis was, again, triggered by a sudden outflow of foreign capital. However, the collapse of the financial system was far more damaging in Asian economies due to a deeper financial markets, higher debt-equity and credit-GDP ratios. Similarly, the degree of overvaluation in Asia was smaller, but due to relative openness of these economies the results of the overvaluation were more severe.

On the other hand, the 1999 Brazilian crisis was not a financial crisis but rather a classic balance of payment crisis with unsustainable fiscal policy. The banking system was sound, adequately hedged and capitalized. The relationship between the soundness of the banking sector and the severity of crises is, therefore, evident.

As we mentioned before, the soundness of the financial system depends on the quality of the supervision and the enforcement of prudential rules – especially in the period of financial liberalization.

In Korea the liberalization started in 1991, in 1993 short-term interest rates and in 1994 lending rates were deregu-

[14] Although the 1997–98 Asian crisis (as opposite to the 1994–95 Mexican crisis of 1994–95) erupted when the international liquidity was high.

[15] It should be said that not only the state of the banking sector but also the condition of the corporate sector (analogously: the moral hazard, increased leverage, unhedged borrowing, overinvestment, political connections) should be taken into account in estimating the probability of a currency or a full-fledged financial crisis in a given country.

lated. Rapid growth of non-bank financial intermediaries – investment and finance companies, mutual savings and merchant banking corporations – followed. They enjoyed a greater autonomy and were able to offer higher interest rates on deposits. Non-commercial bank share in "deposits" rose from 37% at end-1980 to 68% by June 1995. They quickly developed serious maturity and currency mismatches; for example, by 1997 over 70% of their funding were short-term while 90% of loans were long-term. Despite this fact, the supervision was weak and fragmented (Bank of Korea supervised commercial banks while the Ministry of Finance supervised merchant banks); provisioning was even relaxed in 1995–95 (from 100 to 75% for doubtful loans). Korean Deposit Insurance Corporation only was established in 1996.

In Indonesia, between 1978 and 1995, the number of banks doubled. Regulatory and legal structure was simply unable to manage banking business in much more complicated environment.

In Thailand, the number of non-bank financial intermediaries exploded as well – they conducted activities, which banks were restrained from engaging in. Supervision was again fragmented between the Bank of Thailand and the Ministry of Finance. Rules for loan classification were often ignored, large portfolios of questionable loans were simply rolled-over rather than classified as non-performing. There were no limits of large exposures to corporate groups.

Deregulation was accompanied by the rapid growth of little regulated non-bank financial institutions in other countries as well – in Chile from 1974, Argentina since 1978, Venezuela before 1989 – to name a few. For example, in Chile in early 1970s, following privatization, new "groupos" i.e. large conglomerates emerged. They were aggressive, highly leveraged and centered around few banks; by 1979 they controlled more than 80% of all private banks and almost 70% of the equity of firms listed in the stock exchange. Banks acted as agents for these groups and engaged in risky, connected lending, despite their weak capital position.

The above-described syndrome is not unique to emerging markets only. For example, in Sweden, since the end of the WWII the banking system was a very regulated. Between 1945 and 1983 there were no new private entrants. The objective was to avoid banking system failures. In 1986 one prominent Swedish economist said that the idea of a bank run or collapse was out of the question. There has also been a long-tradition of close relationship between industry and banking sector. Swedish banks as well as regulatory bodies were not prepared for liberalization. Tranquil and profitable existence in the environment of credit rationing and monopolistic profit turned into a hard life of increased competition and rising complexity of financial instruments. The new "direct finance" sector emerged. Banks, as previously, had to maintain high capital adequacy

ratios while new non-bank entrants not. These lightly regulated institutions engaged in leveraged real estate lending. The asset bubble finally burst and between 1988 and 1990 half of finance companies went bankrupt. The impairment of the Swedish banking system prolonged several years. To a large extent, the crisis was a result of inadequate supervision and prudential regulations.

According to the World Bank (1993), inadequate prudential regulations also played a major role in crises in Hong-Kong, 1982–1983, Japan, 1991, Chile, 1981–1993, the Philippines, 1981–1987, Turkey, 1982–1985, the US 1979–1989 and many more.

In the same spirit, after the Asian crisis, Bank of Korea admitted that moral hazard (caused by government guarantees) had been present in the case of all major players on the financial markets: borrowers, financial institutions, their creditors and depositors. For example, the President once said that Korean financial institutions were immune to failure because government implicitly guaranteed their solvency and liquidity. And, indeed, the general opinion was that the government would not allow commercial and merchant banks go bankrupt.

By arranging a bailout the government proved that economic agents were right in their expectations (implicit guarantee). This only reinforced these expectations and worsened the moral hazard problem. For example, the Chilean "groupos" started to experience difficulties in early-1980s. Nevertheless, there were expectation of government bailout, and indeed, in 1983, after two largest groupos went bankrupt the government took over five banks, among them the two largest – owned by the conglomerates. Implicit guarantees in the banking system were evident before the Asian crisis – although only Korea and Thailand had explicit deposit insurance schemes, up to 1993 only Hong Kong and Thailand closed any insolvent intermediaries. Major government support has been extended to the failed banking institutions in Malaysia 1985–1988, Thailand 1983–1987, Philippines 1981–1987 and others – the investors and depositors had good grounds to believe that it would happen again in the future, if necessary.

Investors took a specific lesson of global moral hazard in early 1995. Holders of dollar denominated Mexican bonds were bailed-out by the IMF and other financial institutions while holders of other forms of Mexican papers, equity and most peso denominated papers in particular, did suffer heavy losses. This event most probably distorted the patterns of international capital flows – there was a change from equity to debt and from domestic to hard currency. Interbank lending grew in importance, in the expense of equity. This means that debt became very short-term and denominated in foreign currency. Interbank lending to five most crisis-affected countries in Asia ran at around 43\$bln a year. Before the 1997–1998 crisis, about 40% were denominated in yen, the rest in USD; 2/3 had maturity less than a year.

4.4.2. Some Statistics Concerning Banking, Currency and Twin Crisis

Banking and currency crises have not been uncommon in the history. Analyzing the panel of 21 industrial, 37 developing and 32 emerging market [16] countries over the 1975–1997 sample period Glick and Hutchison (2000) find that out of 90 countries 72 had banking problems and 79 experienced at least one currency crisis. There were 90 banking crisis episodes and 202 currency crisis episodes. Out of 90 banking crises 37, i.e. 41% have been twin-crises [17]. Banking crises have increased over time both in numbers and in frequency and are four times as frequent in the 1990s than in the 1970s, while the frequency of currency crises remained more or less the same. The occurrence of twin crises rose as well. All types of crises, in particular the twin crisis phenomenon, are most common in financially lib-

eralized emerging markets. Table 4-1 presents time and geographical distribution of banking, currency and twin crises.

The consequences of crises are not negligible. A decline in output average 4% [18] – this number is higher for recent crises and for crises having a financial component [19]. The average recovery time is around two years – again, higher for financial crises. The interest rate is higher a year after the crisis (but lower thereafter), inflation peaks a year after a crisis on average 28% above the pre-crisis level. The (fiscal) costs of restructuring the economy after a crisis are significant: for industrial countries they are usually little under 10% of GDP, for emerging market economies the costs are huge. The reason is that in emerging economies the overall state of the national balance sheet is much worse and, secondly, the currency and banking crises tend to coincide [20].

Table 4-1. Time and geographical distribution of banking, currency and twin crises

Time distribution		1975-1997	1975-1979	1980-1984	1985-1989	1990-1994	1995-1997	
Banking crises	number	90	6	16	21	30	17	
	frequency	5.0	1.6	4.2	5.3	7.2	6.8	
Currency crises	number	202	39	45	50	48	20	
	frequency	11.3	11.0	12.0	12.6	11.6	8.0	
Twin crises	number	37	3	5	8	11	10	
	frequency	2.1	0.8	1.3	2.0	2.6	4.0	
Geographic distribution		Industrial	Developing	Emerging	Developing			
					Africa	Asia	Latin Am.	Other
Banking crises	number	19	71	46	21	15	26	9
	frequency	4.4	5.2	6.6	5.8	5.0	5.1	4.8
Currency crises	number	42	160	78	59	29	53	19
	frequency	9.6	11.8	11.2	16.5	9.6	10.4	10.2
Twin crises	number	7	30	23	11	7	8	4
	frequency	1.6	2.2	3.3	3.1	2.3	1.6	2.2

Source: Glick and Hutchison (2000).

Frequency: with respect to total country-years,

Other: includes CEE, ME etc.

Table 4-2. Average recovery time and output loss (relative to trend)

	Currency crisis	Currency crash	Banking crisis	Twin crisis
Average recovery time (in years)	1.6	2.0	3.1	3.2
Cumulative loss of output per crisis (in %)	4.3	7.1	11.6	14.4

Source: World Economic Outlook (1998).

[16] As "emerging market" authors define countries with relatively open capital markets while "developing country" sample includes other developing countries and transition economies.

[17] "Twin" crises are defined as banking crises accompanied by a currency crisis in previous, current, or following year.

[18] Which brings the cumulative (potential) output loss to around 7–8%.

[19] It is interesting to notice that crises with a financial component have greater impact (in terms of the loss of output) on developed economies. This is most probably because in these countries a much greater share of GDP is intermediated through the banking system – the possible consequences of a credit crunch are proportional to the importance of the credit itself. I thank Marek Dąbrowski for this remark.

[20] For example: the US 1984–91 banking distress cost 5–7% of GDP, Sweden 1991–93 – 4–5%, Norway 1988–92 – 4%, Finland 1991–93 – 8–10% of GDP. The Argentinean debt crisis cost 13–55%, Chilean dent crisis 19–41%, the Mexican crisis 1994–95 – 12–15%. Figures for 1997–98 Asian crisis run as high as 55% for Indonesia.

4.4.3. The Determinants of Banking Crises

Table 4-3 summarizes the results of typical studies regarding bank crisis determinants and its predictability. With the exception of Kaminsky (1998) the estimations were usually carried through by the limited dependent variables method (binary choice models, such as probit and logit). The table presents the coefficients obtained from the regressions. The asterisks indicate the significance of the variable (*=10%, **=5%, ***=1%, n.s.=not significant). Coefficients are usually not comparable between studies, nevertheless, their "within" magnitude and significance provide much information about how banking crisis erupt.

In general, banking crises tend to happen when macroeconomic environment is weak, i.e. growth is low, inflation high and real interest rate is excessive. Institutional factors seem to matter strongly. Countries with explicit deposit insurance schemes, weak law enforcement and just liberalized are particularly vulnerable.

The decline in growth emerges as one of the most important factors – the undoubtful significance of this variable provides evidence that developments in the real part of the economy are a major source of banking sectors

problems. When economic conditions deteriorate corporations experience difficulties with servicing their debt and the banks' non-performing loans portfolio increases. This conclusion is consistent with the boom-bust cycle theory [21]. However, this result does not seem to give evidence of the reverse causality (i.e. that bank crises induce output decline). Kaminsky and Reinhart (1996) find that a decline in output precede a banking crisis by about 8 months.

The sign for the inflation coefficient is somehow ambiguous. There is some evidence that banking crises happen in an environment of accelerating inflation. On the other hand, the rapid slowdown of inflation (a boom-bust cycle of inflation), as, for example, during disinflation programs, seriously erodes banks' profitability and can be responsible for systemic problems [Hardy and Pazarbasioğlu, 1998].

Other macroeconomic variables as credit expansion, high real interest rates and overvalued exchange rate also increase banking sector's problem.

According to theory and the common sense, greater financial liberalization is highly correlated with the onset of banking distress. Demircuc-Kunt and Detragiache (1997) analyze 53 countries during 1980–1995 and find that financial liberalization increases the probability of a banking cri-

Table 4-3. The empirical evidence of the determinants of banking sector crises

study	growth	infl.	liber	RIR	TOT	DIS	M2/res	RER	Other variables and notice
A	-0.17 ***	0.03 ***	1.95 ***	0.05 ***	- 0.54 **	-	0.02 ***	-	Quality of institutions: (explained below) law and order 95% ** contract enforcement 80% * bureau quality 125% * (no)corruption 130% **
B	-2.2 ***	-1.42 ***	-	0.01 **	n.s.	0.36 ***	-	-	lag of stock prices -0.37 ** lag of credit to priv. sector 0.67 *** interest rate control : -0.36 ***
C	-14.6 ***	-7.9 *** 9.2 ***	-	0.06 ***	n.s.	-	-	7.2 **	Inflation column: first coefficient: first lag of inflation second coefficient: second lag of inflation
D	-0.38 **	n.s.	7.98 ***	-	-	1.42 **	-	-	
E	-0.24 ***	0.06 **	-	0.12 ***	-	-	0.016 **	-	law and order -0.52 *** , gdp/capita -0.16 ** budget surplus not significant
F	0.5	-	0.8	-	0.8	-	0.5	0.3	Noise-to-signal ratios (explained below) dom. credit/GDP 0.6 foreign debt 0.5 exports 0.6 stock prices 0.3 deposit withdrawal (bank run) 1.0 , etc.

Source: A: Demircuc-Kunt and Detragiache (1997), B: Munoz (2000) C: Hardy and Pazarbasioğlu (1998), D: Glick and Hutchison (2000), E:15, F: Kaminsky (1998).

"-"=not included, n.s.=not significant, *=10%, **=5%, ***=1%

"Quality of institution" coefficient indicates how many percent of the initial negative impact of the financial liberalization is (would be) offset if the country got the best score instead of the worst, for a given criterion.

Noise-to-signal ratios = 0=perfect predictor, >1 worse than an unconditional guess (see text for more explanation).

[21] The liabilities-side crisis doesn't get much support from the data. See Kaminsky (1998) - the bank run noise-to-signal ratio is equal to one.

sis significantly. Nevertheless, they also find that in financially repressed countries the financial situation usually improves even if they experienced a banking crisis. For financially restrained this cannot be proven – financial development remains at similar level [22]. They also notice that liberalization not immediately increases banking fragility – it takes usually few years before the country experience banking problems.

What is important – the initial negative impact of the liberalization is lower for countries where the institutional environment is strong. For example, the promotion of the country from the worst to the best score within the "rule of law and order" criterion almost in 100% offsets the negative effect of the liberalization itself. Obtaining the perfect score (instead the worst) within "contract enforcement" category can undo the liberalization's bad influence in 80%. For "efficient bureaucracy" and "low corruption" the offset coefficients are as high as 125% and 130% respectively.

Empirical research seems to support the view that financial liberalization should be treated with caution and special attention should be paid to the existence of sufficient institutional framework: respect for law, prudential regulations and supervision, etc. This is true regardless of just only macroeconomic stabilization.

The results for deposit insurance scheme are disappointing. Although it may have reduced the system's vulnerability to runs, nevertheless, the moral hazard problem posed by the guarantees overrides possible benefits. Countries with deposit insurance schemes were not able to adequately supervise and regulate their banking sectors. However, as it has been mentioned above, this argument is rather not against DIS per se but against its poor design and inadequate implementation.

The overall significance and predictability for the banking crises is the highest in the emerging market sample,

which is consistent with a similar finding for currency crises [compare Sasin, 2001]. In addition, it is interesting to notice that the same factors that increase the probability of a banking crisis also make this crisis more costly [23].

4.4.4. The Empirical Evidence on the Interrelation between Currency and Banking Crises

The general consensus among researchers on this point is that banking crisis is a good leading indicator of a currency crisis but the converse is not necessarily true - currency crises are not good leading indicators of banking crises.

Table 4-4 presents a summary statistics on the frequency of currency crisis accompanying bank crises and vice versa, as well as the performance of bank crises as a signal of currency crises and vice versa. The frequency of banking crises accompanied by currency crisis is higher than the frequency of currency crises accompanied by banking crisis. Currency crises tend to cluster one year after a banking crisis while banking crises accompany a currency crisis usually the previous year. Both findings support the view that banking crises provoke currency crises, rather than the opposite.

Also the comparison of the predictability index developed by Glick and Hutchison reveals that currency crises in period t and $t+1$ can be well predicted by the occurrence of a banking crisis in period t . The predictability is stronger for emerging markets (values of 2.46 and 1.96 respectively). The occurrence of a currency crisis in period t doesn't contain any information regarding the next period probability of a banking crisis (the value of 0.98).

The above analysis was univariate. When we exploit the cross-correlation among variables in the multivariate model, the results change somehow (full table not report-

Table 4-4. Performance of bank crises as a signal of currency crises and vice versa

	Number of banking crises	Freq of accompanying currency crises (%) Currency crises as bank crisis indicator (index)			Cumulative freq.	Number of currency crises	Freq of accompanying banking crises (%) Bank crises as currency crisis indicator (index)			Cumulative freq.
		t-1	t	t+1			t-1	t	t+1	
All	90	11 1.38	16 1.40	15 0.98	41	202	7 0.98	7 1.44	5 1.42	18
Developing	71	10 1.32	18 1.59	15 0.82	42	160	7 0.82	8 1.66	5 1.35	19
Emerging	46	9 1.87	24 2.30	20 0.87	50	78	11 0.77	14 2.46	6 1.96	29

Source: Glick and Hutchison (2000)

Predictability index: the higher the value of the index the better predictability, the value of 1 indicates ambiguous informative content

[22] Financially repressed (restrained) are countries, in which the real interest rate before liberalization was negative (positive).

[23] The breakdown into subsamples and the cost-of-crises regression not reported.

ed). Currency crises as predictors of banking crisis remain insignificant (except for contemporaneous events). The usefulness of banking crises as predictors of currency crises decreases substantially – they only issue a proper (and very strong) signal of an approaching currency crisis in the case of emerging markets. The contemporaneous correlation is significant for both developing and emerging markets.

Kaminsky (1998) develops a so-called "signal approach" to assess what are the determinants of both currency and banking crises. The estimated coefficient are actually noise-to-signal ratios (ntsr): the coefficient equal to zero indicates perfect predictability power of the variable, the coefficient one indicate the power of a simple unconditional guess (i.e. the variable in question is neutral) while values greater than one disqualify the variable. She notices that it is a little harder to predict banking crises (compounded ntsr=0.8) than currency crises (ntsr=0.7). The best variable to predict both crises is the real exchange rate overvaluation (ntsr=0.2 for currency crises and 0.3 for banking crises). Consistently with other studies she finds that a banking crisis is a very good indicator of a currency crisis (ntsr=0.3) while the opposite is not true (ntsr=1.2).

4.5. Conclusions

It has been shown that banking crises and currency crises are interrelated and that banking crises are good leading indicators of currency crises, so there is a point in assessing the condition of the financial system and the probability of a banking crisis. The recent crises are shown to follow the pattern of a boom-bust over-lending – over-investment cycle. Banking crises emerge when macroeconomic situation deteriorates, i.e. growth slows down, inflation and the real interest rates are high, etc.

Institutional factors matter: countries with explicit deposit insurance scheme or with inadequate contract enforcement are more vulnerable. The financial liberalization increases the possibility of a crisis in improperly regulated banking sector. The problem of moral hazard chiefly contributes to the emergence of a crisis.

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Part V.

Propagation of Currency Crises – The Case of the Russian Crisis

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5.1. Introduction

The recent wave of currency crises in the 1980s and 1990s has led to a resumption of studies into this economic phenomenon. The series of crises started with the Mexican debt crisis in 1982, followed by the European Monetary System crisis of 1992–1993, the Mexico crisis of 1994, the Asian crisis of 1997, the Russian crisis of 1998 and the Brazilian crisis of 1999. The financial turmoil seen in these crises triggered a vast bulk of literature on various issues surrounding the topic. Despite all the advancements in theory and empirical analyses there are still some unclear aspects. This ambiguity arises even with regard to the definition of a crisis *per se*.

One strand of currency crisis theory deals with the cross-country propagation of crises – very often referred to as *contagion*. An investigation into the nature of this mechanism is of key importance for a proper understanding of crises. An understanding of contagion has very important policy implications as it can help in the search for answers as to whether contagion can be stopped or avoided.

Despite the proliferation of literature on crisis propagation in recent years there is no research consensus on issues surrounding *contagion*. One of the reasons for this is the problem of defining contagion in the first place. Notwithstanding intuitive comprehensions of the term *contagion*, numerous misconceptions arise. Since the inception of contagion theory, the term *contagion* has been used in a variety of ways, covering both broad and narrow meanings. Thus, this paper starts with a survey of literature on contagion, focusing on definitional approaches. The focus is then shifted to the problem of identifying the various means by which crises propagation, followed by a look at measurement methods.

Research to date has tended to take one of three routes: to investigate individual channel of contagion; to test empirically which channel is most important; to discover simply whether there was any contagion at all. For instance, Masson (1998) and Masson (1999) explored a transmission mechanism via multiple equilibria; Rijckeghem and Weder

(1999a) explored the common lender effect; Drazen (1999) explored political contagion; Glick and Rose (1999) looked at trade channels, and Eichengreen et al. (1996) tested for contagion and the importance of the trade channel. Forbes and Rigobon (1999b) have pointed out deficiencies in econometric tests for contagion and proposed their own test, which remains consistent with econometric theory.

The results of and conclusions drawn from the above-mentioned papers seem to depend to a great extent on the definitions of contagion employed and the respective empirical tests that emanated from them. Rijckeghem and Weder (1999b), applying a very broad definition of contagion, found that spillovers through common bank lenders were significant in the propagation of the Mexican, Thai, and Russian crises. Drazen (1999) put forward a concept of political contagion and a model of 'membership' contagion that applies to the ERM crisis. Glick and Rose (1999) illustrated the key importance of trade channels in contagion above and beyond macroeconomic and financial similarities by sidestepping the problem of defining and testing contagion (they simply assumed that there is contagion). Eichengreen et al. (1996), conducting a panel analysis of industrial countries, found evidence of contagion and also stressed the importance of the trade channel. On the other hand, Forbes and Rigobon (1999a) and (1999b), using a very precise definition of contagion, analysed stock market co-movements and claimed that there is no such thing as contagion, only interdependence.

This paper tackles the issue of crises propagation by investigating the case of the Russian crisis in terms of a sample of 24 selected countries of Central and Eastern Europe (CEE) and Commonwealth of Independent States (CIS). No formal testing of spillovers and the contagion effect is pursued. The focus is put rather on the propagation in general terms. The crisis-hit countries are chosen arbitrarily based on expert knowledge. It is argued that in the global economy there are many co-existing and interdependent mechanisms and channels for shocks to spread across economies. The mechanisms refer both to real and financial linkages and are permanently in operation. Due to real world complexities it is impossible to isolate specific mechanisms. Recognising these limitations and data constraints, the empirical

analysis in this paper goes beyond formal econometric tools and makes use of a less formal approach based on stylised facts. For a more comprehensive understanding of the spread of the Russian crisis, basic developments in crisis-hit countries are presented with a selective analysis of financial market characteristics of the CIS countries. Some references to the Asian economies are also provided. First, a simple probit model is estimated. This outlines the probability of crisis in a country with trade links with crisis-hit countries with reference to macroeconomic fundamentals. Then, some back-of-the-envelope calculations within the framework of the balance of payments model developed by Masson (1999) are conducted. The results of these two approaches form the grounds for a case-by-case analysis of the issue under investigation based on stylised facts.

The remainder of this paper is organised as follows. Chapter 5.2. discusses definitions of contagion and Chapter 5.3. identifies the main channels by which currency crises propagate. Different empirical approaches to the measurement of contagion are presented in Chapter 5.4. Chapter 5.5. introduces the research methodology of this paper and presents its results. Finally, Chapter 5.6. offers some conclusions.

5.2. Definitions of Contagion

Despite what we may call an intuitive understanding of the term contagion there are many misconceptions surrounding it. From the very beginnings of contagion literature researchers adopted varying positions with regards the term. These range from a very broad usage – encompassing the propagation of shocks in general, for example via trade, financial linkages, etc to a very specific usage, i.e. how shocks spread unrelated to fundamentals.

In some papers authors have not explicitly defined contagion at all [e.g., Glick and Rose, 1999] or have provided a specific definition for particular purposes of their research, like in Eichengreen *et al.* (1996), p. 19: 'The contagion effect with which we are concentrated can be thought of as an increase in the probability of a speculative attack on the domestic currency which stems not from "domestic fundamentals" such as money and output but from the existence of a (not necessarily successful) speculative attack elsewhere in the world'.

In other papers more formal and clear-cut distinctions have been put forward. For instance, Masson (1998) distinguishes three types of phenomena related to the spread of crises: *monsoonal effects* – arising from a common shock, e.g. an interest rate hike in the US; *spillovers* – a crisis in one country worsens the macroeconomic fundamentals in other countries, for instance, via trade linkages (see Chapter 5.4); *contagion* – crises spread unrelated to funda-

mentals, in, for example, a shift in market sentiment or in the perception of market conditions.

Though Masson's definitions have conceptual appeal, some problems with differentiating between spillovers and contagion can arise on the empirical side. Contagion can be triggered by unknown factors that underpin investors' expectations or a simple capital squeeze – see further below. In the former case it is virtually impossible to test if fundamentals have an impact on investors' reaction functions and to define its parameters. This is because financial markets are extremely heterogeneous and many reaction functions may exist. Even if there were a single function, its parameters would change instantaneously. Thus, as fundamentals matter for contagion (i.e., investor expectations) the spillover effects naturally influence contagion effects. The factor that should differentiate between contagion and spillovers is time. Contagion should take place immediately, whereas spillovers should take some time to feed through economic mechanisms. However, setting the time window in the real world is difficult and no objective rules exist. A lack of high frequency data on various economic variables makes it impossible to measure the speed of this process. Moreover, market imperfections or specific features may additionally extend the period of propagation. In this respect the relation between spillovers and contagion is similar to the debate over self-fulfilling crises vs. crises due to poor fundamentals. As Jeanne (1997) argued, it does not make sense to set these views up in opposition to each other – they should in fact both be dealt with interactively. Both fundamentals and investor behaviour may contribute to the genesis of a speculative attack.

A different definition was proposed by Forbes and Rigobon (1999a) and (1999b). They coined the term shift-contagion, i.e. "a significant increase in cross-market linkages after a shock to an individual country (or group of countries)". Cross-market linkages can be measured by various statistics, like the correlation in asset returns, the probability of a speculative attack or the transmission of shocks or volatility. This definition is very neat for testing purposes, however, it focuses mechanically on one specific channel and therefore ignores developments in other segments of the economy as well as overall economic background.

In this paper the definitions developed by Masson (1998) are employed. However, given that the empirical focus of the paper is how crises spread in general, the very detailed distinction he makes between contagion and spillovers is of minor importance to us here.

5.3. The Channels of Crises Propagation

Contrary to the problem with defining contagion, there is a general agreement among researchers at the theoretical level on the set of channels by which crises spread. This

chapter is devoted to a discussion of these channels. It draws on Forbes and Rigobon (1999b) and the IMF (1999b).

The first channel is called *multiple equilibria*: [see Masson, 1998]. Masson claims that a crisis in one country affects investors' expectations which then leads to a shift from a good to bad equilibrium in other countries. Expectations are thus the mechanism by which crises spread. This channel clearly would not work during tranquil periods. Masson argues that multiple equilibria should be associated with pure contagion. As market expectations are correlated across economies due to sunspot variables (provided that fundamentals lie in the zone of multiplicity), crises can take place contemporaneously irrespective of these fundamentals. Hence, as Jeanne (1999) notes, self-fulfilling crises feature an inherent tendency to become systemic.

The second channel – *endogenous liquidity shock* – occurs when a crisis in one country causes liquidity strains in other countries. Investors, to survive, maintain margin calls, etc. and have to alter their portfolios. Very often this entails selling assets in other countries which in turn sparks crises. The drop in liquidity can also induce tighter credit rationing in other countries which can also lead to the selling of assets. A similar concept – *common bank lender* – was investigated by Rijckeghem and Weder (1999a). They analysed the effect of significant bank lending to emerging markets (both loans per se and the holding of assets). In the event of crises, banks, in order to restore capital asset ratios, meet margin calls or, to reduce risk exposure, withdraw capital causing contagious effects.

The third channel – *political contagion* – can arise when there is a political conflict between domestic and exchange rate objectives. A country may decide to sacrifice its fixed exchange rate to meet domestic objectives. Such a possibility is revealed by a successful speculative attack, which, in turn, impacts on other countries in a similar position who may also experience pressure on their currencies. This channel was analysed thoroughly by Drazen (1999) and applied to the ERM crisis. Apart from this very specific situation, one should also note the general role of political developments during crises and how they spread. Political factors are usually not in themselves responsible for crises, but add to crisis pressures by aggravating the already poor economic situation, in turn affecting the sentiments of foreign investors.

The fourth channel relates to *trade*. In the event of a crisis, demand for foreign goods is slashed due to 1) devaluation/depreciation of the domestic currency and 2) lower economic activity dampened by higher interest rates. In practice, the exchange rate channel is the most important as it has a direct and immediate impact as opposed to the activity channel. Lower demand in the crisis-hit country induces strains on countries that export significant amounts to this country. A drop in their exports may lead to current account problems and trigger a crisis.

While considering the trade channel, the issue of timing and expectations should be brought to attention. In the spillovers paradigm depreciation in the crisis-hit country worsens export prospect in other countries. This process is rather long-lasting – depending on the structure of trade contracts – but probably not shorter than 3 months. Thus, one should not expect an immediate crisis outbreak due to this mechanism. This appears to depend to a large extent on other factors, like the level of foreign reserves, the size of the depreciation, and whether it is permanent or not. In the case of a one-off depreciation – a significant change in the exchange rate followed by the return to the previous level – we cannot speak about a real spillover mechanism. The trade channel may also involve the expectation mechanism. Trade linkages may enter the reaction function of financial market actors. A crisis in an important export-partner country may incline investors, recognising the trade-related spillovers, to pull out of the domestic market. As a consequence, some of the findings from the literature on the significance of the trade channel in spreading crises may in fact partially point to the financial market channel.

The other trade channel works through the competitiveness effect. If two countries compete in a third country market, a crisis driven devaluation in one of them will cause a relative deterioration in competitiveness in the other country. Similarly to the first case, the lowering of exports can lead to current account problems and a crisis. At this point, it should be stressed that two conditions must be met in order to make this mechanism legitimate. First, the commodity structure of competing countries must be very similar, because if they trade in very different goods one cannot talk in terms of the competitiveness effect. Second, if the first condition is satisfied, the output capacity of the crisis-hit country must be large enough to allow for an increase in output and exports large enough to crowd-out the non-crisis hit country's exports in the third market. As most studies employ aggregated data these conditions have not yet been investigated properly. Only Forbes (2000), working with data at a very disaggregated level, has tested this issue in any formal way.

Forbes (2000) also investigated the *bargaining effect*. This occurs if a crisis-hit country is a significant supplier of a certain good and the crisis induced devaluation leads to lower worldwide prices of that good. As a result, the competitiveness of non-crisis-hit countries is reduced. In this case, the effect does not necessarily require direct competition in the same market. Although this argument is theoretically interesting, in practice its significance is rather limited.

The fifth channel deals with *common aggregate shocks* such as a change in world interest rates, a slowdown in world output growth or changes in bilateral exchange rates among major world economies. These shocks exert contemporaneous pressures on the currencies of several countries and may lead to a crisis.

Forbes and Rigobon (1999) distinguished two main themes out of the aforementioned channels: crisis-contingent (multiple equilibria, endogenous liquidity and political contagion) and non-crisis-contingent (trade and common aggregate shocks). This classification seems rather artificial. It manages to clarify theoretical study but does not facilitate further empirical modelling.

What has to be stressed here is that in reality many of these channels occur simultaneously and the separation of their effects is virtually impossible. Researchers usually tend to focus on one channel at the cost of generality and relevance to the real world. However, the advantage of this approach is the feasibility it allows in conducting econometric modelling, which is the topic of the next chapter.

5.4. Measuring Crises Propagation

Bearing in mind the problems of defining contagion and its channels, we can now turn to a discussion of the methods of measuring the phenomenon. There are two broad approaches (correlation and limited dependent variable models) that will be discussed based on examples from the literature.

5.4.1. Cross-Market Correlation Coefficients

The cross-market correlation coefficients approach to measuring contagion boils down to a comparison of correlation coefficients (for instance between stock returns) during tranquil and volatile periods. An increase in the correlation is treated as an occurrence of contagion. Forbes and Rigobon (1999a) and (1999b) contributed largely to this method. They draw attention to the fact that a simple correlation coefficient is biased if not adjusted for heteroscedasticity. Their adjusted coefficient, applied to stock market indices during periods of the 1987 US stock market crash, 1994 Mexican crisis and 1997 Asian crisis, does not indicate any significant increase in correlation during volatile periods as compared to tranquil periods. Consequently, they concluded that there is no contagion, rather interdependence. This method was also pursued, among others, by Baig and Goldfajn (2000). They analysed contagion from Russia to Brazil focusing on stock indices, sovereign spreads and exchange rates. Rolling correlations (adjusted for heteroscedasticity as in Forbes and Rigobon) and reduced VARs provided the tools for their analysis. They found a significant increase in the correlation on the Brady bonds market. Based on this they claimed that this market was the most likely channel for the propagation of the Russian crisis to Brazil.

5.4.2. Limited Dependent Variable Models

Limited dependent variable models seek to explain how a crisis in one country influences the odds of a crisis in other country (the dependent variable equals 1 if there is a crisis, 0 if otherwise). Probit models are usually used as particular econometric tools. This approach has been widely pursued in many studies. One prominent example is the work of Eichengreen *et al.* (1996). Using panel data for 20 industrialised countries over a period of more than three decades they found that a crisis in one country increases the odds of a crisis in another. Their study showed that the trade channel is more important than macroeconomic similarities in contagion propagation.

Glick and Rose (1999) arrived at similar conclusions. They ran a probit model that explains the occurrence of a crisis with trade linkages and a set of macroeconomic variables. They assumed arbitrarily which country was affected by the turmoil. The sample covers 5 waves of currency crises – 1971, 1973, 1992, 1994–95, and 1997. Their main conclusion highlights the regional nature of currency crises and the dominant role of trade linkages.

Another view was presented by Rijckeghem and Weder (1999b) who ran two types of models that explain contagion (first defined as a binary variable and later as the continuous EMP index) with trade linkages, competition for bank funds and macroeconomic fundamentals. They investigated Mexican, Thai and Russian crises and found that the common bank lender effect contributed significantly to the spreading of analysed crises. However, not all results held up against the inclusion of trade variables.

A different econometric approach to those presented above was employed by Edwards (1998). He estimated the variance-covariance transmission mechanism across countries with the help of ARCH or GARCH models. He tested for volatility contagion in Argentina, Chile, and Mexico using high frequency data on short-term nominal interest rates during the 90s. The augmented GARCH model proved, quite strongly, volatility-contagion from Mexico to Argentina and no volatility-contagion from Mexico to Chile.

This succinct survey of empirical literature presents two broad approaches of measuring contagion and highlights the main difficulties that researchers face in their quest to unravel the mystery of contagion. On the one hand, we have correlation coefficient-based models that try to answer the question of whether contagion exists. Econometric tests may raise reservations as they suffer from heteroscedasticity, omitted variables and endogeneity problems. Even if these problems are solved, such studies only provide answers as to whether or not there was contagion by focusing on one selected indicator. One can not fully learn about the underlying determinants of this process. Thus, this approach is limited in this respect. On the other hand, different forms of limited dependent variable models predict the probabili-

ty of crises with the help of trade and financial linkages as well as macroeconomic fundamentals. The latter approach tends to be more interesting as it sheds more light on the issue under investigation and has more profound implications, though it also poses numerous deficiencies. Limited dependent variable models are not free from similar econometric shortcomings as those in the case of correlation models.

Finally, a few words need to be devoted to an explanation of why empirical studies lag behind the development of the contagion theory. First of all, the problem of crisis definition in itself blurs the situation. Second, in the real world there are a number of factors that determine the economic situation. In empirical studies it is virtually impossible to single out these factors. Moreover, the discussion about fundamentals versus contagion (expectations) usually ignores the inter-determination of these two categories. As Jeanne (1999) points out, the world is not completely deterministic. Consequently, the causality between fundamentals and market expectations runs both ways and econometric models fail to account for this fact.

Second, empirical models are incapable of fully incorporating financial markets. We do not know the reaction function of financial market participants and will probably never be able to estimate it properly. Although there have been some attempts to derive models from microeconomic behaviour, they are of little help within a macroeconomic framework. There are two main reasons behind this conjecture: financial markets are extremely heterogeneous and the parameters of their reaction functions can change instantaneously. This, coupled with problems of informational asymmetries, makes formal modelling untractable. As Jeanne (1999) puts it, researchers estimating probit models that account for multiple equilibria are like meteorologists trying to predict a storm.

A microeconomic approach to modelling of currency crises was pursued by G. Kaminsky *et al.* (1999). They tried to identify investment funds' strategies via analysis at the portfolio level and their links with contagion. They discovered that funds used contagion strategies – i.e., they systematically sell assets from one country when a crisis hits another.

5.5. Model

The perfect model for crisis propagation would test all possible channels at the same time – trade linkages, the common bank lender effect and the role of financial markets. These concepts are mutually interdependent and equally important. Such a test would require detailed data on trade linkages (direct spillovers, the competitiveness

effect and bargaining effect), financial linkages (for instance, a matrix of liabilities linking creditors and debtors) and the reaction function of financial market participants. Unfortunately, only an aggregated trade matrix is available – no reliable and comparable data on financial linkages exist – and most importantly we do not know the reaction function. Therefore, no comprehensive econometric modelling is feasible, leaving only partial analysis possible.

Recognising deficiencies in the theoretical and in particular the empirical aspects of contagion, this paper focuses on the spread of the Russian crisis among selected CIS and CEE countries without formal differentiation between contagion and spillovers. A detailed list of analysed countries is provided in Appendix I. A simple probit model testing trade linkages and the balance of payments model, as developed by Masson (1999), which tests fundamentals (in terms of external debt) is employed. Following this a case-by-case analysis, supported by stylised facts, is applied to the combined results of the two models. This method, in the face of a very complex system of relations (not clearly distinctive channels which overlap and erratic data) may have conclusive power equal to that of general econometric approaches. However, in addition, we can gain more interesting insights that would be overlooked in general econometric models.

The paper aims to categorise the analysed countries into the following cases:

A crisis in country A caused a crisis in country B:

- country B was prone to a crisis and shock propagation triggered the crisis,

- country B was 'healthy' and spillovers/contagion caused it to suffer a crisis.

A crisis in country A did not cause a crisis in country B:

- country B was immune to a crisis and (disregarding if there was or was not shock propagation),

- country B was susceptible to a crisis but no propagation mechanism occurred.

5.5.1. Definition of a Crisis

Prior to a formal analysis the issue of defining a crisis will be tackled. From the very outset of theory dealing with currency crises, academia faced the problem of defining the phenomenon. Questions such as when does a crisis start and end or can a crisis be repelled are crucial in the search to find an universal and formalised definition of crisis. As these questions cannot be answered unambiguously no fully-formed definition has yet been found. It seems that a crisis should be understood as the collapse of confidence in a domestic currency. Unfortunately, this idea is hard to measure in practice.

Recently, however, an approach deploying the exchange market pressure (EMP) index has been widely used. It was

largely developed by Eichengreen *et al.* (1996). They claimed that when analysing crises one should look not only at changes in the exchange rate but also at international reserves and interest rates. Some countries may choose to defend their exchange rates at the cost of reserves or/and higher interest rates.

The deficiency of this approach lies in its mechanical nature and dependence on the choice of weights and thresholds. There is significant scope for the researcher to set these parameters according to her own theoretical predilections. This definition also does not allow one to easily differentiate between 'crisis' and a 'successful defence of a crisis/speculative attack'. Besides, as Flood and Marion (1998) noted, if a crisis is not fully anticipated, then interest rates rise and reserves are depleted prior to the exact timing of the crisis. Because of this, jumps in interest rates, reserves and the exchange rate in the event of a crisis may not be sufficient to be found by the EMP index.

An alternative to the EMP index is the selection of crises based on expert knowledge. This approach is entirely subjective, but makes it possible to account for those specific features of countries under investigation that the mechanical EMP approach would never be able to track down.

Given the focus on CIS countries in this research, computing the identical EMP index to the index of Eichengreen *et al.* (1996) is virtually impossible due to data constraints. In particular, there is a problem with proxies of interest rates. In the face of conceptual and data deficiencies it was decided to choose crisis-hit countries arbitrarily. Namely: Ukraine, Moldova, the Kyrgyz Republic, Belarus, Georgia and Kazakhstan.

5.5.2. The Russian Crisis – Stylised Facts

Before turning to the model basic facts on the crisis-hit countries are provided. In particular, we focus on developments in financial markets and changes in exchange rate arrangements. This factual background should facilitate a better understanding of how crises spread and will serve as a basis for further discussion. In addition, facts on financial and trade linkages as well as some characteristics of financial markets in CIS countries will be presented.

A chronology of the Russian crisis starts with the devaluation of the rouble by over 33 per cent on August 17, 1998. This decision was preceded by mounting pressures on the currency and a change in investors sentiment. The Moscow stock market plummeted in May and June 1998 – the market index dropping by 40 and 21 per cent [Antczak, 2001]. The end of June saw a massive outflow of foreign capital that was reflected in a decline in the official reserves of the Central Bank of Russia by US\$8 billion. At the same time interest rates on GKO/OFZ securities were increased to 130 per cent. As the crisis unfolded the exchange rate

band was abandoned on September 2, 1998 and the rouble depreciated by a further 20 per cent the next day.

An immediate reaction was seen on the Ukrainian market. On September 4, 1998 the National Bank of Ukraine stopped selling foreign exchange to the market and altered the exchange rate band from 1.8–2.25 to 2.5–3.5 Hryvnas per US dollar [IMF, 1999d]. However, it should be stressed that these decisions, accompanied by numerous administrative measures to control the currency market, were the last stage of a long process. Clouds over Ukraine had been gathering since the autumn of 1997. At the time of the Asian crisis, a swing in investors sentiment triggered a sustained outflow of capital during the remaining part of 1997 and the first 9 months of 1998. Consequently, international reserves were declining and pressures in the financial policy mounting.

A similar scenario took place also in Moldova. Strains in the financial system were caused by the continued high budget deficit and the accumulation of external debt as well as debt arrears. Consequently, the T-bill market was eroding for most of 1998. Export proceeds almost immediately ceased to flow in at the time of the Russian crisis. At the same time money and banking conditions deteriorated considerably. A drop in demand for domestic financial assets and money was coupled with an increase in dollarisation. With international reserves running ever lower, the National Bank of Moldova decided to float the leu exchange rate in early November [IMF, 1999f].

The Russian crisis had an immediate impact also on the Kyrgyz financial markets. The som came under a heavy pressure and, despite significant interventions from the National Bank of the Kyrgyz Republic, it had depreciated by 11 per cent by mid-September. International reserves consequently declined up to December and the som continued to depreciate with a considerable drop in November. At the same time foreign investors, in particular Russian and Kazakh banks, fled the government securities market. In order to counteract this process, interest rates were raised, for instance: 3-month T-bill rates rose from 22 per cent in May 1998 to 116 per cent in November [IMF, 2000b].

The situation in Belarus was not a clear-cut case. Crisis identification was blurred due to multiple exchange rates. At the time of the Russian crisis there were 5 exchange rates. Moreover, Belarus had already experienced currency turmoil in March 1998 and developments in Russia triggered a second wave of the crisis. International reserves remained stable with no sharp decline. The official exchange rate between November and December depreciated enormously. In the event of the Russian crisis the central bank's interest rates were lowered due to the desperate need of the public finances to cover mounting deficit. Despite their subsequent rise, they remained negative in real terms as inflation soared.

In Georgia, the Russian crisis coincided with a weak fiscal stance. As market sentiment shifted, a sharp decline in money demand and a considerable rise in dollarisation followed. The T-bill market also came to an end. This reflected a lack of will on the part of the Georgian government to increase yields and rollover the maturity of T-bills (IMF, 2000c). The tightening of monetary policy after September 1998 and heavy interventions from the central bank on the exchange market to defend the lari exchange rate drained international reserves. On December 7, 1998, when reserves reached a low of US\$64 million (an equivalent of 3 weeks of imports), the monetary authorities decided to float the exchange rate. The subsequent and immediate depreciation of the lari against the dollar was 20 per cent.

Kazakhstan was the last victim among the CIS countries of the Russian crisis, though the reaction of financial markets was very rapid. As turmoil in Russia mounted, the premium on Eurobonds issued by Kazakhstan jumped by as high as 2000 basis points [IMF, 2000b]. This eventually cut Kazakhs off from foreign sources of financing. In particular, credit lines from foreign banks were cut short. After mid-1998 the average nominal rate of monthly depreciation of the tenge against the dollar rose and hovered around 1–2 per cent until March 1999. The central bank increased interest rates in an attempt to prop up the currency. Market-determined interest rates were also on the rise. As the policy measures proved ineffective, the authorities decided to float the tenge in early April 1999. It is also important to note that Kazakhstan was also affected at that time by two other negative shocks: a decline in oil prices and drought (lower crops), causing losses in export revenues.

After this very brief background, the role of Russia as an economic centre cannot be underestimated. All the above-mentioned countries have strong economic linkages with Russia – both in terms of foreign trade and financial markets. However, the importance of Russia as an export market differs quite significantly between countries (see Table 5-1 – the complete trade matrix can be found in Appendix 2). The exact financial linkages are hard to pinpoint due to the lack of relevant data, though expert

knowledge suggests that in some cases they played an important role. Many foreign investors (primarily with Baltic states and Russian off-shore origins) were involved in the financial markets in Russia and other CIS countries, e.g. Kazakhstan, the Kyrgyz Republic, Ukraine [Dąbrowski, 2000]. Also, ties between banks in various CIS countries were relatively strong. Thus, the shocks of the Russian financial market in Autumn 1998 most definitely impacted Russia's adjacent economies.

Finally, a few remarks on the nature of financial markets should be made. In many studies on currency crises 'financial markets' have proved a very important factor, though without much explanation of how they are defined and what their specific characteristics are. This would appear to be a serious case of oversight, especially in papers dealing with the identification of the general causes of crises over a large sample of countries given the heterogeneous nature of financial markets.

In order to test comprehensively the financial channels in the spread of crises, financial markets should be defined clearly. This would facilitate better modelling of these channels. In particular, in the case of CIS countries an analysis of financial markets is very important as they feature many peculiarities. Below are a few points on the nature of financial markets in CIS countries and a comparison of the basic financial indicators of selected Asian economies. This comparison illustrates the importance of a clear-cut definition of financial markets.

Financial markets (in terms of financial institutions and mechanisms – stock markets, currency markets, government securities markets, the banking system, and so on) are generally poorly developed in the countries covered in this paper (with the exception of the most advanced countries such as the Czech Republic, Hungary, Poland, the Slovak Republic, Slovenia, Turkey, and to some extent also Russia). For instance, when looking at stock market capitalisation (see Table 5-2) there are huge discrepancies among selected Asian economies and more developed CEE countries, as well as CIS countries. In the latter case stock markets are virtually non-existent.

Information on the key players in financial markets and the extent to which given countries are integrated

Table 5-1. Trade matrix in 1997 (% of total exports)

A\B	Russia	Ukraine	Moldova	Kyrgyz Rep.	Belarus	Georgia	Kazakhstan
Russia		26.2	58.2	16.3	64.5	30.0	33.9
Ukraine	8.5		5.6	0.8	5.9	3.5	4.8
Moldova	0.4	2.1		0.0	1.3	0.0	0.0
Kyrgyz Rep.	0.2	0.0	0.0		0.1	0.0	1.0
Belarus	5.4	5.8	4.0	1.5		0.4	0.7
Georgia	0.2	0.3	0.5	0.2	0.0		0.0
Kazakhstan	2.9	0.7	0.2	14.3	0.7	1.7	

Source: Author's calculations based on IMF data - Direction of Trade Statistics, 2000.

Note: % of country B's exports to country A in terms of country B's total exports .

Table 5-2. Stocks traded, total value (% of GDP)

	1996	1997	1998		1996	1997	1998
Armenia	-	0.06	0.05	Albania	-	-	-
Azerbaijan	-	-	-	Bulgaria	-	-	0.10
Belarus	-	-	-	Czech Rep.	14.56	13.31	8.41
Estonia	-	31.15	18.20	Hungary	3.63	16.81	33.75
Georgia	-	-	-	Macedonia, FYR	-	-	-
Kazakhstan	-	-	-	Poland	3.87	5.57	5.63
Kyrgyz Rep.	0.00	0.00	-	Romania	0.02	0.77	1.55
Latvia	0.23	1.49	1.34	Slovak Rep.	12.36	11.13	5.09
Lithuania	0.60	2.49	2.07	Slovenia	2.12	1.93	3.59
Moldova	-	-	-	Turkey	20.27	31.00	34.52
Tajikistan	-	-	-	Average	8.12	11.50	11.58
Turkmenistan	-	-	-	China	31.35	41.14	29.69
Ukraine	-	-	0.12	Hong Kong	107.99	281.88	123.72
Uzbekistan	0.30	0.14	-	India	6.70	12.82	15.00
Russia	0.71	3.75	2.46	Indonesia	14.14	19.30	10.31
Average	0.37	5.58	4.04	Korea	34.08	35.73	42.98
				Malaysia	172.10	146.74	39.78
				Philippines	30.80	24.08	15.35
				Singapore	46.72	67.22	60.13
				Thailand	24.45	15.51	18.62
				Average	52.04	71.60	39.51

Source: World Development Indicators 2000, World Bank.

Notes: Averages do not take into account missing observations.

Table 5-3. Bank loans as a percentage of GDP, 1996-1999

	1996	1997	1998	1999		1996	1997	1998	1999
Armenia	1.44	2.26	3.16	2.32	Albania	1.97	2.10	2.39	1.50
Azerbaijan	0.93	0.62	0.36	2.18	Bulgaria	15.32	12.23	5.98	5.04
Belarus	2.64	2.11	2.12	2.26	Czech Rep.	14.99	16.67	16.36	15.59
Estonia	2.71	14.82	19.05	12.07	Hungary	13.06	13.21	15.06	13.49
Georgia	3.03	0.52	1.26	-0.15	Macedonia, FYR	0.61	1.43	1.73	3.73
Kazakhstan	3.71	3.45	3.79	5.69	Poland	3.20	4.61	5.87	7.06
Kyrgyz Rep.	2.37	3.29	5.41	6.39	Romania	7.52	7.52	6.33	6.35
Latvia	1.87	2.94	6.16	5.40	Slovak Rep.	11.73	20.77	21.24	15.16
Lithuania	3.00	4.57	8.10	8.34	Slovenia	5.55	5.70	6.78	9.90
Moldova	1.65	1.74	1.76	4.30	Turkey	13.09	14.74	15.87	19.61
Tajikistan	0.48	2.57	6.90	5.96	Average	8.70	9.90	9.76	9.74
Turkmenistan	19.59	33.08	36.03	33.85	China	9.53	12.13	8.10	6.27
Ukraine	2.44	2.52	2.19	2.16	Hong Kong	298.79	271.63	189.09	155.18
Uzbekistan	2.56	2.71	3.79	5.84	India	5.04	5.15	4.74	4.66
Russia	12.33	12.04	18.30	22.27	Indonesia	24.61	30.33	52.12	27.92
Average	4.05	5.95	7.89	7.92	Korea	18.34	21.30	18.51	14.31
					Malaysia	22.13	26.78	27.38	21.22
					Philippines	14.77	20.41	19.50	18.95
					Singapore	311.24	331.10	314.80	253.73
					Thailand	52.98	55.10	42.20	26.03
					Average	84.16	85.99	75.16	58.70

Source: Author's calculations based on BIS debt data and IMF World Economic Outlook GDP data.

Table 5-4. Multilateral claims as a percentage of GDP, 1996-1999

	1996	1997	1998	1999		1996	1997	1998	1999
Armenia	14.94	22.14	22.54	28.59	Albania	6.99	8.14	8.89	10.09
Azerbaijan	5.89	8.47	10.70	16.38	Bulgaria	10.68	13.69	13.76	15.41
Belarus	2.85	2.82	2.56	2.74	Czech Rep.	0.77	0.73	0.65	0.61
Estonia	3.26	2.76	2.28	2.26	Hungary	5.22	3.77	1.44	1.40
Georgia	9.29	11.23	19.92	24.58	Macedonia, FYR	5.36	8.28	10.41	12.11
Kazakhstan	5.43	5.58	6.70	10.96	Poland	1.58	1.47	1.31	1.36
Kyrgyz Rep.	21.46	26.14	37.11	60.04	Romania	4.88	5.69	4.70	6.24
Latvia	4.05	3.64	3.93	3.88	Slovak Rep.	3.16	2.54	2.07	1.88
Lithuania	4.37	4.13	3.89	4.01	Slovenia	0.86	0.74	0.65	0.53
Moldova	20.40	17.27	20.05	35.53	Turkey	2.99	2.33	1.91	1.68
Tajikistan	3.55	6.19	11.65	21.09	Average	4.25	4.74	4.58	5.13
Turkmenistan	0.13	0.22	0.31	0.21	China	2.11	2.05	2.19	2.34
Ukraine	6.17	7.54	9.86	16.27	Hong Kong	0.00	0.00	0.00	0.00
Uzbekistan	2.83	2.56	2.61	2.57	India	8.26	7.44	7.13	7.05
Russia	3.36	3.98	9.17	12.64	Indonesia	7.84	7.36	25.18	19.32
Average	7.20	8.31	10.89	16.12	Korea	0.49	0.42	8.87	4.59
					Malaysia	1.45	1.29	1.99	1.83
					Philippines	10.36	10.36	12.77	12.55
					Singapore	0.00	0.00	0.00	0.00
					Thailand	1.59	2.94	6.43	6.78
					Average	3.57	3.54	7.17	6.05
					Average*	4.58	4.55	9.22	7.78

Source: Author's calculations based on BIS debt data and IMF World Economic Outlook GDP data.

Note: * - excluding Hong Kong and Singapore.

into the international financial community are of significance. The degree of integration can be demonstrated by the share of bank loans as a percentage of GDP (see Table 5-3). It is clearly evident that CIS countries enjoyed very small bank loans as a percentage of GDP (with the exception of Estonia, Russia, and Turkmenistan). The average in these countries ranges between 4 and 8 per cent over the period 1996–1999, whereas in CEE and Asian countries it ranges between 8–10 and 58–86 per cent, respectively. This data also highlights the difference in the creditor structure. Tables 5-3 and 5-4 illustrate that the dependence of CIS countries on financing from international organisations (proxied with multilateral claims – i.e., loans from the Asian Development Bank, the use of IMF credit, IBRD loans and IDA credits from the World Bank) is far greater than in Asian countries. It is also much greater than the dependence on private sources (proxied with bank loans).

When discussing financial linkages in CIS countries one cannot ignore capital flows related to remittance given that labour emigration has been pervasive. These flows have been very important especially for Georgia, Armenia, and Moldova (Dąbrowski, 2000). Many citizens of these countries used to work in Russia and transfer their income back home. The crisis-driven depreciation of the Russian rouble against the dollar caused remittance flows in dollar terms to drop significantly.

Finally, it should be stressed that many CIS economies are characterised by high dollarisation (e.g., Georgia, the Kyrgyz Republic, Moldova, Ukraine). Thus, one could say that these economies were in a state of permanent crisis, if a crisis is understood in terms of lack of confidence in a currency. In this respect, the behaviour of households was also an important additional factor in creating crisis pressure. Therefore, private domestic entities should be treated as a part of financial markets as well. When the crisis came, households in many CIS countries got out of domestic currencies and bought dollars, contrary to the situation in the Asian economies during the 1997 crisis.

The above facts indicate that, analysis of the crises propagation via financial channels should take into account international organisations owing to the considerable role they play in these economies as compared to private investors. Further investigation of the role of the IMF in the spread of crises would be extremely interesting. The behaviour of international organisations may vary considerably from country to country. One could argue that the IMF may be far less concerned about financial turmoil in small economies like the Kyrgyz Republic, Moldova, etc. because the implications for the international stability of financial markets are negligible and the potential costs of bailouts and assistance programmes relatively low.

Bearing in mind these characteristics of financial markets it should be said that the testing of the role played by finan-

cial channels in CIS countries is more difficult than is the case in developed markets. Theoretically, it would be easier to identify the reaction function of investors if there were no distortions in the markets. This is definitely not the case for CIS countries as multiple (Belarus and Uzbekistan) or double exchange rate systems (Turkmenistan) and restrictions on foreign currency transactions (Belarus) exist. In addition, the availability and reliability of financial data is far worse than in developed countries. On the other hand, the multiplicity of financial instruments in developed economies does not make the analysis easier.

5.5.3. The Probit Model

In order to test the role of trade linkages (and, in turn, of spillovers) in the propagation of the Russian crisis we have estimated a simple probit model. The crisis is defined with a binary variable (1 – crisis occurred, 0 no crisis occurred). Russia represents the ground-zero country. Of the 24 countries in the sample (a detailed list is provided in Appendix 1), 6 were identified as crisis-hit countries (Belarus, Georgia, Moldova, Kazakhstan, the Kyrgyz Republic, and Ukraine). Given the numerous problems with data availability and reliability the crisis variable is explained only with the use of trade shares and a single macroeconomic variable.

The trade variable is constructed so as to indicate the importance in any given crisis-hit country of export markets. This is the cumulative share of exports in their total exports. As such, this variable takes into account not only the ground-zero country, but also those countries that were infected with the crisis previously. For countries that did not experience the crisis it is the cumulative share of exports to all crisis-hit countries. The shares are based on annual data from 1997. 1998 was not chosen as the reference year as the considerable devaluations/deprecations that occurred in this year could bias the results. It was decided to incorporate only the direct trade channel (see Section 5.3), as no detailed data on the commodity structure of analysed countries were available and it was thus impossible to make any inference in terms of the competition effect in third markets or the bargaining effect.

The higher the share of exports to crisis-hit countries (i.e., countries that devalued/depreciated their currencies), the higher probability, *ceteris paribus*, of a trade balance deterioration in the given country. As a consequence, this may lead to a balance of payments crisis. Thus, the expected sign of this variable in the model is positive. At this point it should be stressed that trade statistics in CIS countries are widely deemed to be erratic and thus should be treated with great caution. This problem stems primarily from 'transparent' borders, low statistical coverage, discrepancies due to the translation into dollars and the large share of barter and shuttle trade.

Due to hard data constraints (both with regard to availability and reliability) the macroeconomic variable covers only the ratio of total reserves minus gold (as of the end of the third quarter of 1998) to exports (for 1998 as a whole, *fob*). The higher the ratio, the lower probability that a shock to the trade balance will cause balance of payments problems (higher/lower trade deficit/surplus can be financed with reserves). Therefore, this coefficient's sign should be negative.

A richer set of macroeconomic variables would seem to be more instructive and an occurrence of the omitted variable error less probable. Unfortunately, the small sample size made it impossible to estimate such a model. In various papers macroeconomic variables are added in order to control for differences in these variables across countries. For instance, Glick and Rose (1999) inserted credit growth, budget balance to GDP, current account balance to GDP, GDP growth, M2 to reserves and inflation. However, as Pritsker (2000) noted, the inclusion of fundamentals is not the same as controlling for them in an economic model. Properly controlling the role of fundamentals is possible only when all the ways in which the fundamentals can influence the economic situation are identified.

Prior to turning to the discussion of results, the problem of 'time inconsistency' in the variables of the above model should be brought to attention. The variables are measured at different points in time, which is conceptually incorrect. One reason behind such a situation is the previously discussed problem of defining the moments of crisis outbreak and elapse. The other handicap is the lack of high-frequency data. For instance, in the case of this paper's country coverage debt data are only available on an annual basis with some exceptions on a quarterly basis. The problem is even more profound when ratios are used. In this case variables are usually not only measured in different points in time, but also stock and flow variables are mixed. The long time-scale of crisis spreading under the investigation here does not make things easier, especially if it covers the turn of two years.

A potential solution to this problem could be the employment of multiperiod multinomial discrete choice and discrete/continuous econometric specifications with flexible correlation structures in unobservables as developed by Hajivassiliou and McFadden (1990). They illustrated that the estimation of these models based on simulation methods has attractive statistical properties and is computationally tractable. The models were applied to an analysis of external debt crises in developing countries.

The detailed results of the estimation are presented in Appendix 3. Below we outline only the probabilities of a crisis in a given country as computed in the model (see Table 5-5). Given a cut-off point of 50 per cent, the model predicted one crisis out of six and also two crises which did not happen. The former case applies to the Kyrgyz Republic.

Table 5-5. The Results of the Probit Model

	Actual	Fitted probability	Cut-off = 0.50	Cut-off = 0.75		Actual	Fitted probability	Cut-off = 0.50	Cut-off = 0.75
1 Ukraine	1	0.9154	1	1	13 Latvia	0	0.1640	0	0
2 Moldova	1	0.9474	1	1	14 Lithuania	0	0.5277	1	0
3 Kyrgyz Rep.	1	0.1411	0	0	15 Poland	0	0.0000	0	0
4 Belarus	1	1.0000	1	1	16 Romania	0	0.0109	0	0
5 Georgia	1	0.5739	1	0	17 Slovak Rep.	0	0.0424	0	0
6 Kazakhstan	1	0.8924	1	1	18 Slovenia	0	0.0013	0	0
7 Armenia	0	0.0000	0	0	19 Tajikistan	0	0.5309	1	0
8 Azerbaijan	0	0.0011	0	0	20 Turkey	0	0.0000	0	0
9 Bulgaria	0	0.0000	0	0	21 Turkmenistan	0	0.0000	0	0
10 Czech Rep.	0	0.0002	0	0	22 Albania	0	0.0000	0	0
11 Estonia	0	0.3009	0	0	23 Croatia	0	0.0000	0	0
12 Hungary	0	0.0018	0	0	24 Macedonia, FYR	0	0.0656	0	0

Source: Author's calculations.

This is hardly surprising given its low official share of exports to Russia and other crisis-hit countries. However, there are reasons – discussed later in this paper – to expect a stronger trade impact than the official data suggest. The model predicts a crisis in Lithuania (mainly due to its very high share of exports compared to crisis-hit countries – of over 45 per cent) as well as in Tajikistan, where the ratio of reserves to exports was very low, at 11.1 per cent (whereas the trade share remained small – around 11 per cent). Given the above result, one should seek other explanations as to why these countries did or did not experience a crisis.

It should be also noted that if the cut-off threshold was set at 75 per cent, then the model would fail to predict a crisis not only in the Kyrgyz Republic but also in Georgia, though the non-crisis cases would be fully identified. For this reason sensitivity to the cut-off threshold should be taken into consideration in further analysis.

The small size of the sample, poor quality data, time inconsistency in the variables as well as conceptual shortcomings of the above model all oblige one to treat these results with caution. The result should be treated as a rough indicator pointing to which trade links were helpful in explaining the propagation of crises which not. In order to gain more insights into how the Russian crisis spread back-of-the-envelope calculations within the framework of a balance of payments model are conducted.

5.5.4. The Balance of Payments Model

Masson's (1999) simple balance of payments model is capable of demonstrating how a large enough shock to the current account can trigger a crisis if foreign debt servicing exceeds a certain level. Borrowing costs reflect expectations of crisis. Higher interest rates make debt servicing more expensive and can deplete reserves, which in turn may lead to devaluation. In this framework, the size of

external debt is an important determinant of when a crisis breaks out.

Given the level of external debt, the size of the expected devaluation, expectations with regard to the trade balance and the standard deviation of the trade balance shock one can calculate levels of fundamentals (i.e., a level of reserves as a percentage of GDP) that set ranges in which: i) devaluation probability is uniquely defined and close to zero; ii) devaluation probability can take three different values – multiple equilibria; iii) devaluation probability is uniquely defined and close to 1.

The respective levels of reserves as a percentage of GDP are computed according to the following formula:

$$R^{min, max} \equiv \Phi^{min, max} - E_t(T_{t+1}) + r^*D + R_c$$

where T is the foreign trade balance, D is the stock of foreign debt, r^* – the risk-neutral interest rate that must be compensated to investors given the expectations of devaluation (δ), R_c – the critical level of reserves – if reserves fall below this level crisis occurs. $\Phi \equiv E_t [b_{t+1}]$ and the min and max values are derived from the conditions on multiple equilibria occurrence derived from Jeanne (1997) and Masson (1999).

In order to compute $R^{min, max}$ and $\Phi^{min, max}$ one has to assume a level of expected devaluation (δ), the variance of the trade balance equation $\sigma (\varepsilon = [T_t - r^*D + R_{c,t} - R_c] - \Phi_{t-1})$, the expected trade balance ($E_t [T_{t+1}]$), the risk-neutral interest rate (r^*) and the critical level of reserves (R_c). Besides this, the stock of external debt (D) and the level of reserves (R) must be known. Given these inputs one can determine the probability of a crisis (π_t) in a given country at a certain point in time according to the following algorithm:

$$\text{if } R_t \begin{cases} < R^{min} \\ \in [R^{min}, R^{max}] \\ > R^{max} \end{cases} \text{ then } \begin{cases} \pi_t \approx 1 \\ \text{multiple equilibria} \\ \pi_t \approx 0 \end{cases}$$

Given the focus here on the Russian crisis and its impact the probability of a crisis outbreak at the end of 1997 over a one-year period is determined. In the exercise the following assumptions were made: the level of expected devaluation (δ) was set at 20 per cent, which is well below depreciations that took place in some crisis-hit countries; the expected trade balance was the actual trade balance at the end of 1998, the risk-neutral rate was equal to the German 1-year inter-bank interest rate at the end of 1997 ($r^* = 4.53$ per cent) and the critical reserve level (R_c) was set at 1 per cent of GDP. The biggest problem was estimating the variance of the trade balance (σ) due to the lack of sufficient number of observations. Thus, as no other option was feasible, it was arbitrarily assumed for every country. Sensitivity tests of this parameter on the final outcome proved that it does not influence interference significantly. It is likely, however, that in some cases the computation of the R^{min} and R^{max} would not be possible given the estimated values of σ .

When considering data issues the problem of debt should be brought to the agenda. The logic of Masson's (1999) model applies primarily to domestic currency denominated external debt because this accounts for the perspective of foreign investors. Noting e_t as a spot exchange rate at time t and e_{t+1} the spot exchange rate for the next period (if devaluation does not occur then $e_{t+1} = e_t$), the *ex ante* logarithm of the return on liabilities denominated in local currency can be written as follows:

$$\begin{aligned} E_t [\ln (1+r_t)/(e_t + e_{t+1})] &= E_t [\ln(1 + r_t) - \ln(e_{t+1}/e_t)] \\ &= \pi_t * [\ln(1 + r_t) - \ln(e_{t+1}/e_t)] + \\ &\quad + (1 - \pi_t) * \\ &\quad * [\ln(1 + r_t) - \ln(e_{t+1}/e_t)] \\ &= \ln(1 + r_t) - \pi_t * \ln(1 + \delta) \\ &\approx r_t - \pi_t \delta. \end{aligned}$$

Thus, as Masson (1999) points out, a risk-neutral investor must be compensated by the neutral-risk interest rate plus the probability of devaluation (π_t) times its size (δ).

However, Masson (1999) proves that the model may also suit the foreign currency denominated debt (not subject to devaluation risk), only if there is a risk of default. In general terms, the threat of devaluation and default are linked: devaluation makes it harder to repay debts as it increases the chances for default, and, conversely, defaults may induce devaluations in order to boost net exports in the face of the drop in capital inflows. If one assumes this in the event of partial default (of amount δ), it can be demonstrated that the *ex ante* logarithm return on assets is equal to:

$$E_t [\ln (1+r_t)/(V_t + V_{t+1})] \approx r_t - \pi_t \delta,$$

where V_t and V_{t+1} are values of assets at period t and $t+1$, respectively. If the default does not take place, then $V_{t+1} = V_t$.

There is also the issue of debt maturity. In the model only debt with maturity of 1 year (the horizon of investors' expectations) should be taken into account. However, data constraints make such an analysis virtually impossible. Besides, the risk of default may be an argument in favour of the inclusion of total debt disregarding maturity structure.

The results of the calculations in the framework of the Masson (1999) balance of payments model are shown in Table 5-6. They indicate that most of the countries under investigation (18 out of 24) had fundamentals at the end of 1997 that were conducive to the outbreak of crisis. Only two fell in the multiple region (Bulgaria and Poland) and 5 featured 'healthy' fundamentals (the Czech Republic, Hungary, Russia, Slovenia, Turkmenistan). Among the countries with a low probability of crisis, Russia and Turkmenistan deserve closer examination. Russia, despite its very low reserves (even by the standards of the sample countries) and significant external debt, recorded a substantial trade surplus of 6.2 per cent of GDP. The latter meant the calculated values of R^{min} and R^{max} became negative and thus unreliable. It should be noted that the high surplus in Russia has been overestimated as the deficit in shuttle trade is not included. In the case of Turkmenistan, very high reserves (over 47 per cent) made it, according to the model, resistant to balance of payments shocks.

The frequent occurrence of high probabilities of crisis in the sample should not be surprising given the structure of the employed balance of payments model. These results may be viewed as biased to some extent. There are two main reasons behind this. First, most of the countries were characterised with high debt and trade deficit ratios. Trade deficits seem to be a permanent feature of developing and transition economies. Therefore, assuming the perfect foresight of trade balances and their natural low value (not necessarily as a consequence of external shock) the model tends to indicate a high probability of a crisis. In general terms, emerging and developing countries suffer capital deficiencies and are therefore notorious for having various financial and macroeconomic imbalances. In this case, it could be inferred that crises stem primarily from these imbalances. The shock propagation appears to be the final nail in the country's coffin.

Second, the inclusion of total external debt may also cause a bias in the same direction. In addition to the division into short- and long-term debt, one should pay attention to the creditor structure. Many countries were indebted to a large extent to international organisations such as the World Bank, the IMF, etc. (see Table 5-7). In many developing countries these loans have long maturi-

Table 5-6. Calculations of crisis probabilities in the Masson (1999) balance of payments model

		Reserves as % of GDP	Debt as % of GDP	Variance of trade shock	Expected value of trade balance	R ^{min}	R ^{max}	Crisis	Multiple Equilibria	No Crisis
1	Albania	13.5	33.1	2.0	-19.7	25.2	25.9	I		
2	Armenia	14.0	48.0	3.0	-30.4	38.0	38.8	I		
3	Azerbaijan	11.5	14.8	1.0	-25.2	28.2	28.4	I		
4	Belarus	2.9	17.2	1.0	-9.9	13.2	13.5	I		
5	Bulgaria	22.2	95.0	5.0	-3.1	16.4	19.4			I
6	Croatia	12.6	37.1	2.0	-19.1	24.9	26.0	I		
7	Czech Rep.	18.4	40.3	3.0	-4.7	11.5	11.6			I
8	Estonia	16.3	57.1	4.0	-21.4	30.5	30.9	I		
9	Georgia	5.8	43.7	3.0	-28.1	35.3	35.6	I		
10	Hungary	18.4	51.9	4.0	-5.0	13.5	13.6			I
11	Kazakhstan	7.6	26.9	2.0	-3.7	8.5	8.6	I		
12	Kyrgyz Rep.	9.6	76.8	5.0	-13.6	25.2	26.2	I		
13	Latvia	12.5	48.4	3.0	-18.6	26.2	27.0	I		
14	Lithuania	10.5	33.8	2.0	-14.1	19.7	20.4	I		
15	Macedonia, FYR	6.9	30.5	2.0	-12.1	17.4	17.7	I		
16	Moldova	16.7	47.9	3.0	-20.1	27.7	28.5	I		
17	Poland	14.3	36.0	2.0	-8.2	13.9	14.9		I	
18	Romania	10.8	30.1	2.0	-6.3	11.5	11.9	I		
19	Russia	3.0	29.8	2.0	6.2	-1.0	-0.7			I
20	Slovak Rep.	16.6	50.9	4.0	-11.5	19.9	19.9	I		
21	Slovenia	17.4	22.9	1.5	-4.0	8.2	8.4			I
22	Tajikistan	2.7	98.5	5.0	-11.1	24.7	28.2	I		
23	Turkey	9.8	47.8	3.0	-7.1	14.7	15.4	I		
24	Turkmenistan	47.9	65.3	5.0	-18.3	28.7	28.8			I
25	Ukraine	5.4	23.5	1.5	-6.2	10.4	10.8	I		

Source: Author's calculations.

Note: Calculations made on the following assumptions: $r^* = 4.31$ per cent, $\delta = 20$ per cent, $R_c = 1$ per cent of GDP.

ties and feature concessional clauses. In this respect, even the heavy exposure to foreign financing may bear very different consequences for risk of devaluation or default. This problem highlights the importance of cautious analysis of financial markets as was already pointed out (see Section 5.5.2.).

Finally, it should be noted that the definition of good and bad fundamentals could include a broader set of macroeconomic variables (e.g., public finance debt, current account balance, inflation, unemployment, the structure of foreign capital flows, etc.). However, given the limited scope of this paper and problems with deciding on a system of universal and formal assessment of various fundamentals such an analysis is not pursued. In addition, the implications of the exchange rate arrangement should be taken into consideration. For instance, countries that adopted a currency board system may sustain higher current account deficits without inflicting devaluation risks and thus should be assessed on a different basis than countries with other exchange rate arrangements.

Bearing in mind all these reservations we can turn to a comparison of the results obtained in the probit and balance of payments models and focus on a case-by-case analysis. The combined outcome of the two analyses is presented in Table 5-8. Significant/insignificant trade linkages are determined on the basis of the probit model, whereas good/bad fundamentals are determined on the basis of our back-of-the-envelope calculations in the manner deployed by Masson (1999).

From Table 5-8 it is clear that most countries that did not experience a crisis (Albania, Armenia, Azerbaijan, Croatia, Estonia, Latvia, Macedonia FYR, the Slovak Republic, Turkey, Turkmenistan) had bad fundamentals though there was insufficient crisis propagation to trigger crises there (at least in terms of trade linkages, as no formal inferences about financial linkages can be drawn). However, as was noted earlier, the criteria for 'bad fundamentals' could be biased and tend to indicate more frequently those countries with bad rather than good fundamentals. Thus, the group may incorporate countries that either had bad fundamentals

Table 5-7. Share of multilateral claims in total external debt (per cent)

	1997	1998		1997	1998
1 Albania	25.4	35.9	14 Lithuania	16.7	12.9
2 Armenia	59.1	54.5	15 Macedonia	27.4	31.9
3 Azerbaijan	61.4	78.1	16 Moldova	46.4	36.9
4 Belarus	17.9	15.9	17 Poland	4.4	4.2
5 Bulgaria	14.6	17.4	18 Romania	23.3	20.6
6 Croatia	8.7	7.2	19 Russia	12.8	19.0
7 Czech Republic	1.9	1.7	20 Slovak Republic	6.4	4.3
8 Estonia	9.2	4.5	21 Slovenia	3.5	3.1
9 Georgia	28.8	35.6	22 Tajikistan	8.1	13.8
10 Hungary	6.2	2.9	23 Turkey	5.3	4.2
11 Kazakhstan	29.8	24.6	24 Turkmenistan	0.9	0.7
12 Kyrgyz Republic	40.0	44.5	25 Ukraine	35.8	34.9
13 Latvia	10.1	8.8			

Source: Author's calculations based on EBRD (total external debt) and BIS data (multilateral claims).

Note: Multilateral claims - loans from the Asian Development Bank, use of IMF credit and IBRD loans and IDA credits from the World Bank.

Table 5-8. Comparison of the results of the probit and balance of payments models

	Crisis		No crisis	
	Good fundamentals	Bad fundamentals	Good fundamentals	Bad fundamentals
Significant trade linkages		Belarus, Georgia, Kazakhstan, Moldova, Ukraine		Lithuania, Tajikistan
Insignificant trade linkages		Kyrgyz Republic	Bulgaria*, Czech Republic, Hungary, Poland*, Slovenia	Albania, Armenia, Azerbaijan, Croatia, Estonia, Latvia, Macedonia FYR, Slovak Republic, Turkey, Turkmenistan

Source: Author's calculations.

Notes: * - multiple equilibria.

and no crisis propagation (both via trade and financial channels) or had relatively good fundamentals and crisis propagation (if any) was not strong enough to trigger financial turmoil. Unfortunately, the data and tools available make it impossible to differentiate between these cases in a formal manner.

Five countries (Bulgaria, the Czech Republic, Hungary, Poland, and Slovenia) proved to be in 'healthy' condition (Bulgaria and Poland had tendencies to multiple equilibria) and have insignificant trade linkages. As these countries did not experience a crisis, it seems reasonable to assume that there was also not enough crisis propagation via financial channels.

Lithuania and Tajikistan turned out to be interesting cases. These countries were not defined as crisis-hit, though both the probit model and balance of payments model indicate that they should have had crises. Although Tajikistan was not chosen as a crisis-hit country it experienced depreciation of its rouble in November 1998. But this can be ignored given the reasons presented in the discussion on the probit model's results (its trade share was actually small) and

probably should be included in the group of countries with insignificant trade linkages.

So why did Lithuania not succumb to crisis? 45 per cent of its exports in 1997 went to crisis-hit countries (only 24.5 per cent to Russia), its external debt stood at 33.8 per cent of GDP (28.2 per cent excluding multilateral claims). What was special about Lithuania (and can serve as an explanation to the question) was its exchange rate regime. In April 1994 Lithuania adopted the currency board arrangement. When the crisis broke out in Russia, the Lithuanian authorities halted the implementation of a policy to abolish the exchange rate arrangement over the medium term [IMF, 1999e]. Thus, their strong determination to maintain the currency board could serve as a strong reputational signal and deter investors speculation. In addition, the currency board's automatic mechanisms jump-started heavy sales of foreign exchange to the banking system and this propped up the exchange rate. Furthermore, interest rates, which automatically went up, also help a great deal. Throughout the period of financial turmoil in Russia international reserves remained at a comfortable level covering over 100 per cent of the litas' liabilities.

The second interesting case is the Kyrgyz Republic. In terms of official trade linkages one could have expected the country to avoid a currency crisis given its low share of exports to crisis-hit countries. However, these figures may be slightly misleading. IMF trade statistics do not include shuttle trade. It is believed that such trade constitutes a large share of official trade figures (both with respect to imports and exports). The geographic structure of shuttle trade should not differ significantly from registered trade flows. Thus, in principle, the share of exports to crisis-hit countries, in particular to Russia, should be higher, if accounting for shuttle trade, and consequently, the trade model should have been able to predict a crisis in the Kyrgyz Republic. In addition, although external debt (excluding multilateral claims) at over 40 per cent of GDP (see Appendix 4) was not that high by regional standards, it seems that financial channels were the underlying cause of the propagation of the crisis. At the end of 1997, 18.7 per cent of the country's external public debt was owed to CIS creditors on a non-concessional basis and this was roughly at the level of international reserves excluding gold. Thus, the withdrawal of Russian and Kazakh creditors [IMF, 1999c] could have impacted the market, especially in the face of a very shallow exchange rate market. Moreover, a lack of confidence in the som was also expressed on the household side – high dollarisation and low household banking deposits are a fact in the Kyrgyz Republic. Finally, it should be noted that external pressures in the aftermath of the Russian crisis coincided with other unfavourable developments. Kyrgyz exports were hit by protectionist trade measures introduced by Kazakhstan and Uzbekistan – important trading partners – and the drop in gold prices in 1998. Gold comprises a significant share of official Kyrgyz exports. These two factors definitely increased the odds of a crisis in the Kyrgyz Republic.

Summarising these results, one can say that all of the crisis-hit countries should be classified as having conditions conducive to crisis and that the actual timing of crises was determined by the shock propagation (both trade and financial channels were important). These conducive conditions do not have to be defined only in terms of the balance of payments model, but also in terms of various macroeconomic imbalances that were present in many analysed countries (for instance high current account and budget deficits).

It would be also interesting to know if any of the crisis-inflicted countries would have had a crisis regardless of developments in Russia. Unfortunately, there are no formal tools to assess such a possibility, though one could make an expert guess based on the available information. Among others, Ukraine would have appeared to be such a country. As Markiewicz (2001) noted, Ukraine had been on the verge of crisis for some time prior to the financial turmoil in Russia and the later developments only hastened the meltdown. Also Moldova, the Kyrgyz Republic, Georgia and

Belarus, with profound fiscal imbalance problems, were exposed to currency crisis risks.

In the case of countries that did not experience crises two groups are represented. The first comprises economies that proved to be immune to financial turmoil and trade-related spillovers. Financial linkages were insufficient to change this. On the other hand, a second group was identified as having bad fundamentals and thus prone to crises. As they did not actually suffer turmoil this tends to suggest that the propagation mechanisms were not present. However, it should be stressed that the differentiation between 'healthy' and 'ill' countries is far from perfect.

On top of the above-mentioned channels by which crisis were spread in the Russian case one should also note the psychological factor suggested by Dąbrowski (2000) which refers in particular to FSU states. The legacy of former integration and centralisation in the framework of the USSR's command economy inclined many politicians, economists as well as ordinary people to think that economic developments in Russian must follow the same path in other FSU states. As such, in the aftermath of the Russian crisis there were strong expectations of financial turmoil in other CIS countries. In some cases – the Kyrgyz Republic and Kazakhstan – this proved a self-fulfilling prophecy.

5.6. Conclusions

The recent wave of currency crises in the 1980s and 1990s has led to a resumption of studies on this economic phenomenon and, in particular, on the propagation of crisis. Despite the proliferation of studies and advancements in theory and empirical research, there are still some unclear aspects. One reason behind this is the problem of finding a universal and formal definition of crisis as well as of contagion. Nonetheless, there is a consensus over the channels by which crisis spread. These are multiple equilibria, endogenous liquidity shock (or common bank lender), political contagion, trade, and common aggregate shocks. Empirical testing took one of two paths: testing if contagion was present and testing what influences the propagation. The former generally used correlation-coefficient based models, while the latter used limited dependent variable models. Both approaches suffer from econometric problems of omitted variables, heteroscedasticity, and endogeneity.

This paper claims that empirical research lags behind the development of contagion theory because of: problems of crisis definition, real world complexities, the mutual determination of various channels that cannot be single out – for instance interdependence of fundamentals and expectations of financial markets and finally the impossibility of properly incorporating financial markets. The latter stems primarily

from the heterogeneity of financial markets, probably instantaneous changes in parameters of their reaction functions and informational asymmetries.

Recognising these problems and data constraints (both with regard to availability and reliability) the paper analyses the propagation of the Russian crisis among 24 CEE and CIS countries. The simple probit model and the balance of payments model developed by Masson (1999) have been employed. The former identified the significance of trade links and the latter the stance of fundamentals in terms of debt exposure and susceptibility to trade balance shocks. Given their methodological and data deficiencies the results have been treated with caution. Thus, they were analysed against the background of stylised facts and specific features of financial markets in CIS countries.

The research proved that the propagation of crises took place mostly in countries with very bad fundamentals and strong trade linkages to the ground-zero country – Russia. However, the linkages were not the whole story as in the case of Lithuania the exchange rate regime acted as a successful defender against the crisis or, as in the case of the Kyrgyz Republic, the small official trade exposure did not prevent financial factors from triggering a crisis.

Among countries not affected by crises many were found to be in poor condition, though the crisis propagation was not able to trigger financial turmoil due to a lack of significant trade and financial linkages.

Appendix

Appendix I. Country list and their exchange rate arrangements as for end-1997

	Country	Currency	Exchange rate arrangement
1	Albania	lek	Independent floating
2	Armenia	dram	Independent floating
3	Azerbaijan	manat	Independent floating
4	Belarus	roubel	Managed floating with no pre-announced path for the exchange rate
5	Bulgaria	lev	Currency board arrangement (DM and euro)
6	Croatia	kuna	Pegged exchange rate with horizontal bands
7	Czech Rep.	koruna	Managed floating with no pre-announced path for the exchange rate
8	Estonia	kroon	Currency board arrangement (euro)
9	Georgia	lari	Managed floating
10	Hungary	forint	Crawling band (euro and US\$)
11	Kazakhstan	tenge	Managed floating with no pre-announced path for the exchange rate
12	Kyrgyz Rep.	som	Managed floating with no pre-announced path for the exchange rate
13	Latvia	lats	Conventional pegged arrangement (SDR basket)
14	Lithuania	litas	Currency board arrangement (US\$)
15	Macedonia	denar	Conventional pegged arrangement
16	Moldova	leu	Independent floating
17	Poland	zloty	Crawling band (US\$ and DM)
18	Romania	leu	Managed floating with no pre-announced path for the exchange rate
19	Russia	rouble	Managed floating with no pre-announced path for the exchange rate
20	Slovak Rep.	koruna	Conventional pegged arrangement (US\$ and DM)
21	Slovenia	tolar	Managed floating with no pre-announced path for the exchange rate
22	Tajikistan	rouble	Managed floating with no pre-announced path for the exchange rate
23	Turkey	lira	Crawling peg
24	Turkmenistan	manat	Managed floating

Source: Exchange Rate Arrangements 1998 and 1999, IMF.

Appendix 2. Trade matrix

	Albania	Armenia	Azerbaijan	Belarus	Bulgaria	Croatia	Czech Rep.	Estonia	Georgia	Hungary	Kazakhstan	Kyrgyz Rep.	Latvia
Albania		-	-	-	0.5	0.1	-	-	-	0.1	-	-	-
Armenia	-		-	-	0.3	-	-	-	8.3	-	-	-	-
Azerbaijan	-	-		0.1	0.3	-	-	-	10.9	-	0.4	0.5	0.1
Belarus	-	0.4	0.5		0.3	0.3	0.3	1.4	0.4	0.3	0.7	1.5	3.2
Bulgaria	-	-	0.5	0.2		0.2	0.3	-	3.9	0.2	-	0.2	-
Croatia	-	-	-	0.2	0.3		0.8	-	-	1.2	-	-	-
Czech Rep.	-	-	0.5	0.4	0.4	1.1		0.1	-	1.7	0.3	2.5	0.4
Estonia	-	-	0.1	0.2	0.1	-	0.1		-	0.1	0.7	-	4.2
Georgia	-	4.7	17.0	-	2.6	-	-	-		0.1	-	0.2	-
Hungary	-	-	0.5	0.5	0.5	1.1	1.9	-	-		0.1	0.2	0.1
Kazakhstan	-	0.4	1.2	0.7	0.2	-	0.1	0.4	1.7	0.2		14.3	0.6
Kyrgyz Rep.	-	-	0.3	0.1	-	-	-	0.1	-	-	1.0		0.1
Latvia	-	-	0.3	1.0	0.1	-	-	8.6	-	0.1	0.3	-	
Lithuania	-	-	0.1	1.9	0.2	-	0.5	6.1	-	0.3	0.7	0.5	7.5
Macedonia, FYR	2.8	-	-	-	2.0	1.8	0.1	-	-	0.1	-	-	-
Moldova	-	-	0.1	1.3	2.1	-	0.1	0.2	-	0.1	-	-	0.2
Poland	-	-	0.4	3.4	-	1.1	5.6	0.9	0.4	2.7	0.4	0.2	1.2
Romania	-	-	-	0.4	1.4	0.3	0.4	-	-	-	0.1	0.2	-
Russia	-	27.0	23.2	64.5	7.9	3.8	3.3	18.8	30	5.1	33.9	16.3	21.0
Slovak Rep.	-	-	0.1	0.4	-	0.5	12.9	-	-	1.4	0.2	0.2	0.2
Slovenia	1.4	-	-	-	0.2	12.2	0.9	-	-	1.5	-	-	0.1
Tajikistan	-	-	0.4	0.1	0.4	-	-	0.1	0.4	-	0.9	2.1	-
Turkey	0.7	3.0	5.2	-	9.9	0.2	0.3	0.4	13.0	0.4	1.6	1.3	0.1
Turkmenistan	-	6.0	1.2	0.1	0.1	-	-	-	2.6	-	0.8	0.5	-
Ukraine	-	1.3	4.1	5.9	-	0.3	-	5.0	3.5	1.3	4.8	0.8	3.9
Industrial states	89.4	32.2	12.3	9.0	50.6	55.0	65.2	55.0	16.5	76.7	35.2	34.8	52.3
Developing states	10.6	67.0	87.6	90.8	49.1	44.1	34.5	45.0	83.5	23.3	64.8	65.4	47.7
Africa	-	-	-	-	1.4	3.2	0.3	0.3	-	0.4	0.2	-	0.6
Asia	-	-	5.9	3.3	3.6	0.6	3.0	1.4	0.9	1.1	12.5	6.4	2.2
Europe	10.6	44.2	56.2	82.1	39.0	38.9	28.6	42.7	77.4	20.2	49.5	57.6	43.8
Middle East	-	22.7	25.2	1.1	-	-	1.9	0.3	1.7	1.3	2.0	1.1	0.7
Western Hemishpere	-	-	0.3	3.0	-	-	0.7	0.3	3.0	0.4	0.6	-	0.4

Source: Author's calculations based on the IMF data - Direction of Trade Statistics, 2000.

Note: the % of country B's exports to country A in country B's total exports; '-' signifies either no trade or the share less than 0.1 per cent.

Appendix 2. Trade matrix (continued)

	Lithuania	Macedonia	Moldova	Poland	Romania	Russia	Slovak Rep.	Slovenia	Tajikistan	Turkey	Turkmenistan	Ukraine
Albania	-	2.7	0.1	-	-	-	-	0.1	-	0.2	-	-
Armenia	-	-	-	-	-	0.1	-	-	-	-	-	0.1
Azerbaijan	0.2	-	0.1	0.2	-	0.3	-	-	-	1.2	3.9	0.6
Belarus	10.3	0.4	4.0	1.2	-	5.4	0.3	0.3	0.4	-	0.1	5.8
Bulgaria	0.1	2.7	1.1	0.2	0.7	1.1	0.3	0.2	-	0.7	0.1	1.1
Croatia	-	3.1	-	0.2	0.2	0.2	0.9	10.0	-	0.1	-	0.1
Czech Rep.	0.4	0.5	0.1	3.5	0.2	2.1	25.5	1.8	-	0.3	0.1	1.2
Estonia	2.5	-	0.2	0.2	-	0.6	0.1	-	0.1	-	-	0.3
Georgia	0.1	-	0.5	-	0.4	0.2	-	-	-	0.7	1.5	0.3
Hungary	0.3	0.4	0.2	1.5	2.2	2.2	4.5	1.4	1.6	0.5	-	2.2
Kazakhstan	1.1	-	0.2	0.2	-	2.9	0.1	0.1	1.2	0.8	4.1	0.7
Kyrgyz Rep.	0.1	-	-	-	-	0.2	-	-	1.1	0.2	1.7	-
Latvia	8.6	-	0.9	0.4	-	1.4	0.2	-	8.0	-	-	0.6
Lithuania		-	1.3	1.3	-	1.6	0.2	0.2	0.1	0.2	-	-
Macedonia, FYR	-		-	-	0.1	-	0.1	1.8	-	0.3	-	0.3
Moldova	0.3	-		0.2	1.5	0.4	0.1	-	-	0.1	-	2.1
Poland	2.3	0.3	0.2		1.2	3.0	5.2	1.9	-	1.0	-	2.7
Romania	0.1	0.3	6.7	0.3		0.9	0.7	0.3	0.2	1.4	0.1	1.0
Russia	24.5	2.1	58.2	8.4	3.0		3.5	3.9	7.8	7.8	7.6	26.2
Slovak Rep.	0.1	0.1	0.1	1.2	0.3	2.0		-	0.1	0.1	-	2.0
Slovenia	0.1	4.6	-	0.2	0.2	0.2	1.0		-	0.1	-	-
Tajikistan	0.2	-	-	-	-	0.1	-	-		-	4.0	0.6
Turkey	0.8	-	0.6	0.2	4.2	2.3	0.3	0.4	1.0		6.8	4.7
Turkmenistan	0.1	-	-	-	-	0.3	-	-	1.2	0.4		1.2
Ukraine	8.9	-	5.6	4.7	1.1	8.5	2.8	0.5	0.5	1.3	0.1	
Industrial states	36.0	52.6	17.9	69.0	62.6	47.0	50.6	68.2	51.6	57.2	9.1	16.2
Developing states	63.9	44.5	82.1	30.9	37.0	52.5	49.3	43.7	48.3	37.9	54.6	83.7
Africa	0.2	0.2	-	0.9	2.4	0.4	0.3	0.3	-	2.8	0.3	2.0
Asia	1.1	0.2	0.1	2.6	5.4	8.8	1.1	0.9	2.6	4.6	6.9	16.0
Europe	61.9	43.1	81.3	25.2	18.5	39.2	46.5	28.4	45.2	18.8	30.9	56.8
Middle East	0.1	-	0.5	1.2	9.4	2.1	0.8	1.5	0.5	10.7	16.5	6.5
Western Hemishpere	0.6	-	0.1	0.9	1.3	2.0	0.6	0.6	-	0.9	-	2.3

Source: Author's calculations based on the IMF data - Direction of Trade Statistics, 2000.

Note: the % of country B's exports to country A in country B's total exports; '-' signifies either no trade or the share less than 0.1 per cent.

Appendix 3. Trade matrix in 1997 (% of total exports)

Dependent Variable: CRISIS				
Method: ML - Binary Probit				
Included observations: 24				
Convergence achieved after 8 iterations				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.309071	1.377686	0.224341	0.8225
RES_EXP3Q98	-0.086901	-0.053646	-1.619899	0.1053
S_TRADE	-0.066057	-0.034255	1.928367	-0.0538
Mean dependent var	0.250000	S.D. dependent var		0.442326
S.E. of regression	0.278157	Akaike info criterion		0.661704
Sum squared resid	1.624792	Schwarz criterion		0.808961
Log likelihood	-4.940451	Hannan-Quinn criter.		0.700771
Restr. log likelihood	-13.49604	Avg. log likelihood		-0.205852
LR statistic (2 df)	17.11119	McFadden R-squared		0.633933
Probability(LR stat)	-0.000192			
Obs with Dep=0		18	Total obs	24
Obs with Dep=1		6		

Notes: res_exp3Q98 – export-reserves ratio variable; s_trad – exports share variable.

Dependent Variable: CRISIS						
Method: ML - Binary Probit						
Included observations: 24						
Prediction Evaluation (success cutoff C = 0.5)						
	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
P(Dep=1) <= C	16	1	17	18	6	24
P(Dep=1) > C	2	5	7	0	0	0
Total	18	6	24	18	6	24
Correct	16	5	21	18	0	18
% Correct	88.89	83.33	87.50	100.00	0.00	75.00
% Incorrect	11.11	16.67	12.50	0.00	100.00	25.00
Total Gain*	-11.11	83.33	12.50			
Percent Gain**	NA	83.33	50.00			
	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
E(# of Dep=0)	16.35	1.53	17.88	13.50	4.50	18.00
E(# of Dep=1)	1.65	4.47	6.12	4.50	1.50	6.00
Total	18.00	6.00	24.00	18.00	6.00	24.00
Correct	16.35	4.47	20.82	13.50	1.50	15.00
% Correct	90.85	74.50	86.76	75.00	25.00	62.50
% Incorrect	9.15	25.50	13.24	25.00	75.00	37.50
Total Gain*	15.85	49.50	24.26			
Percent Gain**	63.40	66.00	64.70			

*Change in "% Correct" from default (constant probability) specification

**Percent of incorrect (default) prediction corrected by equation

Appendix 3. Trade matrix in 1997 (% of total exports)

Dependent Variable: CRISIS						
Method: ML - Binary Probit						
Included observations: 24						
Prediction Evaluation (success cutoff C = 0.75)						
	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
P(Dep=1) ≤ C	18	2	20	18	6	24
P(Dep=1) > C	0	4	4	0	0	0
Total	18	6	24	18	6	24
Correct	18	4	22	18	0	18
% Correct	100.00	66.67	91.67	100.00	0.00	75.00
% Incorrect	0.00	33.33	8.33	0.00	100.00	25.00
Total Gain*	0.00	66.67	16.67			
Percent Gain**	NA	66.67	66.67			
	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
E(# of Dep=0)	16.35	1.53	17.88	13.50	4.50	18.00
E(# of Dep=1)	1.65	4.47	6.12	4.50	1.50	6.00
Total	18.00	6.00	24.00	18.00	6.00	24.00
Correct	16.35	4.47	20.82	13.50	1.50	15.00
% Correct	90.85	74.50	86.76	75.00	25.00	62.50
% Incorrect	9.15	25.50	13.24	25.00	75.00	37.50
Total Gain*	15.85	49.50	24.26			
Percent Gain**	63.40	66.00	64.70			

*Change in "% Correct" from default (constant probability) specification

**Percent of incorrect (default) prediction corrected by equation

Appendix 4. External debt as a percentage of GDP, 1997-1998

	1997		1998			1997		1998	
	A	B	A	B		A	B	A	B
1 Albania	33.1	18.0	28.7	18.7	14 Lithuania	33.8	35.7	34.7	41.8
2 Armenia	48.0	22.4	42.2	16.9	15 Macedonia	30.5	17.5	39.4	21.9
3 Azerbaijan	14.8	3.8	16.6	2.0	16 Moldova	47.9	34.1	53.8	28.5
4 Belarus	17.2	14.2	17.6	15.8	17 Poland	36.0	32.8	36.2	38.3
5 Bulgaria	95.0	81.3	82.4	82.8	18 Romania	30.1	21.3	23.2	21.2
6 Croatia	37.1	34.8	44.1	45.2	19 Russia	29.8	25.9	58.6	32.1
7 Czech Rep.	40.3	36.2	42.6	41.0	20 Slovak Rep.	50.9	50.4	58.5	61.5
8 Estonia	57.1	58.0	53.0	60.8	21 Slovenia	22.9	21.4	25.4	25.7
9 Georgia	43.7	32.9	47.4	32.4	22 Tajikistan	98.5	91.4	90.5	90.3
10 Hungary	51.9	51.1	56.9	57.7	23 Turkey	47.8	49.4	50.4	55.5
11 Kazakhstan	26.9	21.5	36.0	29.8	24 Turkmenistan	65.3	56.6	75.6	73.3
12 Kyrgyz Rep.	76.8	41.5	89.5	40.3	25 Ukraine	23.5	18.0	27.6	15.7
13 Latvia	48.4	48.5	50.4	54.8					

Source: Author's calculations based on EBRD, BIS and IMF data.

Note: A - total external debt, B - total external debt excluding multilateral claims.

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Part VI.

The Economic and Social Consequences of Financial Crises

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6.1. Introduction

The 1990s have witnessed five waves of financial turbulence in international capital markets: the EMS crisis of 1992–1993, the Mexican peso crisis and its aftermath (1994–1995), the Asian crisis of 1997, the Russian crisis and consequent crashes in several former Soviet Union countries (FSU), and finally Brazil and Turkey. Financial crises are not the new phenomena, and have occurred with occasionally higher or lower intensities for at least the last two centuries (a good historical panorama is provided, e.g., by Bordo and Schwartz, 1999 and Kindleberger, 2000). However, along with proceeding globalization, the nature of financial collapses has been changing.

The literature dealing with the causes of financial crises is vast and, especially in recent years, much progress has been recorded in this field. However, the consequences of financial turbulence are rarely examined. The establishment of the set of 'early warning indicators' is of course highly desirable since it helps to predict crises, but the diagnosis of the performance of economies after crises is at least equally important. For example, were it the case that crises are a crude but optimal way of removing the imbalances in an economy, it would then become unnecessary to analyze indexes of financial market pressure (what brings questionable results anyway) or other ways of measuring potential vulnerabilities. Moreover, transition economies are often excluded from analyses. The most serious reason for this is perhaps the lack of good quality data. Also, the transition process itself embraces great systemic changes to the functioning of economies, so it is extremely difficult to separate the effects of these changes from those stemming from crises.

In the public discussion about financial turbulence (that has been very vivid recently and took part on a popular level also, e.g. in international press) the majority of voices seem to share the view that crises are unfavorable incidents that should be avoided using all possible means. The arguments usually point at the severe costs the crashes bring [Stiglitz, 1998]. On the other hand, in some cases authors emphasize

the positive impact of turmoil on the economic policies, and the progress of reforms [e.g. Bulgarian crisis of 1996; cf. IMF, 1999] or developments in the real sector and functioning of an economy in general [e.g. Russian crisis of 1998; cf. Westin, 1999].

Actually, it turns out that that much evidence on which the reasoning in both directions hinges is rather weak. Certainly, countries that underwent problems with financial stability are very different, and so were natures of the crises and their consequences. Thus, it is impossible to find generally binding rules assigned to crises' consequences. Yet, it is possible to discover statistical regularities in the results of crises and to present some stylized types of interactions that tend to strengthen either negative or positive outcomes.

This paper attempts to investigate the consequences of financial crises from an international perspective. It does so by analyzing the behavior of several macroeconomic variables before and after episodes of financial turbulence and describes both their positive and negative consequences. The analysis is limited to the 1990s and covers mostly transition economies. The time constraints were set in order to focus on recent developments in world financial markets; the inclusion of considerable number of transition economies was motivated by the willingness to fill in a gap existing in the literature.

The paper also analyzes the channels through which crises affect various economic and social spheres. In addition, some checks are carried to see whether and under what circumstances crises can have a lasting and positive (or at least neutral) influence on economies in the medium term perspective. The paper further focuses on the question how long the post-crisis effects are present and if the recovery process removes the pre-crisis imbalances.

The rest of the paper is organized as follows. In section two a brief survey of literature dealing with consequences of financial crises is presented. Section three is devoted to the presentation of graphical analysis of the behavior of selected macroeconomic variables in a period before and after a crisis. Various notions of costs related to financial turmoil are dealt with in section four. Section five discusses what the possible positive outcomes of crises are and under

what circumstances they are likely to occur. Conclusions comprise section six.

6.2. Review of the Literature

As indicated, the recent outburst of literature dealing with causes of financial crises apparently has not been accompanied by a similar development in the field of crises' consequences. There are perhaps several reasons behind this. One is certainly the fashion. Also, the task of detecting some common features in the aftermath of crises is perhaps more difficult than in the case of its causes. Finally, the importance of taking lessons from outcomes of financial turbulence seems to be underestimated.

The studies dealing with the consequences of financial crisis episodes can be broadly divided into two groups. The first one comprises papers studying results of a crisis in a particular country, a few consecutive crises in one country, or within a region. Such analyses benefit from access to disaggregated and comparable data that allow for using fine statistical tools. Also, the authors are often able to use their detailed knowledge of the situation in a given country that is not captured by official data. The studies of that kind frequently produce meaningful and interesting results. The examples of such papers are Berry et al. (1999), Ferri (1998), and Cutler, et al. (2000). The main disadvantage of such an approach is that obtained results are country or region specific and usually cannot be sensibly generalized.

The second group covers studies undertaking cross-country analyses. Unfortunately, there are not too many papers of that kind, and they all tend to use similar methodology that is not free from serious limitations and shortcomings. The typical approach is to consider a large sample of countries (from a few dozens to close to two hundred) over a rather long time (20 or more years). The crisis episodes are then mechanically identified using some index measure. The standard procedure is then to analyze (usually graphically) the behavior of several macroeconomic variables in the so-called crisis window, i.e. in the period before and after a crisis. The average values of particular variables are plotted in levels or against their tranquil period average, i.e. the average of all time points outside a crisis window. The examples of such studies include IMF (1998a), Milesi-Ferretti and Razin (1998), Aziz et al. (2000), and Bordo and Schwartz (2000).

The first important limitation of this approach is that as all crises are treated as identical events, therefore, there is not much place for studying the causal relationships. Milesi-Ferretti and Razin (1998) attempt to establish a causal relationship between growth performance after a crisis and other variables. They run an OLS regression with a three-

year average GDP growth rate after the crisis as a dependent variable and a set of explanatory variables. Their results are, however, not very robust, with growth rate before the crisis and openness to trade being the best predictors.

An attempt to do a similar exercise for the sample examined in this paper failed to produce any meaningful results. At this point one should once again note that the whole discussion relates to 'typical' relationships and holds 'on average'. In fact, financial crises are very different and any particular event can exhibit characteristics not present in case of other crises.

Another problem is that the methodology does not allow for any check of whether the levels of certain macroeconomic variables achieved before a crisis may be considered sustainable. It is thus impossible to decide to what extent crises bring the economies back to equilibrium and to what extent they constitute a break in an otherwise sustainable trend. This limitation can hardly be efficiently overcome. The problem lies in the lack of trustworthy models of estimating 'typical', 'trend' or 'sustainable' ranges of values for the most of economic variables.

6.3. Some Statistical Exercises

As discussed above, one possible method of analyzing the behavior of macroeconomic variables over the crisis period is the 'before-after' approach, which compares the performance of selected variables in the period before and after a crisis. This method, while not free from faults, can still be useful for policymaking. This is because the macroeconomic stabilization policies as well as structural reforms are key to the process of recovery. If misdirected they not only fail to restore credibility and the balance of an economy, but are also likely to have long-lasting effects on the real sector. This scenario holds whether the crisis results from fundamental problems or is rooted in investors' panic. Thus, if there exists any cross-country pattern in the behavior of particular economic indicators over the crisis window, identifying it might contribute to better management of the crisis.

6.3.1. The Definition of a Crisis

In order to conduct the above analysis, first of all, it is necessary to identify the exact time the financial crisis erupted in each country under consideration. Several approaches can be found in literature. An interesting discussion of the issue can be found in Szczurek (2001). For the purpose of this paper, we decided to employ the methodology similar to that of Eichengreen et. al (1996). It relies on the index of speculative pressure calculated on the quarterly basis. The

index is a combination of the exchange rate, interest rate and domestic reserves of foreign exchange. The pressure increases as the exchange rate depreciates, reserves deplete and interest rates go up. If the attack is successful devaluation occurs, but authorities may try to defend the currency by running down international reserves or raising interest rates. The crisis episode is defined as an unusually rapid increase in the index. A formal presentation can be found in Appendix 1.

The presented methodology captured 27 crisis episodes with Brazil, Kazakhstan, Kyrgyz Republic, Moldova and Ukraine suffering from financial turbulence twice over the studied period.

6.3.2. The Sample

The sample spans from 1990 to 1999 and covers 43 countries. The list of all countries included can be found in Appendix 2. Such a choice was determined by the aim to concentrate on the recent crisis only (i.e. the financial crisis of the 1990s) and to include as many transition countries (in particular the FSU countries) as possible. In this respect the statistical analysis presented below differs from the one conducted in several other studies.

6.3.3. Data

Having identified crisis episodes, it is necessary to evaluate the performance of economic variables that according to theory can be affected by a financial crisis. The rationality behind the choice of indicators presented below lies in two facts. First, the deviation of these variables from their equilibrium levels (that can somehow be established) has led many countries to problems and was recognized by researchers as central to the incidences of crisis [e.g. see Kaminsky et al., 1998; Flood et al., 1998]. Then, if the crisis was to help to restore the balance in an economy, one should observe striking changes in the performance of former predictors of crises. Second, as social repercussions of a crisis also lie within our interests, the analysis cannot be constraint to macroeconomic indicators only. For instance, households can be worse off due to the decline in the value of their assets or because of a post-crisis economic contraction affecting them through various channels (see section 4 for a more detailed discussion).

The analysis below focuses on the following indicators:

- GDP per capita,
- GDP growth,
- inflation,
- real and nominal interest rates,
- current account balance,
- capital flows, exchange rate,

- changes in government and private consumption,
- investment rates,
- trade performance
- unemployment rate.

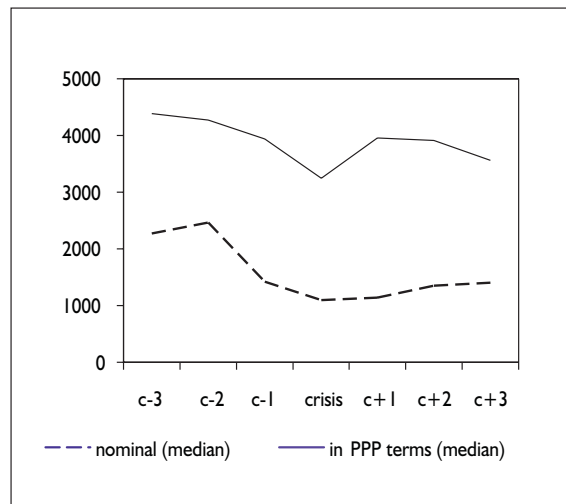
The main source of data is the International Financial Statistics (IFS) of the International Monetary Fund (IMF). GDP data are taken from the IMF's World Economic Outlook database (May 2001). Additional data sources (such as Asian Development Bank, and the countries' statistical agencies) were also used in some instances. Unemployment rates and nominal wages come from the International Labor Organization (ILO) and the World Health Organization (WHO), respectively. GDP per capita in PPP terms is from WHO.

6.3.4. Economic Performance before and after the Crisis

The following discussion focuses on the behavior of selected macroeconomic variables in the 'crisis window'. We start from checking some characteristics of countries in our sample. Assessing the level of development of analyzed countries is important as it certainly influences eventual impact of financial crises. In poor countries crisis spillovers are likely to be more difficult to manage. In particular, the impact on the social sphere might have significant consequences, e.g. rising poverty.

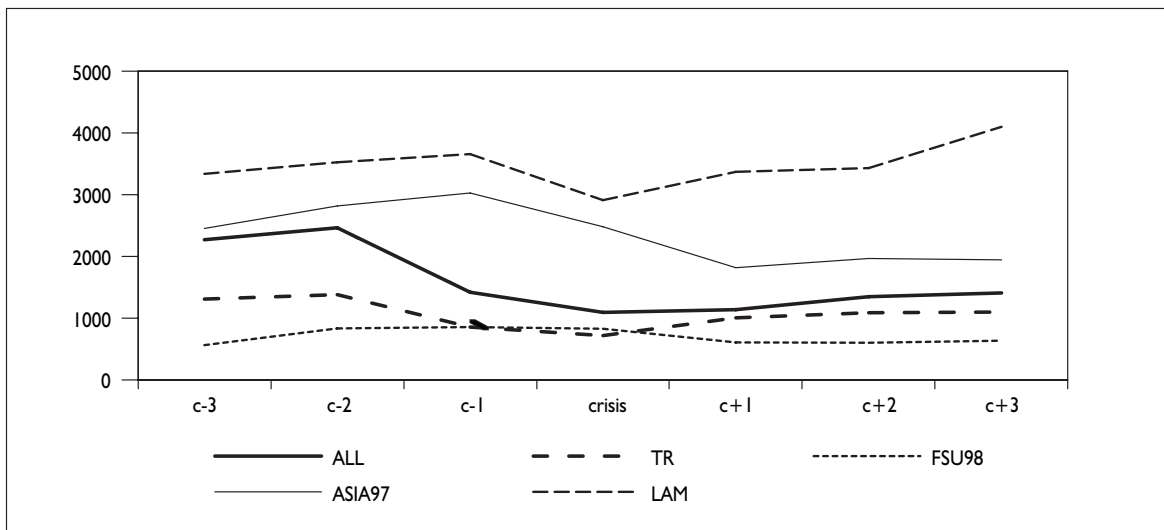
In order to see the development level of the countries in the sample we calculated average GDP per capita. As evident from the picture, on average (median), countries under

Figure 6-1. GDP per capita in a crisis window, USD



Note: Graph plots a median GDP per capita on annual basis in a crisis window of three years before and after a crisis.

Sources: IMF IFS (2001), WHO (2001).

Figure 6-2. GDP per capita in a crisis window, USD

Note: Graph plots a median GDP per capita on annual basis in a crisis window of three years before and after a crisis.
Sources: IMF IFS (2001), WHO (2001).

consideration fall short of developed economies with GDP per capita not exceeding 4500 US dollars in PPP terms and 2500 US dollars using market exchange rates. Furthermore, three years after the crises, income still does not go back to the levels achieved three years before the crises. The same patterns are repeated in all but one of the identified sub-groups [1]. By definition, developing countries must have minimally increasing GDP per capita in order to reduce the poverty and lower the distance to advanced economies. This was not the case for the analyzed sample.

6.3.4.1. GDP Growth

Financial crises often deteriorate into systemic crises and are most pronouncedly reflected in the erosion of economic activity. Looking at the behavior of GDP growth rates for the whole sample (ALL), the economic stagnation around a crisis year is clear. On average [2], countries already demonstrate signs of the slowdown two years before a crisis with the 1.5% recession in the crisis year. However, from there on economies grow faster than before.

Similar situation (the drop of output in the crisis year) is observed for transition economies. But this group already suffers from recession three years before a crisis. Then the situation improves but, together with a crisis, it worsens again and the average growth rate drops to -6.5%. GDP returns to its pre-crisis level a year after the crisis and economic growth resumes thereafter.

It should be stressed that the behavior of GDP in a crisis window is strongly influenced by the transition process itself. The pre-crisis recession visible in the graph often results from the experience of dramatic economic contraction in the early stages of transition. Actually, a simple approach, such as the one implemented here, does not allow for dismantling the impact of crises from the one of the transition process.

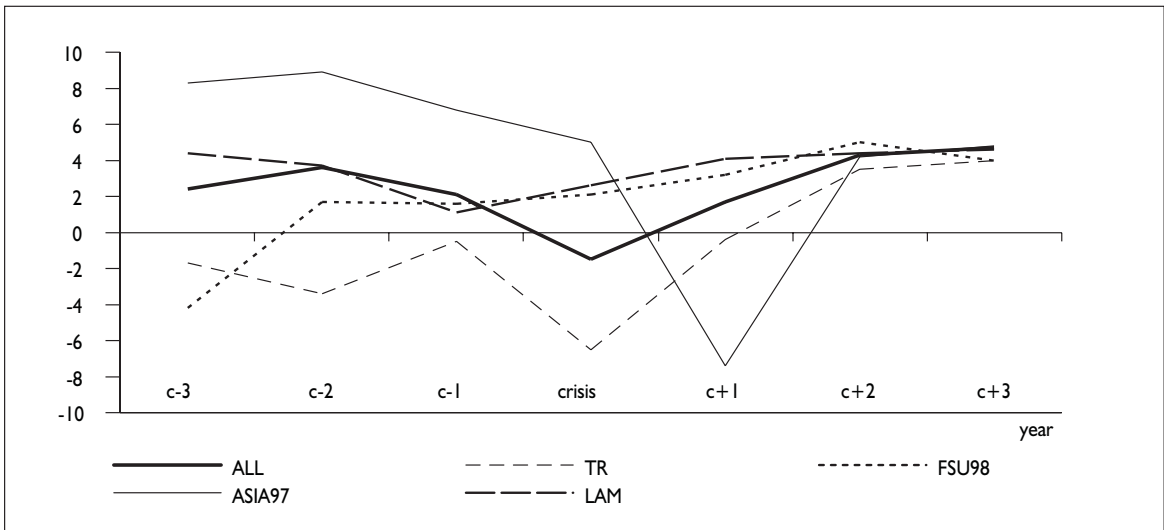
The same problem applies to the FSU98 group. The crises in 1998 and 1999 occurred exactly when the economies started to recover after a few years of recession. Consequently, the impact of a transition itself was perhaps more pronounced than the impact of the crises. Also, one should note that the median does not perform well in describing the behavior of GDP growth in this group of countries around 1998. Actually, five out of six countries belonging to the group recorded a sizable slowdown in growth rates (or deepening of recession) in the crisis year with respect to the previous year. This is also reflected by arithmetic average of growth rates dropping from 4.2% to 0.4% in this period. The crisis did represent a major setback to a weak recovery that started to be seen in FSU countries around 1997. Three years after the crises growth rates remained positive staying in the range of 3–4%. However, given the recession record of the early 1990s, the recovery is rather modest and growth rates are likely to be reduced in 2001 (third year after the crisis) [3].

[1] These are crises in transition economies (TR), crises in FSU countries in 1998 and 1999 (FSU98), crises in South-East Asian economies in 1997 (ASIA97), and Latin American crises (LAM). See Annex 2 for a detailed sample description.

[2] In order to reduce distortions resulting from large variation in some economic variables across the sample, in the statistical analysis median was used instead of arithmetic average. Unless otherwise indicated, whenever in the paper we write 'average' it actually means 'median'.

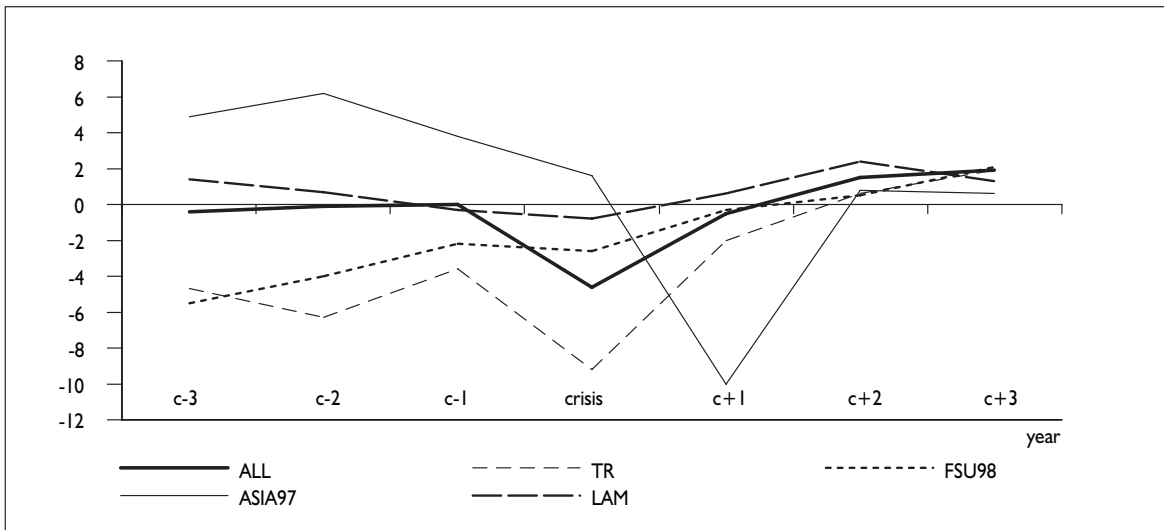
[3] The last year in the crisis window for the FSU98 group is the IMF forecast from May 2001 and therefore might be changed.

Figure 6-3. Real GDP growth (median), %



Source: IMF, WEO database.

Figure 6-4. Real GDP growth differential (median), %



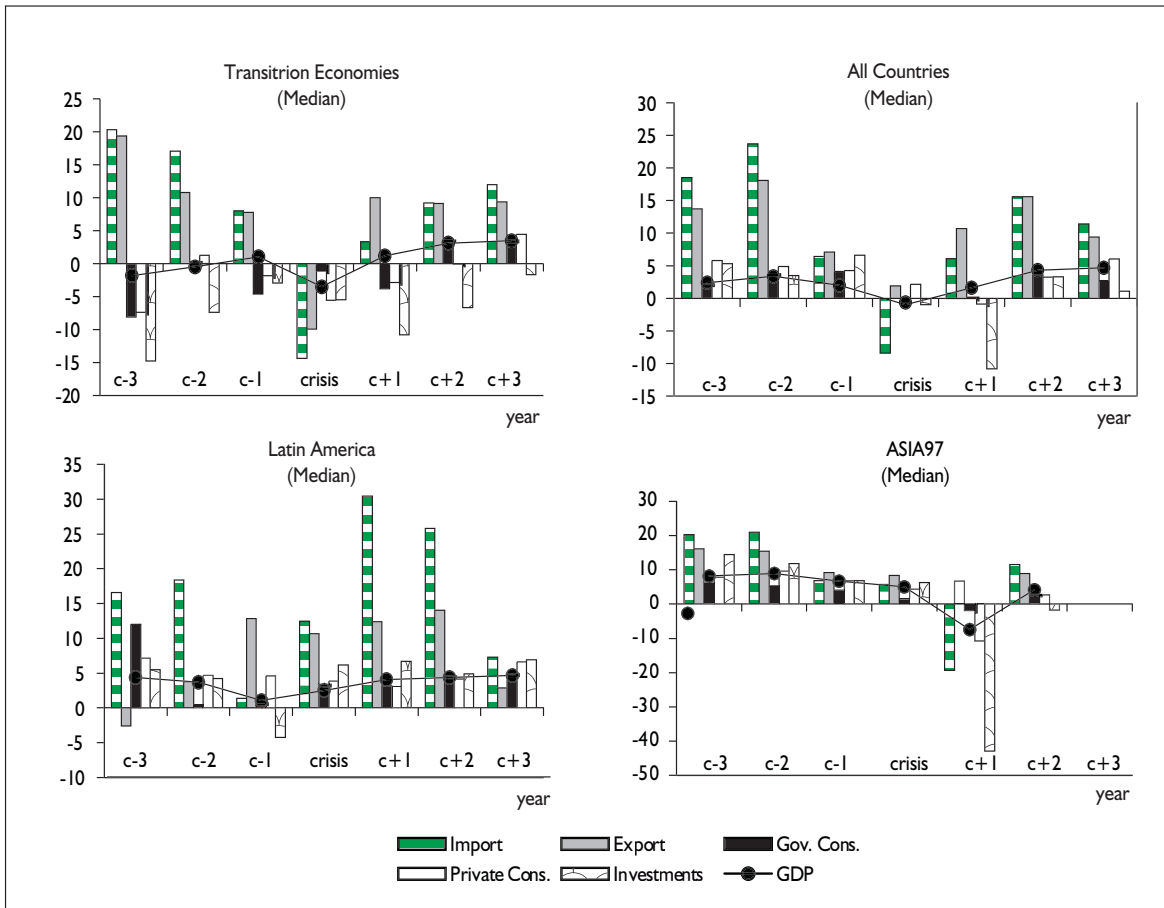
Note: GDP growth differential is defined as a difference between a crisis country growth rate and advanced economies average GDP growth (the aggregate is provided by the IMF, World Economic Outlook 2001 database).

Source: IMF, WEO database.

In South-East Asia, the 1997 crisis brought the average rate of output growth down from more than 8% in 1994 to an estimated 4.8% in 2001. In terms of the scale of growth contraction, the ASIA97 group stands out in the entire examined sample (with the recession of 7.4% a year after the shock). However, this group is also exceptional in terms of its pre-crisis stance, when the Asian economies recorded astounding growth rates of around 8% annually. Furthermore, the 1997 crisis was not a typical one with chronic

internal or external imbalances playing a decisive role. The problem was more complex. In short, apart from the Philippines, the crises were driven by the developments in the capital account. 'Asian Tigers' were growing fast, attracting huge amounts of foreign capital (on average 40% of GDP in 1990–1996) that led to an investment boom. After the crisis, investors discounted the market that deepened the recession and reduced the growth stimulus stemming from increased competitiveness.

Figure 6-5. GDP components, % change



Notes: Graph plot y-o-y percentage changes of aggregates. The upper right picture plots the median of all crisis economies included in the sample. The changes of all components of GDP but trade balance are calculated in real terms (y-o-y). Exports and imports are calculated in current prices in USD. For the Asia97 group all values are real and come from national accounts. The inconsistency in methodology is due to data availability, but should not influence the results of the analysis.

Source: IMF IFS, Asian Development Bank, statistical agencies.

The economic growth in Latin America started slowing down already two years prior to crisis with the sharpest drop a year before an event. Following crisis episodes the improvement was observed and two years later GDP growth rate, on average, surpassed its pre-crisis high.

Summing up, on average financial crises brought a substantial setback to growth prospects of countries in our sample. Due to data limitations (not enough time passed since many of the analyzed crisis episodes), it is hard to judge what was the impact on countries' long-term growth prospects. Growth rates three years after a shock do not significantly exceed the pre-crisis levels. On average, crisis economies – instead of catching up with the advanced countries growth rates – were losing or just keeping their pace within the whole crisis window examined.

6.3.4.2. Expenditure on GDP

To have a clear picture about the growth development in countries affected by the crises, it is necessary to check the performance of growth key drivers, namely private and public consumption, investments as well as external balance.

Looking at the above figures one general conclusion can be made: the output decline is mostly associated with a sharp contraction in investments and imports. The former seems to be crowded out more permanently as a result of a crisis. Exports remain a main driving force of GDP growth. The fact that imports already pick up a year after turbulence may imply the rebound in an economy. Strikingly, investment expenditures are seriously undermined and despite some signs of improvement two years after a crisis they drop again in the third year. This observation supports the

view that, on average, the post-crisis recovery in our sample remains fragile.

In Asia, the analysis is only preliminary since at the time of writing (April 2001) national accounts provide data only up to 1999 [4]. Nevertheless, in terms of causes of output contraction, the predominant element in Asia was more than a proportional decline in investments. Additionally, the 1997 crisis hit private and public consumption (it declined by 10% and 2% (y-o-y) respectively) as well as imports. While currency devaluation in Asia certainly increased external competitiveness, on average, exports in 1999 remained lower than prior to the crisis. The improvement in external balance a year after devaluation was due more to the decline in imports than the exports expansion.

In transition economies crises were accompanied by a precipitous drop in all components of GDP. Investments continued a downward trend for the next three years. Actually, they were under-performing throughout the entire crisis window, but before crises these contractions were decreasing, and crises represented a sizable setback in this trend. The post-crisis recovery in the transition group was supported mainly by an increase in exports. In the second year imports and public consumption boosted; private consumption was on the rise only in the third year after a crisis.

In terms of the deceleration in investment demand, Latin American economies performed relatively better; nevertheless, the 4% drop was the major factor reducing

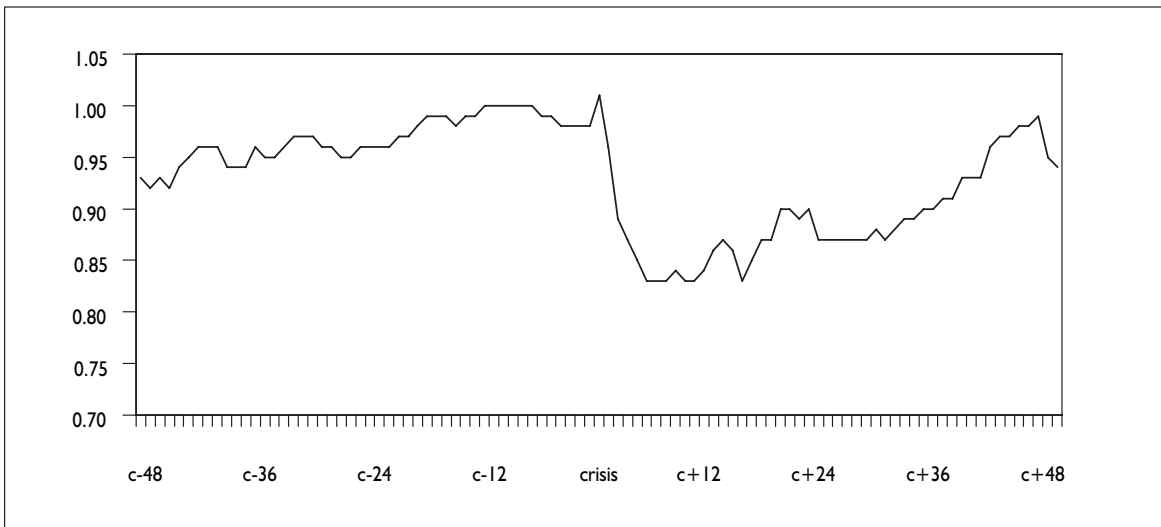
growth around the crisis year. The same holds for private consumption, which kept growing, albeit at a slower pace. What is interesting in the case of Latin America is the economic outlook in the last year of the window examined. Public and private consumption as well as investments grew, but both export and import expansion slowed down. Widening trade deficit increased volatility.

6.3.4.3. Real Exchange Rate

Since the exchange rate is a crucial indicator of the competitiveness of a country and its behavior is usually strongly affected by financial crises (by sudden devaluation), before we turn to the assessment of the external position of crisis economies, it is useful to check the behavior of the real effective exchange rate over a crisis window.

From the chart below it is clear that for the sample of 10-15 countries (subject to data availability) the exchange rates were on average appreciating up to the crisis. Then it depreciated sharply by around 20% and remained below its pre-crisis level for the next four years. Also, crises occurred when real exchange rates reached the average for the whole sample over a 20 years period (or shorter, subject to data availability). Such long-term averages are often treated and referred to as 'equilibrium' real exchange rates. This exercise depicts one major weakness of such an approach. The (theoretical) equilibrium rate (if anything like that exist) must be changing over time, reflecting different stages of country development [cf. Sasin, 2001].

Figure 6-6. Real exchange rate in a crisis window, monthly data, index



Note: Index, I = average index value for 1981–2000 period (or shorter, subject to data availability). The window spans 48 month before and after a crisis.

Source: IMF IFS (2001).

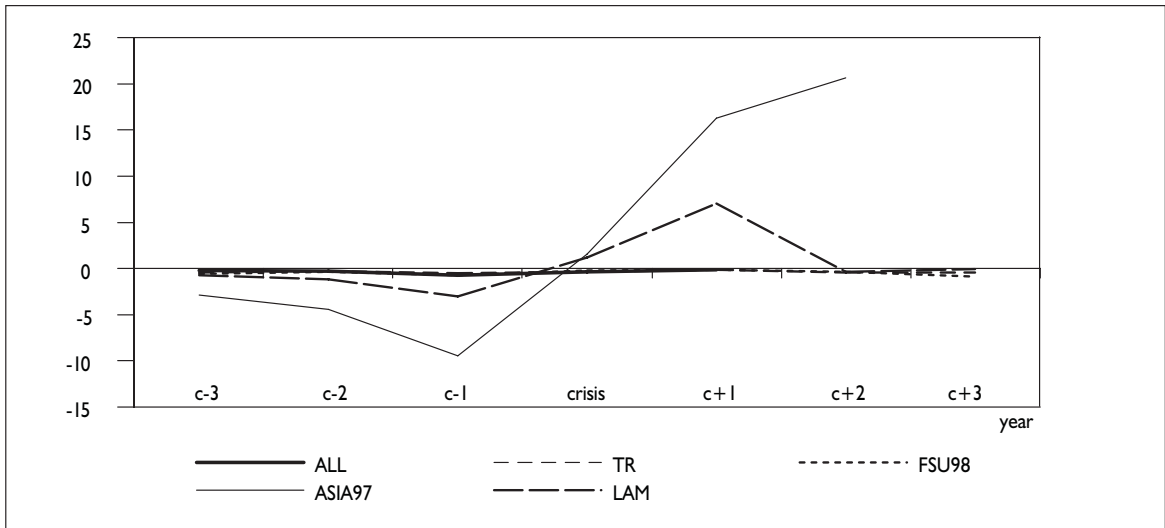
[4] For the same reason the FSU98 group is not presented.

6.3.4.4. External Balance

The supplementary indicator of country competitiveness is its trade balance. Usually countries which export more grow faster. There is also a direct link between the trade and current account balance as the latter consists of the former [5]. Thus, both indicators provide an important measurement of the country external position, and the overall health of the economy. Yet, it is extremely difficult to assess what level of current account deficit can be

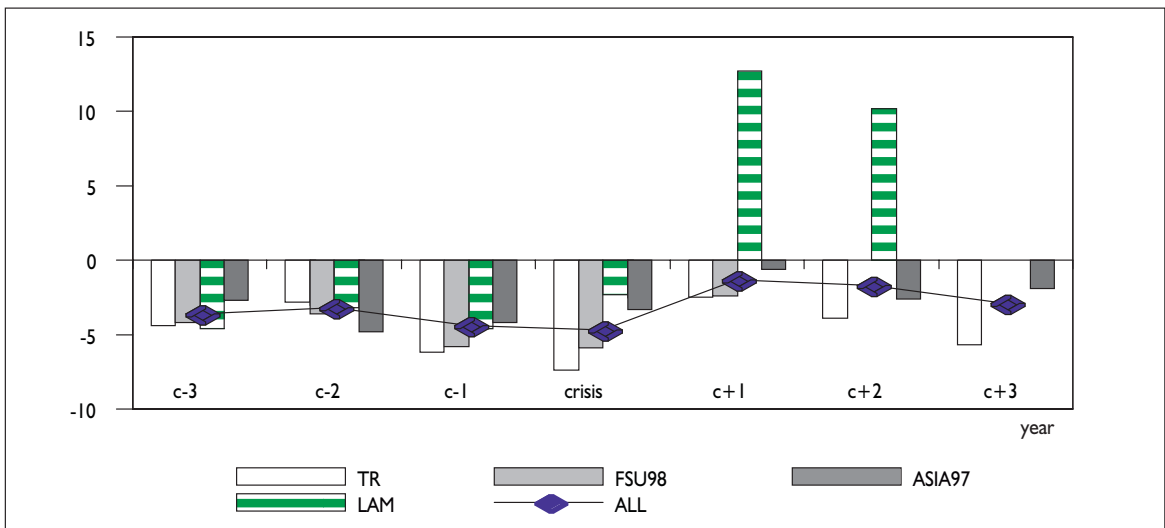
financed (Sasin, 2001); e.g. even outsized current account deficit might be sustainable if trade turnovers are favorable. Rapidly accelerating imports if associated with a lagged exports boom may be beneficial for the economy. While developing countries usually need current account (CA) deficits to support growth rates, financial crisis are very often associated exactly with the persistent current account imbalances. Therefore, the difficult challenge is to avoid excessive growth in domestic absorption. Of course,

Figure 6-7. Trade balance (median), US\$ billion



Source: IMF IFS (2001).

Figure 6-8. Current Account Balance, % of GDP



Source: IMF IFS (2001).

[5] For developing countries other elements of CA (like services balance) are usually of lower importance.

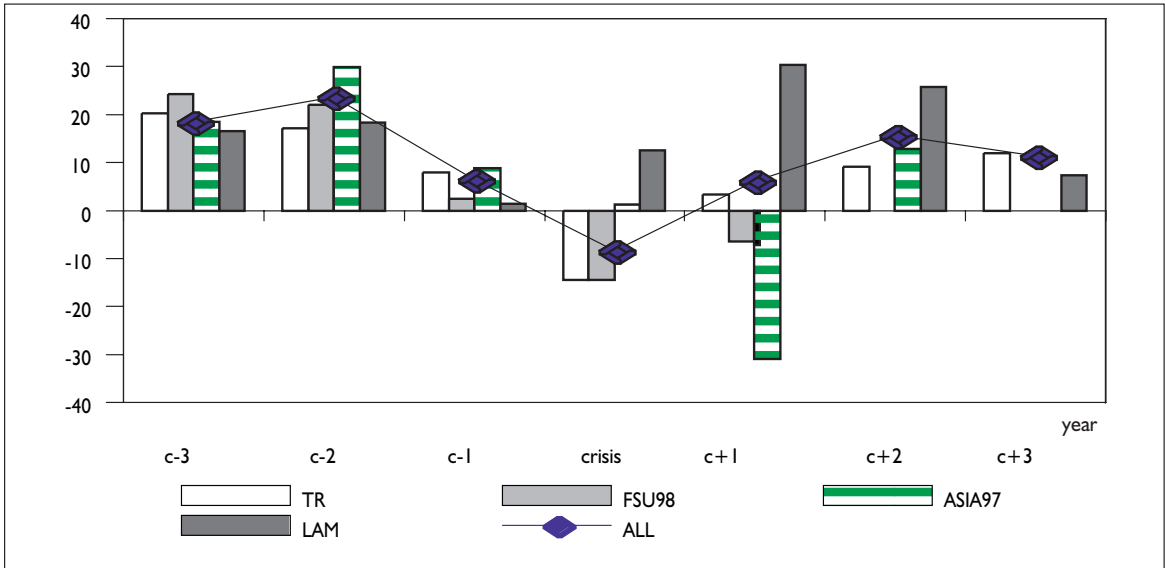
every country is specific, and so are roots underlying the excess of investments over savings, but the outcome is the same – a fragile external position.

From the above picture it is clear that all countries in the sample suffered from persistent current account imbalances. Moreover, on average, our "crisis sample" supports the common view, that a CA deficit oscillating around 5% of GDP is a precarious one and should be a "warning flag" for policy makers. As for sub-groups, the

biggest savings-investments gap is evident in transition economies. A year before a crisis the average deficit for these countries was equal to 7.4% of GDP.

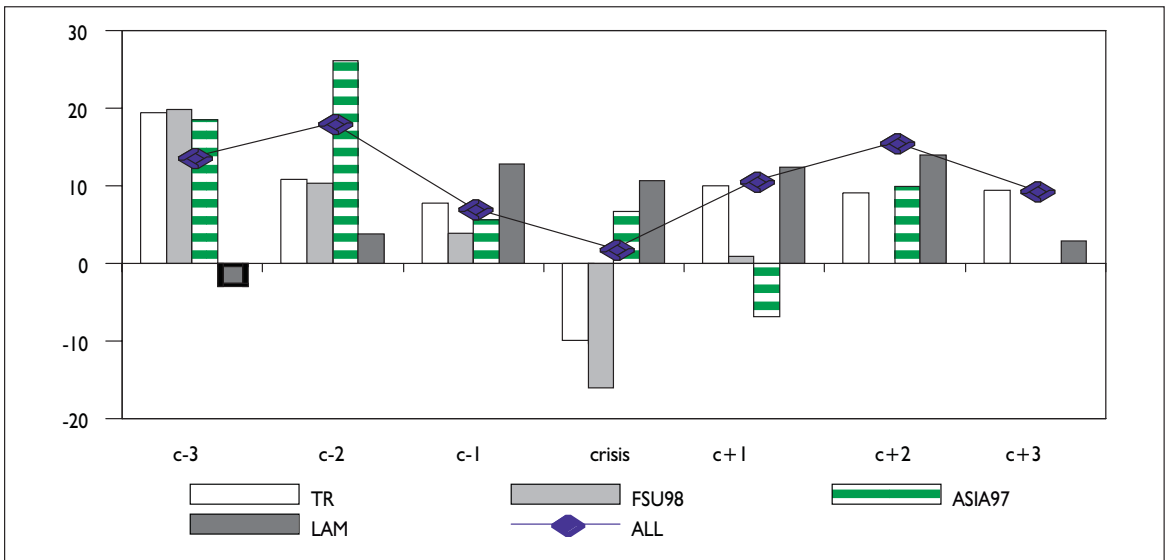
Interestingly, the advantageous role of the weak currency (as a result of devaluation) associated with financial crashes was not strongly supported by the data. The impact on trade balance proved to be limited. On average, trade balance was worsening until one year before crises not only for the whole sample, but also for individual sub-samples. Then,

Figure 6-9. Imports growth (median), % change



Source: IMF IFS (2001).

Figure 6-10. Exports growth (median), % change



Source: IMF IFS (2001).

on average, it started to improve, but turned positive only in Asia and Latin America. In the third year after the crisis, the trade balance for the whole sample deteriorated again.

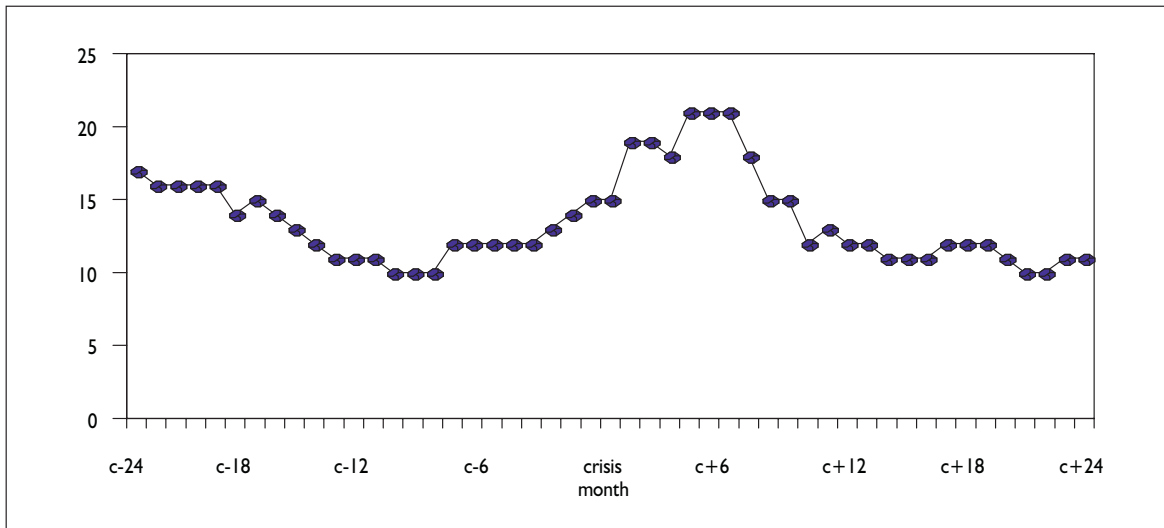
In Latin American countries imports outperformed exports already in the second year after the crisis. Trade balance in transition economies improved only for one year after devaluation. FSU98 group is hard to gauge since the time series is too short to justify the impact of the crisis on trade. The only 'book case' scenario in which currency

devaluation improves competitiveness of a country is observed in the Asia97 group. The pattern for CA recovery is similar. This is only in Asia where a crisis brings the CA to a surplus. In other groups, current account deficit shrinks only during the first year after a crisis, but widens thereafter.

6.3.4.5. Interest Rates

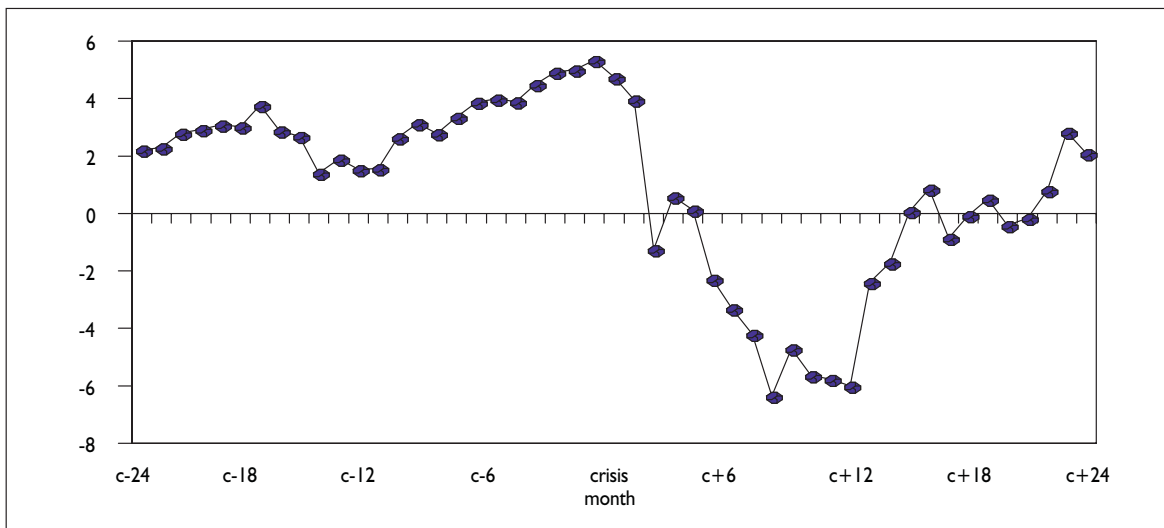
The changes in domestic deposit rates provide an important indicator of a stance of monetary policy conducted in any

Figure 6-11. Nominal interest rates (deposit or similar rate), %



Note: Monthly data; graph plots median for the sample.
Source: IMF IFS (2001).

Figure 6-12. Real interest rates (deposit or similar rate), %



Note: Monthly data; graph plots median for the sample. Real rates were calculated using CPI index.
Source: IMF IFS (2001).

particular country. Reflecting changes in various spheres of the economy, interest rates affect other policies (e.g. the room for maneuver of fiscal policy is subject to cost of debt servicing) as well as consumers and producers behavior (including expectations) through various transition channels [Mishkin, 1996; Bernanke and Geritler, 1995]. High interest rates are usually a feature of so-called emerging markets that have to pay high-risk premium to attract capital.

The purpose of this paper is not to discuss the theory behind the interest rate policy. From the perspective of our analysis the behavior of interest rates is interesting for one major reason. In the onset of financial crises, in order to defend the exchange rate and stop fleeing capital, interest rates usually go up. After a crisis rising inflation drives nominal interest rates up. This brings recessionary tendencies and exacerbates uncertainty related to the fact that high interest rates increase the probability that productive investments are not undertaken [see Mishkin, 1996]. If this was the case then, some time after a crisis interest rates should start declining. Indeed, in our sample, nominal interest rates return to pre-crisis levels in the fourth quarter after a crisis. They remain flat for another year to start growing in later quarters.

Real interest rates perform somehow differently. They start increasing already a year before a crisis to reveal the downward trend thereafter. Then, surprisingly, for more than one year real interest rates remain negative (real money market rates oscillate around 0%) with the slight rebound in the end of this period. Such a behavior is driven by high inflation levels (see below). Also, the limited size of

the sample for which the data were available might have influenced the results.

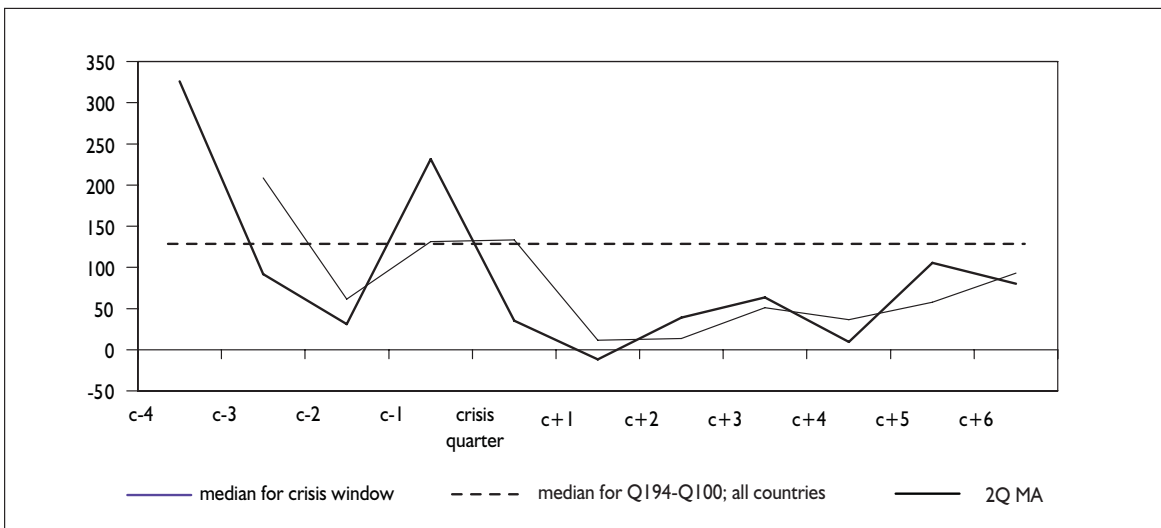
Data availability did not allow for checking the performance of lending rates. It seems that with the event of a crisis the problem lies not so much in skyscraping interest rates but a credit crunch may be driven by other factors. Banks may simply become more reluctant to lend money and this is what depresses investments. Yet, to prove such a hypothesis further investigation is required.

6.3.4.6. Capital Inflow

Less advanced economies need foreign capital to support growth. While there is a discussion on beneficiary role of cross-border flows, nobody really denies their positive contribution to growth [6]. Yet, the general problem, especially in countries with underdeveloped financial markets, is the magnitude and composition of these flows. If the proportion between foreign direct investments and portfolio capital is inadequate and these are short-term flows which play a major role in external financing, country's exposure to a potential crisis increases.

The fact that financial markets are not able to function effectively adds to costs associated with financial crises (IMF, 1998a). In this case the increased uncertainty has a negative impact on economic activity; i.e. in the light of a crisis investors not sure about the overall health of the financial sector become reluctant to allocate their assets in bonds or other equities thus limiting available resources necessary to boost growth. Accordingly, there might be a large net outflow of for-

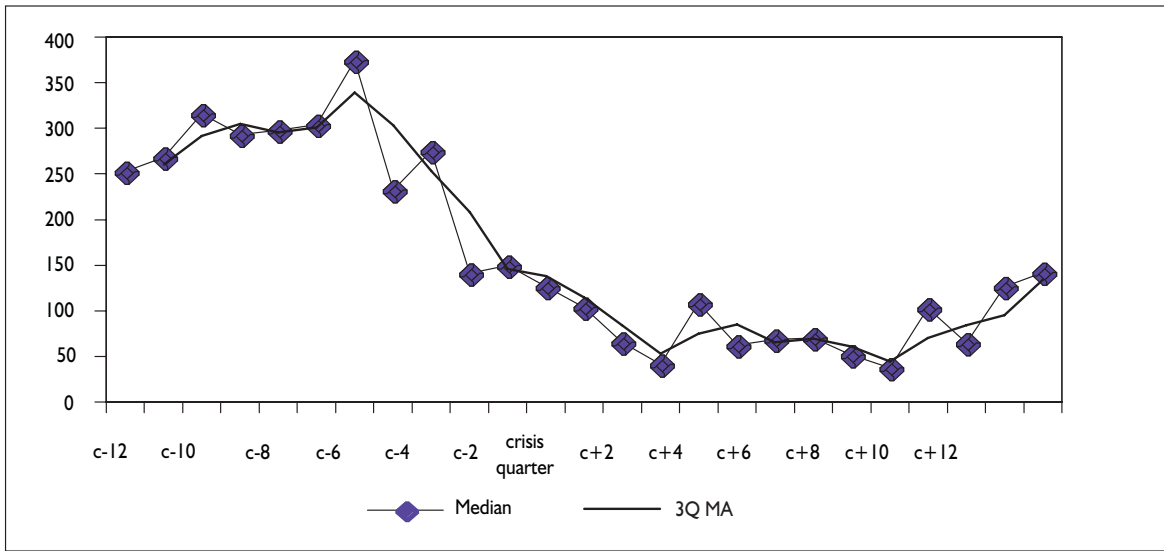
Figure 6-13. Net capital inflow, quarterly data, US\$ million



Source: IMF IFS (2001).

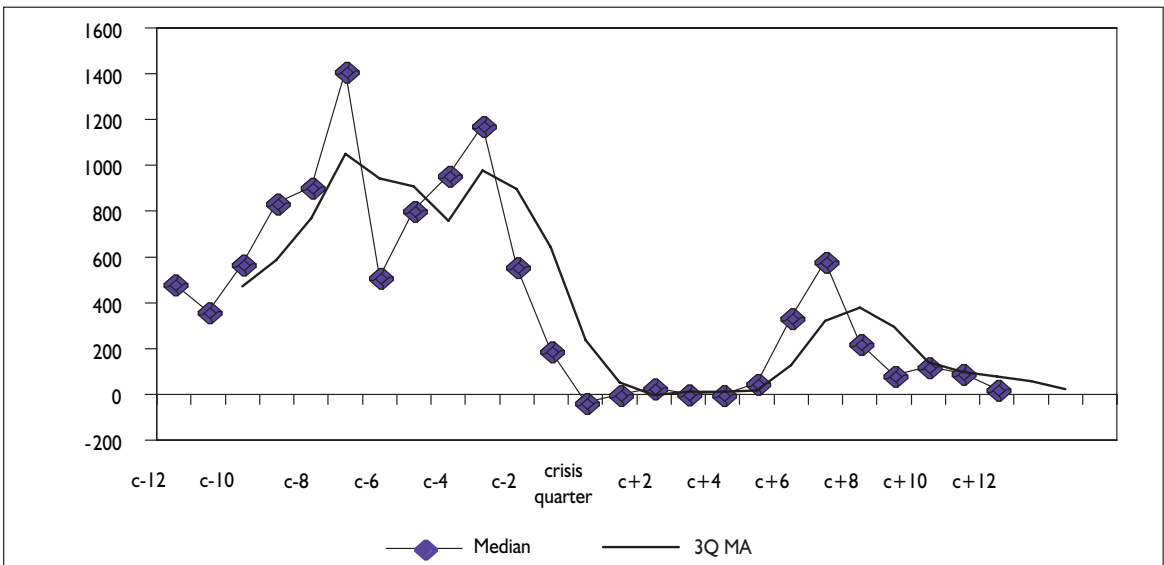
[6] For example, emerging economies are very often afraid of 'oligopolistic power' of foreign investors. There might also be some political reasons making these countries reluctant to foreign capital (for details see IFC, 1997).

Figure 6-14. Foreign direct investment, quarterly data, US\$ million



Source: IMF IFS (2001).

Figure 6-15. Portfolio investments, quarterly data, US\$ million



Source: IMF IFS (2001).

own portfolio capital [7]. If a crisis brought necessary adjustments, investors should restore their confidence in the overall stability of an economy and continue to provide lending.

The above charts represent the behavior of cross-border flows in a crisis window. Unfortunately, limited data

is available for this analysis, especially in the case of FDI flows, make the results volatile to the sample size incorporated to the crisis window. Consequently, the results should be treated with caution and analysis for individual sub-groups is not undertaken [8].

[7] Domestic rates of savings on its own even if high but allocated in the form of banks' deposits are very unlikely to boost dampened consumers' demand (Japanese case provides a good example). Instead, increased public expenditures create a challenge in addressing large fiscal sector imbalances.

[8] To obtain more reliable results analysis should focus on the spread on yields of sovereign debt of crisis economies and yields on US Treasury Bonds. The downward trend would suggest restored confidence. This was not done in this paper due to data availability.

Up to one year before a crisis, countries in the sample were experiencing net capital inflows of more than \$300 million per quarter. This figure decreased significantly in quarters preceding the crisis, turning negative in the first quarter after the crisis episode. Then, net capital inflows remained repressed for at least next two years, staying below the pre-crisis levels and below the median value for the whole sample in the IQ94-IQ00 suggesting that financial markets in countries under consideration remained adversely affected.

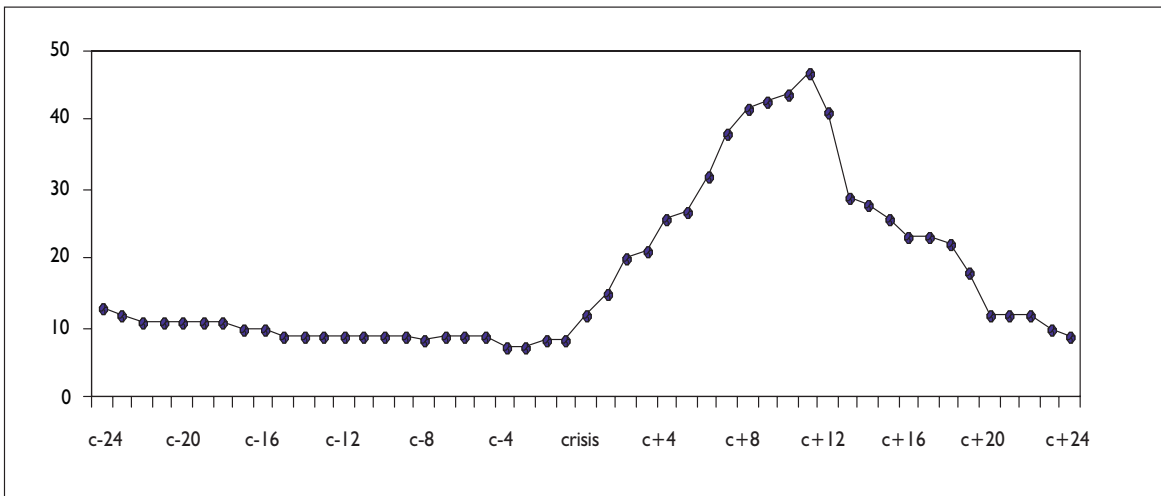
The same holds true for portfolio and foreign direct

investments; the drop in inflow associated with crisis is clearly visible for both categories. Not surprisingly the drop is sharper for short-term flows. Three years after the crisis FDI and portfolio investments still remain substantially lower than before.

6.3.4.7. Inflation

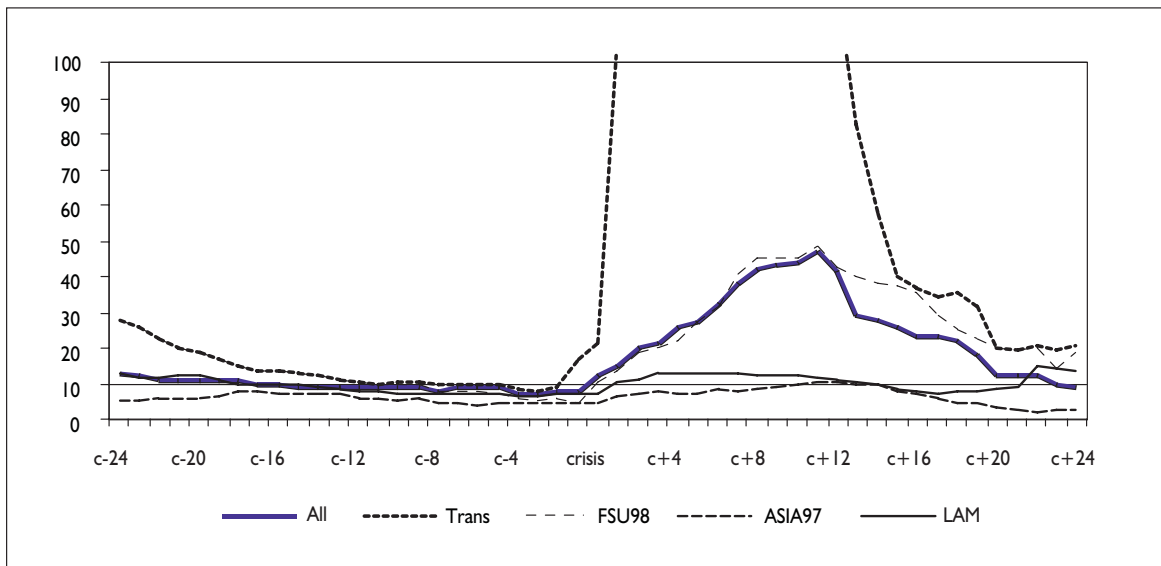
As most financial crises in our sample (and in general) end up in a sizable change in the exchange rate it is natural that they likely result in price hikes. Indeed, the pictures presented below strongly support that hypothesis. This

Figure 6-16. CPI, y-o-y percentage change in crisis window; sample median, monthly data



Source: IMF IFS (2001).

Figure 6-17. CPI, y-o-y percentage change in crisis window; monthly data (medians for subgroups)



Source: IMF IFS (2001).

result is also similar to results obtained in other studies for different samples.

Interestingly, in the period before a crisis a clear disinflation trend can be observed and in general inflation is low, staying at single digit levels. A crisis represents a dramatic change in the trend with CPI rising on average (median of the sample) by more than 40% during 12 months after the crisis. The graph suggests that on average it takes at least another year until 12-month rate of CPI growth returns to single digit levels. As regards the behavior of prices among different country groups, transition economies stand out. In this group the crises of the 1990s tended to have the strongest impact on prices. On the other end are Asian countries that experienced the crisis of 1997. Here the hike of CPI inflation was very moderate, with 12-month growth rates rising, on average, from around 4% before the crisis to some 10% a year later. The results are in line with the ones obtained in other studies, e.g. Aziz et al. (2000).

6.4. The Cost of a Crisis

In this part we are trying to briefly discuss the notion of the cost of a financial crisis and how can it possibly be measured. It is clear that financial turbulence often negatively affects many aspects of economic and social spheres. One can thus speak of many different costs brought by a crisis. A broad but certainly non-comprehensive classification of costs can be done in the following way:

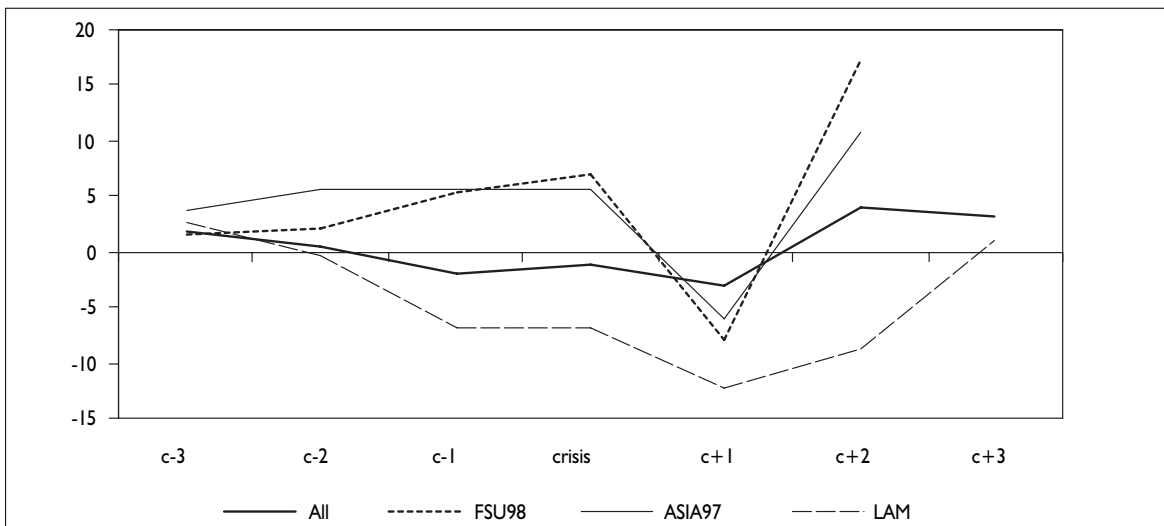
- fiscal / quasi-fiscal cost; they emerge from at least two distinct reasons: corporate and financial sector restructuring

- and the rise in external and internal debt obligations (due to devaluation and increase in interest rates). The need to bail out or support corporate or financial sector institutions stems from the fact that currency crises often coincide with banking sector problems or even banking crises. These costs vary substantially between different crises and can be quite substantial. For example, Bank of Thailand estimated that the special Fund established after the 1997 crisis had to cover losses of about US\$20–30 billion (Times of India, 2000). The costs related to the servicing of foreign debt are hard to measure precisely, but it is clear that an increase in debt burden can have severe and long lasting consequences [cf. IMF and World Bank, 2001]. In Indonesia government debt approached 100% of GDP in the beginning of 2001 [World Bank, 2001] in comparison to the pre-crisis level of 23%. One should note that increased indebtedness results from a hike in interest rates and depreciation of national currency (and consequent increase in foreign currency denominated debt), as well as increased borrowing (usually at higher premium) to cover the financial and corporate sector losses or other government actions aimed at reducing the social impact of a crisis. For example, this was the case in Thailand, where state total debt and obligations increased two-fold (in nominal Baht terms) between November 1997 and September 1999 [Bangkok Post, 1999].

- costs related to lost economic growth; as the analysis in section 6.3 shows, financial crises often result in a period of recession or growth slowdown.

- social costs; the term is very general, but also the possible impact of financial turbulence on social sphere can be transferred through various channels. Several issues can be raised:

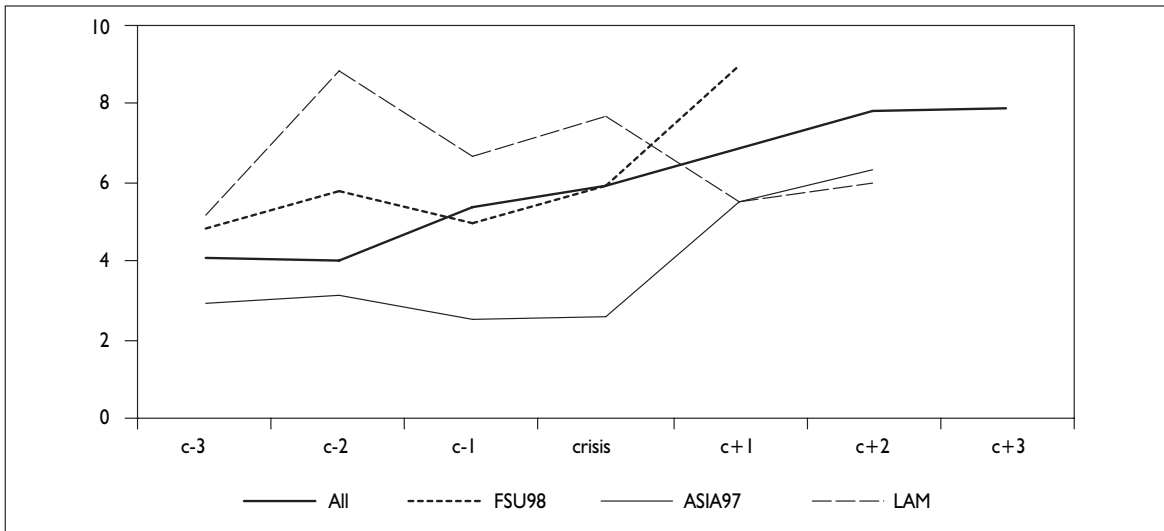
Figure 6-18. Real wages in crisis window (medians for subsamples; annual data, percentage changes)



Note: Calculations are based on wages for different groups subject to data availability in different periods. Nominal wages were deflated using CPI inflation. Presented figures are sample medians.

Source: Own calculations based on data extracted from the ILO database (nominal wages) and IMF, World Economic Outlook database (inflation).

Figure 6-19. Unemployment rate in crisis window (medians for subsamples; annual data)



Source: Own calculations based on data extracted from the WHO database.

- unemployment
- decline in real incomes
- increased inflation resulting in changes in relative prices and overall uncertainty about their future levels; this can hit unevenly various social groups
 - worsened health situation
 - worsened educational situation
 - increase in the number of people living in poverty
 - costs related to changes in political sphere; a crisis is likely to impact domestic policies (not only economic policies), international ratings (and thus availability of foreign financing in the future), relations between various social groups (as a crisis unevenly affects various groups, that might create tensions).

Most of the above listed issues are very hard to measure, especially in international comparisons. It is certainly the case, that country specific conditions to a very large extent determine what kind of consequences and how severe will be felt. For example, Cutler et al. (2000) provide evidence that health situation deteriorated (rise in mortality rates) after several Mexican crises in the past two decades. Also, the impact on education can be spotted (Oxfam, 1999 discusses the situation after the Asian 1997 crisis).

For the sample of countries analyzed in this paper we were able to find data on unemployment rates and changes in real wages (though, data were not available for all countries and there are some doubts about its quality). With respect to real wages development no clear single pattern can be spotted. A drop of real wages is visible only in the first year after a crisis. In the second year, wages tend to rebound strongly. One should keep in mind that the impact on real incomes is possibly stronger (due to increased

unemployment). A general downward trend in wages before crises for the whole sample can perhaps be a result of the inclusion of many crises events in transition economies. These crises often happened during the period of general economic decline.

A clearer picture can be observed in average (median) unemployment rate. With the exception of Latin American countries (those included in our sample), unemployment starts to increase already a year before a crisis and continues a strong upward trend afterwards. This suggests that episodes of financial crises where authorities facing problems like rising unemployment decide to devalue (as in the ERM crisis of 1992 in the UK) are not strongly represented in the sample examined. The situation in the labor market usually deteriorated after the onset of a crisis. Also, the average rise in the unemployment rate was significant – from around 4% 2–3 years before a crisis, to around 8% 2–3 years after a crisis.

Another thing that can be somehow quantified is the output loss due to a crisis. There are, however, some limitations with that approach. It is not clear whether the growth path before the outburst of a crisis was sustainable. This problem is handled by adding some subjective corrections to the average growth rates before crisis episodes (used as an approximation of a trend). The results are summarized in the table below. Several tentative conclusions could be drawn. Firstly, the results for our sample do not differ significantly from the results obtained for a larger sample of countries in IMF (1998a). There is however large variation between particular country groups. Latin American countries turn out to be relatively weakly affected by crisis episodes of the last decade – at least in terms of lost GDP growth. On the other hand, the Asian countries that experienced turbulence in 1997 suffered

Table 6-1. Costs of crises in lost output relative to trend

	Average recovery time	Cumulative loss of output (% of GDP)	Crises with output losses (%)
Currency crises: 90's sample	1.4	6.4	71
Currency crises: IMF (1998a) sample	1.6 E(1.5)	4.3 E(4.8)	61 E(64)
Transition countries crises	1.1	4.8	69
FSU 1998-1999 crises	1.1	2.9	71
Asian 1997 crises	2.4	16.9	100
Latin Am. crises of the 90's	0.8	1.8	50

Notes: Lists of countries included in samples can be found in Appendix 2.

In the IMF sample the numbers in parentheses refer to emerging economies group.

Average recovery time is calculated as the average time of returning to the trend growth path.

Cumulative lost of output is calculated as a sum of differences between observed and trend growth figures, until an economy returns to trend growth path.

Last column shows the percentage of countries that experienced output loss after a financial crisis.

Sources: Second row is from IMF (1998a); other data: authors' calculations based on IMF, WEO database.

massive losses in that presentation. This last result can be explained by very strong growth rates experienced by the region before 1997 (and consequently, even after some downward corrections, high level of trend growth). Transition countries and in particular FSU countries that experienced the crises in 1998 and 1999 tend to recover relatively quickly and with only limited output losses. Again, all the above indicates, that the results should be treated with caution and that they provide only indicative measures of the impact of financial crises on growth (complementary to the graphical presentation in section 6.3).

The notion of a cost of a financial crisis does not have a precise narrow meaning. The discussion in this part leads to a general conclusion that it is not possible to find a good definition suitable for all purposes. Rather, depending on particular interests one can use specially designed notions. This is indeed the case, with different studies concentrating on only some aspects of crises' costs. For example, Dooley (2000) refers to output losses (in a sense analogous to the one presented in a table above) as a cost of a crisis (actually, in that study it is only relevant as a potential punishment for failing to service foreign debt). Several other authors emphasize the need to pay more attention to so-called social costs of financial turbulence. The notion, however, while intuitively very important, up to date lacks appropriate measuring tools and can hardly be tackled in a more scientific way. The main difficulty seems to be the lack of appropriate comparable data. The field certainly needs further studies.

6.5. Turning Crisis into Opportunity? Do Crises Bring Catharsis to Economies?

It is relatively clear that a financial crisis can bring some positive changes to the functioning of the economy. One

can show several fields where such changes are most likely to happen. Financial turbulence may bring important changes to the political situation in the country (e.g. a fall of an irresponsible government, etc.). Such developments, apart of possibly crucial though hard to measure influence on other life spheres, can bring a major improvement in economic policies. Bulgarian crisis of 1996 stands an excellent example of such a scenario. The crisis experience may speed up vital reforms and restructuring in the financial and corporate sectors. Rodrik (1996) argues that thanks to this mechanism crises actually enhance growth in the long run. Also, the episodes of financial turbulence bring more hints as to the functioning of the economy, thus helping in proper shaping of economic policies of particular countries, as well as international financial organizations [Köhler, 2001].

Also, a rapid adjustment of the exchange rate and resulting competitiveness gain could bolster the real sector of the economy. In particular, export oriented or import-substituting industries are most likely to benefit from a crisis. Actually, this is precisely the mechanism that usually brings the economies back to a growth track. One should note, however, that post-crisis real depreciation and resulting increased competitiveness are temporary phenomena. Consequently, a crucial question is whether companies will be able to use this window of opportunity to strengthen their stance (restructure) so that they can remain competitive even after real exchange rate appreciates. It would be indeed very interesting to pursue a further research in that field – especially in international comparison. Unfortunately, research again faces a lack of appropriate data. There is some anecdotal evidence that such positive processes did indeed take place in certain countries (e.g. Mexico after 1994, Russia and Ukraine after 1998), but the scope, depth and sustainability of changes is very hard to measure. In some countries a collapse of the

Table 6-2. Current account position before and after a crisis

Large CA deficit before a crisis	'Safe' CA position before a crisis	Large CA deficit after a crisis	'Safe' CA position after a crisis	No data after a crisis
13		4	9	
	16	5	8	3

Note: See text for more explanation.

Source: Own calculation based on IMF data (IFS for current account, WEO for GDP).

exchange rate can be seen as a mechanism removing existing imbalances, while not being able to impel significant positive internal changes. There is clearly much variation between countries.

The impact on economic policies and, in particular, on the will and ability of the authorities to pursue difficult reforms is perhaps one of the most important topics of study in transition countries. It is, however, a very difficult task and certainly lies beyond the scope of this paper. We can only make a few points at this stage.

Financial crises can be seen as mechanisms of rapid adjustment and bringing economies back to balance. Certainly, such an approach does not capture all kinds of crises (as allegedly they may also result from speculative attack when there are no fundamental imbalances). If one accepts such a view, the next question naturally arises, of whether the change brought by a crisis is sustainable. In other words, it is very important to see whether crises tend to permanently (i.e. for a long time) remove underlying imbalances. Again, approaching such a question in international comparison is quite difficult. One obvious reason is that it is usually quite hard to recognize the underlying causes of any particular crisis, not to mention a large sample of crises. One thing that could be done is to check the behavior of some standard indicators that are commonly thought to be likely associated with financial turbulence. The discussion of various crisis indicators can be found e.g. in Tomczyńska (2001), Kaminsky et al. (1998).

The idea is to check whether any particular indicator was indeed observed before a crisis (interpreted as presence of some fundamental problems in related spheres) and then to check whether the situation improved after a crisis. Due to data limitations it was only possible to do such an exercise for current account deficit (a survey of literature dealing with the role of current account deficits in provoking financial crises can be found, e.g. in Sasin, 2001). The table below presents the outcome of the following procedure. The current account balance relative to GDP (in percent) was studied in three years preceding and three years following a crisis year. A 'problem' with current account imbalance was defined as deficit larger than 4% of GDP in any two of the three preceding years or deficit of more than 6% of GDP in a year before a crisis. A current account 'problem' after a crisis was defined in a similar way: deficit larger than 4% of GDP in any two of the three

following years or deficit larger than 6% of GDP in the third year after a crisis. Such a threshold allowed for identifying of 13 crises where current account was potentially a problem beforehand. Of these, in 9 cases the situation improved and current account deficits were reduced (or turned into surpluses) in three years after crises, while in 4 cases there was no much improvement. Additionally, in 5 cases, the current account deficits widened significantly after financial turbulence, while the model signaled no problems before a crisis. Also, the data are not always available for all three years after crises, so the statistics might actually look even worse. The general conclusion from that exercise is that financial crises in our sample were quite varied phenomena in terms of current account position. Consequently, for some countries, potential imbalances were removed by a crisis, while for the other they remained in place or even newly emerged.

6.6. Conclusions

The review of literature carried in section two shows that there is a substantial gap in existing writing on the consequences of financial crises. In particular, transition countries are rarely included in cross-country studies. Also, due to data limitations, analyses attempting international comparisons usually not include the most recent crisis episodes, i.e. the Asian crises of 1997 and FSU crises of 1998 and 1999.

This paper tries to contribute its part in research on the various outcomes that are brought by financial turbulence. In particular, an attempt is made to assess the performance of transition economies in this respect and to include the newest available data, so that the analysis can cover the crises that emerged in 1997–1999.

The results of graphical presentations carried in section three remain broadly in line with other similar studies. In some instances there is large variation in outcomes of crises in different sub-groups. The available data do not allow, however, for concluding that the crises of the last decade or the crises in transition economies – in terms of their consequences – differ from other financial crashes. As for output trends, the general finding is that, on average, after the sharp drop in a crisis year, GDP growth recovers gradually and starting from the second year after

a crisis the rebound speeds up. Yet, available data do not allow for stating whether this increase may be maintained in a longer run. Also, taking a look at the development of particular components of GDP for the whole sample, a worrying factor is decelerating rate of investments already in the third year after a crisis (following a rebound observed in the second year). Another interesting observation is that net capital inflows remain depressed for a long time after crises not reaching pre-crisis highs. This factor also suggests that the recovery may prove weak.

The evidence presented in this paper, although limited by the data availability, shows that various costs associated with financial crises are on average indeed high. A median of crises included in the sample led to a significant loss of output, increase in unemployment and also a fall in real wages. There are also many other negative consequences, such as sizable fiscal costs, deteriorating social stance, etc.

With respect to the positive outcomes of financial turbulence incidents, in some cases they provided stimulus for a change in economic policies and speeding up reforms. However, often too, post-crisis reforms proceed slowly because they are subject to social constraints and political pressures. Lower growth in the aftermath of a crisis does not help to overcome these problems. For example, in Southeast Asia restructuring process still remains in dire straits. Political tensions, if present, are unlikely to be removed by a crisis with Indonesia being an excellent example. The real sector, especially export oriented branches, benefit from increased competitiveness (although the data on export performance does not allow for making strong statistical inference). The simple exercise was carried in order to check whether crises are able to remove existing imbalances in the economies, thus reducing a threat of crisis reappearance. It proved that while this seems to be the case in some instances; in general, this cannot be demonstrated (the analysis was carried for current account balances).

Certainly, the scope for further research remains vast. The experience of this paper shows that it is necessary to strengthen the available databases that would allow a more appropriate analysis of crises' impact, especially in the social sphere. Also, the influence on economic policies and institutions in crisis affected countries remains as a very promising and very important (due to its bearing on development) field for further research.

Appendix. The Definition of a Crisis

The pressure index that we use in order to identify crisis episodes is defined as follows:

$$EMP_{C,T} = \alpha_C [(e_{C,T} / e_{C,T-1}) - 1] - \beta [(r_{C,T} / r_{C,T-1}) - 1] + \gamma [(i_{C,T} / i_{C,T-1}) - 1]$$

$$Crisis_{C,T} = \begin{cases} = 1 & \text{if } EMP_{C,T} > \delta * \sigma EMP + \mu EMP \\ = 0 & \text{otherwise,} \end{cases}$$

EMP – exchange market pressure index,

e – exchange rate (domestic currency vs. US dollar),

i – domestic nominal interest rate,

r – reserves,

C – country

T – time

$\alpha, \beta, \gamma, \delta$ – weights,

σEMP – the sample standard deviation

μEMP – the sample mean

Appendix 2. The List of Countries Included in the Analysis

ALBANIA, ARGENTINA, ARMENIA, AZERBAIJAN, BELARUS, BOLIVIA, BRAZIL, BULGARIA, CHILE, CHINA, HONG KONG, CROATIA, CZECH REPUBLIC, ESTONIA, GEORGIA, HUNGARY, INDIA, INDONESIA, KAZAKHSTAN, KOREA, KYRGYZ REPUBLIC, LATVIA, LITHUANIA, MACEDONIA, MALAYSIA, MEXICO, MOLDOVA, PHILIPPINES, RUSSIA, SINGAPORE, SLOVAK REPUBLIC, SLOVENIA, SRI LANKA, TAIWAN, TAJIKISTAN, THAILAND, TURKEY, TURKMENISTAN, UKRAINE, UZBEKISTAN, VENEZUELA.

Within the whole sample, the following sub-samples were identified:

Transition economies (TE): ALBANIA, ARMENIA, AZERBAIJAN, BELARUS, BULGARIA, CROATIA, CZECH REPUBLIC, ESTONIA, GEORGIA, HUNGARY, KAZAKHSTAN, KYRGYZ REPUBLIC, LATVIA, LITHUANIA, MACEDONIA, MOLDOVA, RUSSIA, SLOVAK REPUBLIC, SLOVENIA, TAJIKISTAN, TURKMENISTAN, UKRAINE, UZBEKISTAN.

FSU countries that underwent a crisis in 1998/99 (FSU 98): BELARUS, GEORGIA, KAZAKHSTAN, KYRGYZ REPUBLIC, RUSSIA, UKRAINE.

Southeast Asian economies that underwent a crisis in 1997 (ASIA97): INDONESIA, KOREA, MALAYSIA, PHILIPPINES, THAILAND.

Latin American economies (LAM): ARGENTINA, BOLIVIA, BRAZIL, CHILE, MEXICO, VENEZUELA.

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Part VII.

Financial Crises in FSU Countries: The Role of the IMF

Rafał Antczak, Małgorzata Markiewicz, Artur Radziwiłł

7.1. Introduction

The IMF has supported the transition process in a number of FSU countries. This support involved concessionary financing, policy advice and technical assistance. Notwithstanding temporary conflicts, the cooperation between the Fund and FSU countries throughout the period was described by the Fund as generally successful. It was argued that it contributed to the macroeconomic and financial stabilization [1]. Yet, the financial crisis of 1998 wiped out this stabilization and proved that previous policies were fully unsustainable. This paper attempts to answer the crucial question why countries collaborating closely with the IMF and implementing policies supported by the Fund had to undergo deep financial crisis. The question is made more intriguing by earlier research [2] showing that this was a first-generation crisis – that is, one caused by bad policies that led to macroeconomic imbalances. While the core of the problems was domestic, deterioration of external conditions was the trigger that started the inevitable collapse. True, it is also well understood now that vested interests, insufficient structural reforms and lack of political will were crucial factors preventing necessary policy adjustments. But has the Fund influenced the pace of structural reforms and fiscal tightening? Should the IMF have been more insistent on reforms through tighter conditionality or have allowed for more reform ownership? Finally, should it have withdrawn long before 1998 and not underwritten unsustainable policies?

Before we proceed with addressing these questions we would like to make a short comment on the methodology. In order to evaluate the impact of the IMF program on the economic situation we have to distinguish some specific

questions. First, the original design of the program (assumptions and targets) and its adequacy for the economic problems of the countries under investigation are discussed. Second, the implementation of the program is evaluated, especially the compliance with the performance criteria. Third, if the IMF chooses to support the program even though some of its key parameters are breached, we conclude that the Fund is still sharing ownership for the final outcome. One of the advantages of case studies, as opposed to large multi-country studies [3], is the ability not only to test the significance of the sheer existence of the program but also to better evaluate its key parameters and consider the quality of its implementation. At the same time we believe that the group of countries under investigation – Russia, Ukraine, Moldova, Georgia and Kyrgyzstan (RUMGK) – is large and diversified enough to allow for some generalization of results.

There is also a problem of the baseline scenario against which one can compare the outcome of IMF-supported programs. In the literature [4] there are three major approaches. The before and after approach simply compares the situation in the country before and after the adoption of the IMF-supported programs. This approach is imperfect especially if the country has faced an important exogenous shock or had to undertake fundamental changes in its economic structure. For that reason, this approach is not suitable for the evaluation of programs in transition economies. Another popular approach is to compare countries that adopted the IMF program with countries of similar characteristics (in terms of economic structures and exposure to external shocks) that did not. In the case of FSU countries there is no such control group as virtually all transition countries cooperated with the IMF [5]. The only theoretically reliable method of assessing the impact of this program is based on the construction

[1] The large majority of IMF documents related to programs in transition economies (at least until the 1998 crisis) began and concluded with the praise of stabilization achievements and progress in structural reforms. Compare: IMF (MER, LI, A4C, RED, SP), Camdessus (1994) and Fischer (1998).

[2] Compare country monographs prepared under this project: Antczak (2000), Markiewicz (2000) and Radziwiłł (2000), and also: Siwinska (2000).

[3] See Haque and Khan (1998) for discussion.

[4] Ibid.

[5] Among 26 transition countries, only Turkmenistan did not have at least one IMF-supported program.

of the counterfactual scenario: "comparing the macroeconomic outcomes of a program with the corresponding outcomes obtained under an alternative set of feasible policies is the most appropriate way of judging the effects of programs. However, the difficulties involved in using this criteria should not be underestimated" [6]. Actually this approach is especially difficult in the case of transition countries. With a newly emerging and constantly changing structure of the economy, it is impossible to build a full structural model of the economy. However, throughout the discussion of the political economy of reforms and moral hazard we cannot avoid asking "what if...". The last methodological point is more trivial and relates to scarcities of data. As details of program arrangements, at least until 1998, were generally confidential, it was "extremely difficult for outside observers to prepare a serious quantitative analysis appraisal of IMF policies" [7]. We try to overcome the problem through extensive use of published materials and materials released by the governments of the countries in question.

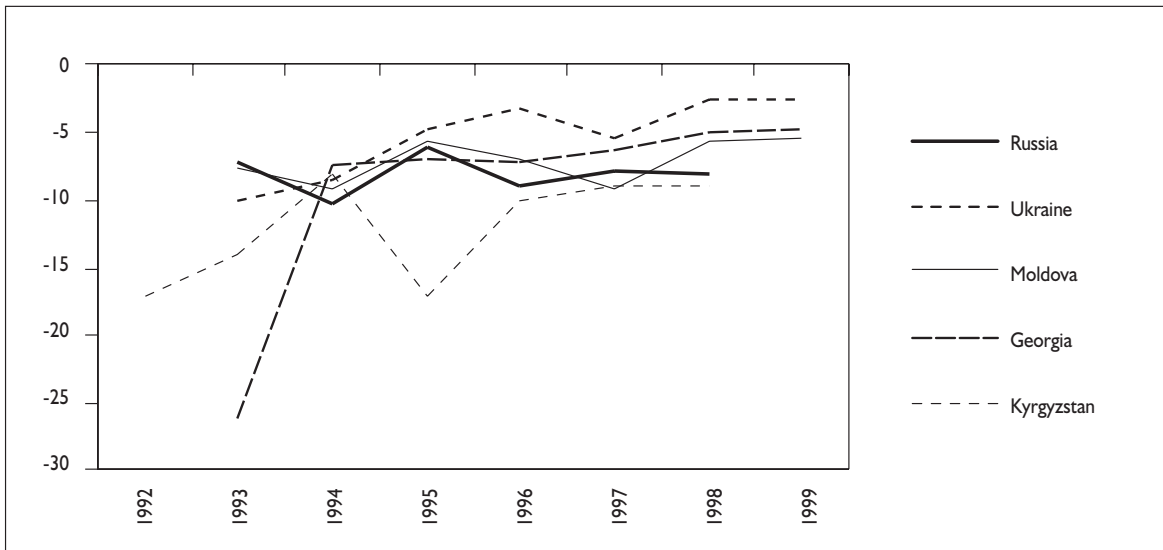
The remainder of this paper is organized in the following way. Chapter one presents the character and main causes of the financial crisis in FSU countries. Chapter two discusses what impact IMF policies could have had in crisis prevention. It also presents the general logic of IMF programs and prior experience of the Fund that contributed substantially to the way it handled cooperation with transition countries.

Against this background, chapter three describes the design and scale of the IMF programs in the region. Chapter four identifies program deficiencies and shows their impact on the policies. Chapter five concludes by commenting on the institutional factors that could have contributed to these weaknesses.

7.2. The Nature of Financial Crisis in FSU Countries

The existing literature shows clearly that the financial crisis that affected FSU countries in 1998 can be convincingly explained by fundamental macroeconomic imbalances [8]. Loose fiscal policy and the lack of structural reforms resulted in unsustainable internal and external positions. Without rapid policy adjustments, this situation had to lead to a financial crisis. For Russia the turmoil in financial markets following the Asian crisis in 1997 combined with the falling prices of oil constituted the trigger that revealed existing imbalances and especially the accumulation of debt service liabilities. For other countries, the clear contagion pressures from Russia (operating both through the trade and financial market channels) led to open crisis only in economies with similar fundamental weaknesses. Among these weaknesses the most easily vis-

Figure 7-1. General government balance (the cash basis), percent of GDP



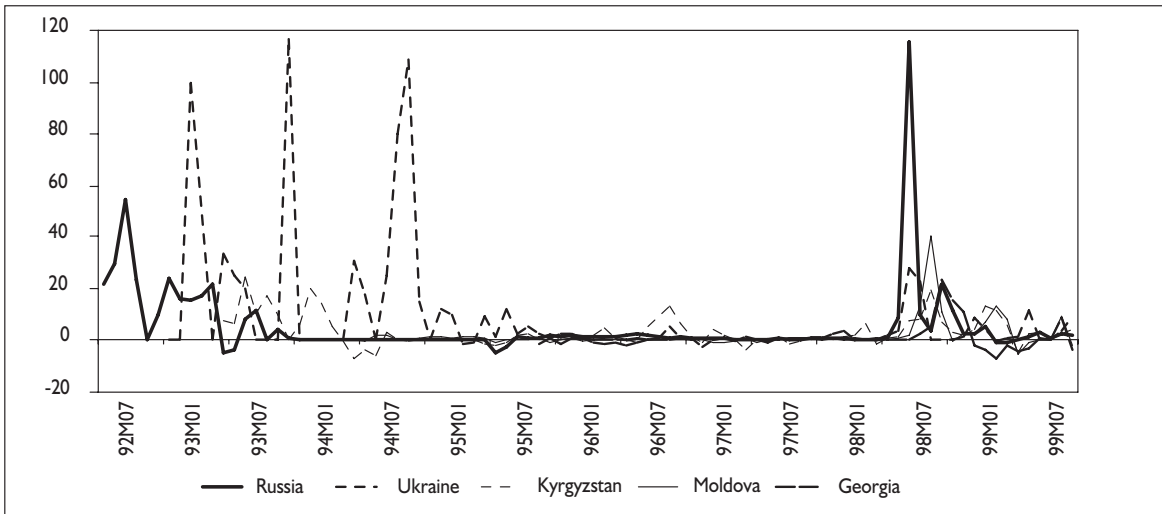
Source: IMF (RED).

[6] Haque and Khan (1998).

[7] Jeffrey Sachs, cited in Bandow and Vasquez (1994).

[8] Compare footnote 2.

Figure 7-2. Changes in nominal exchange rates, monthly (1992-1999)



Source: IMF (IFS).

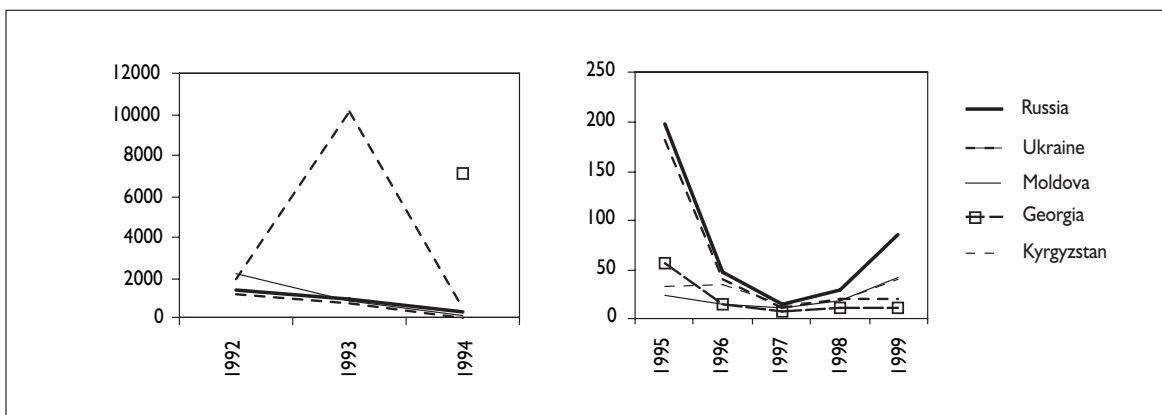
ible was a deep fiscal deficit [9]. Fiscal imbalances were permanently very large in all five countries studied here, with the possible exception of Ukraine, where the deficit was not above 5 percent of GDP since 1995. Figure 7-1 presents deficits on cash basis. If expenditure arrears are also accounted for, imbalances are even larger.

However, even under fiscal policy that is unsustainable in the longer run, short-term monetary stabilization can be achieved. This was accomplished by stabilizing exchange rates in Russia, Moldova, Georgia, and Kyrgyzstan beginning in mid-1994, and in Ukraine beginning in mid-1995, and lasted until the August 1998 crisis. Stable exchange rates were

maintained at the expense of central banks interventions (especially in Russia and Ukraine), while foreign currency reserves were replenished by disbursements from the IMF. The proceeds from sale of reserves served in turn as a source of budget deficit financing in these two countries. Moldova, Georgia and Kyrgyzstan relied mainly on government official transfers and contracted foreign debt to support exchange rate stabilization and finance budget deficits.

As a result of exchange rate based stabilizations and external sources of deficit financing CPI inflation (and inflationary expectations) in RUMGK was lowered to moderate levels during 1995–1998. Low inflation rates and stable

Figure 7-3. CPI inflation rate, end-period (percent)



Source: IMF (RED).

[9] Dabrowski (1999b) writes "Experience of transition process gives a lot of evidence that fiscal policy performance reflects a quality of economic policy and systemic reforms in the specific country. Any inconsequence of the conducted policy, delay in transition on the microeconomic level, weakness of government institutions and favorable political climate for intensive rent seeking negatively influence fiscal balances. Thus fiscal equilibrium depends not only on the fiscal policy itself but also on the speed, quality, and consequence of overall reform process."

exchange rates also allowed for issuance of treasury papers to residents and non-residents what attracted foreign portfolio investors to finance fiscal deficits.

Changing the pattern of deficit financing was a step in the right direction but was not followed by the hard budget constraints necessary for the market economy to function properly. This inconsistency led to accumulation of high debt burdens with an unfavorable structure (i.e., a large share of short-term liabilities held by non-residents). The prevailing view at the time was that deficits in transition could be accepted as long as they are caused by transitional expenditures [10]. However, the primary reasons behind fiscal deficits in the countries under investigation were delay in fiscal reforms and maintenance of pre-transition budgeting practices, and not the costs of reforms. As a result, additional resources and time were lost: foreign financing was used for current spending and not for implementing necessary reforms [11]. This left the countries extremely vulnerable to change in risk perceptions on international financial markets.

7.3. The Role of the IMF

The crises in the region have originated mainly from irresponsible fiscal policies. Therefore, the role that the IMF played needs to be evaluated on the basis of the impact that IMF-supported programs had on the fiscal stance. This impact could be made through the following methods for correcting imbalances:

- tight performance criteria (ceilings on budget deficits, accumulation of debt and arrears, and financing from central banks);
- relevant structural benchmarks related to reform of the fiscal sector (tax system, expenditures and their prioritization, budgetary process) and policy advice;
- strict conditionality regarding compliance with performance criteria and structural benchmarks.

These three interdependent aspects could have enabled governments to run restrictive policies, even if the current political situation created pressure for unsustainable policies. If domestic reformers were prepared to follow the path of responsible policies, external binding commitment could give them an additional political instrument. However, other aspects of the program have to be taken into account too:

- unrealistic assumptions concerning GDP growth, exports, and budget revenues that led to formulation of pro-

grams that were sustainable only if these assumptions were realized;

- lax conditionality, undermining macroeconomic discipline;
- a lenient approach to accumulation of arrears and debt;
- improving access to non-inflationary sources of deficit financing;
- ineffective conditionality in the area of structural reforms, stimulating "paper reforms" and not real restructuring of the economy.

In our view, this group of factors (discussed at length later in this paper) was detrimental to necessary fiscal adjustment and undermined the possible disciplinary effects outlined before. This weakness was tightly linked to the changes in the way the IMF has been operating since the debt crisis in the beginning of the 1980s.

IMF: evolution prior to transition

Of all international organizations, the IMF played the most important role in the process of transition of post-communist economies [12]. This is explained by the fact that by the early 1990s the IMF acquired significant experience not only in macroeconomic policy but also in structural and institutional reform. It was, therefore, perceived as fully prepared to assume responsibility to monitor, manage, and support the transformation process in the medium term. But all these activities were quite different from the tasks for which the IMF was originally designed for.

The IMF was established in 1946 as the part of the Bretton Woods system. The Fund's role was to provide short-term financing to countries with balance of payment problems in order to avoid the repetition of interwar protectionist practices and competitive devaluations. The IMF had a systemic role in supporting the global exchange rate system. Accordingly, it worked mainly with developed countries and its focus was constrained to the main monetary and fiscal aggregates. Structural policies were largely absent in IMF-supported programs and the importance of conditionality was rather weak. Conditionality was formally added to the Articles of Agreement only in 1968 and until the mid-1970s included only macroeconomic aggregates. However, after 1971, in the aftermath of the collapse of Bretton Woods system, the IMF lost its core task. Floating exchange rate regimes among most developed countries did not require constant surveillance and support from the Fund. As Milton Friedman put it [13]: "the IMF has lost its only function and should have closed shop". Instead, in the 1970s the scope of Fund's activities started to move increasingly towards cooperation with developing countries. The

[10] Compare Sachs (1994). For the contrary view see: Dąbrowski (1995).

[11] Dąbrowski (1999a).

[12] Dąbrowski (1995) and Gomulka (1995).

[13] Friedman (1998).

outbreak of the debt crisis in 1982 is generally seen as a major turning point in this process (usually dubbed "mission creep"). In the following years, Fund activities were concentrated on financial support and technical assistance for developing countries affected by the crisis. This change was reflected in the lengthening average duration of programs, broadening of program objectives and change in the character of conditionality. "In response to the substantial changes in the nature and magnitude of economic disequilibria facing members, IMF-supported programs have for several years placed more emphasis on structural reforms and the

achievement of sustainable economic growth" [14]. This was, in part, a response to the growing criticism of the IMF as the "austerity" institution that focused excessively on domestic demand reduction and not sufficiently on domestic supply development.

The change in the hierarchy of goals and in the character of problems in major client countries has led to the lengthening of the duration of stand-by arrangements to three years and the introduction of new medium-term programs such as EFF, SAF, and ESAF (see Table 7-2). The rationale for establishment of the EFF in 1974 was to address the

Table 7-1. Goals of IMF-supported programs

<p>Official goals:</p> <ul style="list-style-type: none"> • Improvement in the balance of payment (without policies detrimental for the growth of world trade) <ul style="list-style-type: none"> - Inherent role of the IMF • Increase in longer term growth <ul style="list-style-type: none"> - Receiving increased attention after 1982 • Better utilization (allocation) of production potential <ul style="list-style-type: none"> - Especially crucial in transition economies <p>Other goals, declared in program memoranda, public statements and staff papers:</p> <ul style="list-style-type: none"> - Poverty alleviation - Environmental protection - Containment of military expenditure - Political considerations
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Source: IMF (1987), IMF (LI, MEP).

Table 7-2. The IMF basic facilities

<p>Stand-by arrangement (SBA, since 1952)</p> <ul style="list-style-type: none"> - Financing for balance of payment deficit of temporary or cyclical nature - Purchases: 6-36 months (initially 6-12 months), repurchases 3.5-5 years afterwards - Originally conditionality limited to macroeconomic policies, since 1980s also structural elements - Reviewed annually <p>Extended Fund Facility (EFF, since 1974)</p> <ul style="list-style-type: none"> - Financing for medium term adjustment of chronic or acute balance of payment deficit due to structural distortions or weak growth performance - Purchases: 3 years (can be extended to 4 years), repurchases: 4.5-10 years - Conditionality includes more structural elements than SBA - Reviewed annually <p>Structural Adjustment Facility (SAF, since 1986)</p> <p>Enhanced Structural Adjustment Facility (ESAF, since 1987)</p> <ul style="list-style-type: none"> - Highly concessionary financing for medium-term macroeconomic adjustment in low-income countries described in the policy framework paper - Purchases: 3 years (can be extended to 4 years), repurchases: 5.5-10 years - Stronger conditionality, including structural policy criteria - Reviewed semi-annually <p>Poverty Reduction and Growth Facility (PRGF, since 1999)</p> <ul style="list-style-type: none"> - Replacement for SAF and ESAF programs with strong focus on poverty reduction with the medium term policies stipulated in the poverty reduction strategy paper - Purchases: 3 years (can be extended to 4 years), repurchases: 5.5-10 years - Strong conditionality, including structural policy criteria - Reviewed semi-annually
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Source: www.imf.org.

[14] IMF (1987).

problem of "an economy experiencing serious payments imbalance relating to structural maladjustments [...] or an economy characterized by slow growth and an inherently weak balance of payment position which prevents the pursuit of active development policy" [15]. Similarly the aim of SAF was "the alleviation of structural imbalances and rigidities" in low-income countries, "many of which [had] suffered for many years from low rates of economic growth and declining per capita incomes".

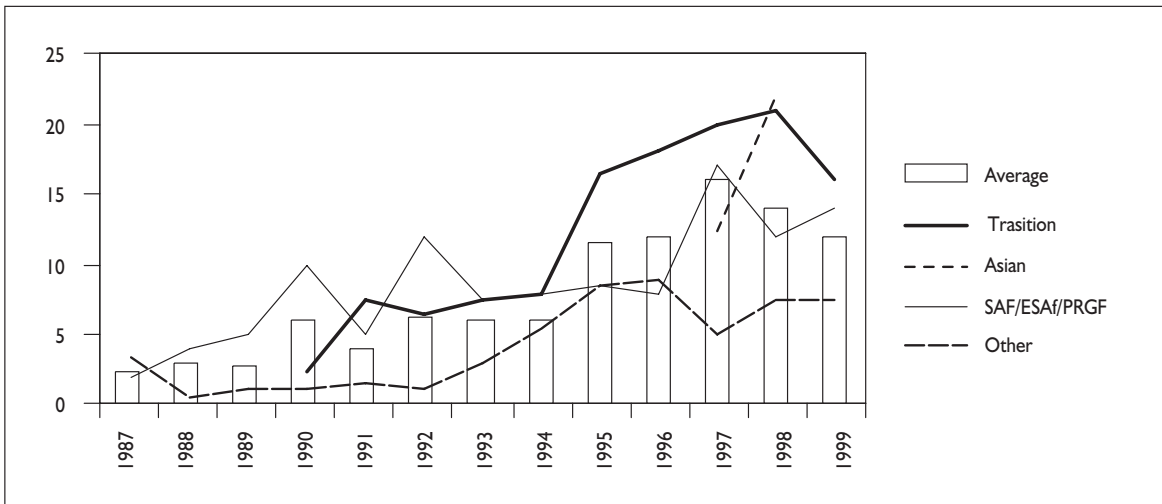
In order to compensate the IMF for the additional risk that it faces when lending on concessionary terms to troubled countries for longer periods, conditionality was constantly intensified throughout the 1980s. The fastest increase was in the area of structural benchmarks linked to improving long term growth prospects. While in beginning of the decade structural elements were exceptional, roughly two thirds of the Fund's programs included some structural elements by the end of the decade, and the average number of structural benchmarks reached almost three per program [16].

Originally, the rationale for conditionality was to make sure "that the member country is pursuing policies that will ameliorate or eliminate its external payments problem" and therefore also "be able to repay IMF in a timely manner – which allows the Fund's limited resources to

revolve and be available to other members" [17]. However, as a result of introducing medium-term programs and difficulties in healing the developing economies, conditionality was turned to as an instrument for micro managing member economies. At the same time, IMF resources started to be locked in several problematic countries. Many governments became permanently dependent on IMF resources. As Bird (2000) notes "the image of the Fund coming into a country, offering swift financial support, helping to turn the balance of payments around, and then getting out, is purely and simply wrong". The lengthening of the programs contributed only partially to this dependence [18].

Another factor was the long series of generally unsuccessful programs. For example, Brazil had eight separate stand-by programs between 1965 and 1972, and Peru had 17 different arrangements between 1971 and 1977 [19]. In general, evaluation of the IMF-supported programs in developing countries is controversial. While empirical research shows frequently negative impact on growth and positive impact on current account in the shorter run and positive impact on growth in the longer run, results are generally inconclusive [20]. Some authors argue that the willingness of the Fund to support unsustainable policies actually led to such policies [21]. The IMF strongly rejects the views about

Figure 7-4. Average number of structural benchmarks per program (1987-1999)



Source: IMF (2001b).

[15] IMF (2001a).

[16] IMF (2001b).

[17] IMF (1998a).

[18] Return of the IMF to its original purpose, that is short-term, emergency lending was urged by many authors; compare Meltzer and Sachs (2000).

[19] McQuillan (1998).

[20] Haque and Khan (1998) offer the survey of evaluations of IMF-Supported programs.

[21] Meltzer (1998) suggests that "without the IMF and the U. S. Treasury, Mexico would learn to run better policies, would have less debt and, I believe, would have made more progress".

its negative impact on policies, but recognizes its limitations in imposing good policies on member countries [22].

With this recent history of focus on delivering growth to poorly developed economies and some reluctance of governments of the recipient countries to impose austere adjustment measures, the Fund started its support for the post-communist economies. In these countries structural reforms were particularly important due to the expectations that the initial decline of output would be followed by rapid growth generated by the improved structure of the economies. Therefore the role of the IMF as a technical assistance agency (as opposed to its systemic role of maintaining liberal trade conditions) gained even more significance.

Expectations of future high rates of growth and considerations about costs of reforms led to reluctance to impose restrictive fiscal policies on transition economies. In our opinion this neglect had a profound impact on future developments. It soon turned out that the countries that benefited from this cooperation with the IMF were the countries with strong national ownership of reforms – mainly Central European countries and the Baltic States. Characteristically, these countries followed the path of more fiscal restraint than the bulk of the FSU countries. Initial stabilization programs were generally successful, and at later stages the process of accession to the OECD and especially the EU drove more comprehensive structural reforms. Thus, IMF financing was not needed any more in most cases.

However, in the majority of FSU countries policies remained undisciplined in spite of initial macroeconomic stabilization and the end of hyperinflation. Conditionality failed to steer policy, confirming the well-known assertion that the IMF cannot effectively impose good policies. The sequence of unsuccessful programs, double standards, and long-term dependence on IMF resources has been repeated. Finally, the mirage of macroeconomic stabilization that underpinned the IMF's willingness to support the economies evaporated in the Russian crisis in 1998. The

next two chapters describe these developments in more detail.

7.4. IMF Programs in FSU Countries

The IMF stepped in to support transition economies very forcefully. Virtually all countries undertaking reform efforts received financial support. The table below presents major programs that were received by countries investigated here. Generally speaking, external financing was provided in support to efforts to stabilize and reform post-communist economies. Russia, due to its size and importance, received the most sizable financing (in nominal terms) of all transition countries, followed by Ukraine. However, the importance of the IMF programs and their impacts on policies were higher in smaller countries like Kyrgyzstan, Moldova or Georgia. Still, there are important common patterns in the disbursement of IMF resources to countries in the region.

IMF lending to FSU countries started with the SBA for Russia in 1992. The program did not involve conditions, and the Yeltsin-Gaidar reform strategy was concerned mainly with liberalization, privatization, and institutional reforms, and not at all with detailed stabilization policies. All other countries started cooperation with the Fund with the Structural Transformation Facility (STF), a program designed specially for transition economies under severe trade and payment disruptions (between 1993 and 1995). This program not only supported countries at the initial stage of transition but also prepared them to receive standard Fund facilities. The disbursements of funds under the STF were relatively small and involved very little conditionality (mostly successfully implemented prior actions). Performance criteria were loose, with fiscal deficits of up to 10 percent of GDP permitted [23]. Afterwards, the series of short-term arrange-

Table 7-3. IMF facilities for investigated countries

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Russia	SBA	STF	STF	SBA	EFF			SBA		
Ukraine			STF	SBA	SBA	SBA	EFF			
Moldova		STF	SBA	SBA	EFF					PRGF
Georgia			STF	SBA	ESAF					PRGF
Kyrgyzstan		STF	SBA	ESAF			ESAF			

Sources: www.imf.org.
Notes: Excluding CCFE.

[23] Considerations about the interactions of the program conditionality, national ownership of policies and their quality are reflected in the current debate within the IMF about changes in conditionality. Compare: IMF (2001a).

[24] Dąbrowski (1995).

ments (SBAs) followed. It is common to view [24] STFs and SBAs as the first generation programs that strove to establish basic short-term macroeconomic stability and stop hyperinflation. The only structural measures for obtaining these aims included price, exchange and trade liberalization, and dismantling of the system of state orders.

In contrast, medium-term EFFs and ESAFs were the second-generation programs that aimed at providing a basis for long-term growth and stabilization. Accordingly, these programs involved much more comprehensive conditionality. Kyrgyzstan was the first country to sign such a program (in 1994), and the biggest wave took place in 1996, when Russia, Moldova, and Georgia signed their second-generation programs. Ukraine was lagging behind other countries and signed a medium-term program only shortly after the outbreak of the Russian crisis (beginning of September 1998). Earlier it had three stand-by arrangements, reflecting its lack of a consistent reform program and policy slippages rather than any conscious cooperation strategy [25]. Among countries under investigation, EFFs were given to Russia, Ukraine and Moldova, perceived as more developed countries, and concessionary ESAFs to Georgia and Kyrgyzstan [26].

Another aspect of the financing is the overall size of net financing received under various facilities. Georgia and Kyrgyzstan have received a relatively constant net inflow of IMF resources, although there was a moderate declining trend (especially in Georgia after 1997). More importantly, there was no particular shock in 1998, as at least loose cooperation with the IMF was unbroken up to the moment of the

Russian crisis. Moldova represents a somewhat different pattern: after close cooperation with the Fund in the first years of transition, when the country secured a relatively high level of financing, later flows to Moldova more closely resembled the volatile and unpredictable flows to the largest countries – Russia and Ukraine.

Although Russia started cooperation with the Fund and switched to medium term programs much earlier than Ukraine, financial flows to these two countries in the period of 1994–1997 are almost identical, which may suggest some sort of "financing contagion", usually attributed to political factors. For Russia, Ukraine, and Moldova the gradual decline in 1994–1997 is a sign of policy slippages and missed disbursements. Only in 1998 we see a dramatic difference. While Russia receives a record high last-chance package, Ukraine receives minimal funds, and Moldova faces a dramatic and probably destabilizing net outflow of IMF funds. Russia undergoes a period of substantial negative financing in 1999 and in 2000, as does Ukraine in 2000. In these years, the perception of Moldova changed, and this country started to be eligible for the same concessionary programs as Georgia or Kyrgyzstan.

Obviously, this is a very superficial picture. Financing from the IMF reflected not only the donors' choices but also – in theory at least – a combination of financing needs, underlying assumptions of reform strategies and compliance with conditionality. The following chapter describes in detail the mechanisms of program financing and points out major

Figure 7-5. Net financing from the IMF (percent of quota)



Source: www.imf.org.

[24] IMF (2001b).

[25] IMF (2001a) calls these facilities "a holding operation" and "an interim solution", respectively.

[26] In the aftermath of the crisis Moldova is qualified together with Georgia and Kyrgyzstan to PRGF, the successor of ESAF.

deficiencies. Still one crucial characteristic must be noted: all five countries received funds from the IMF in every year of the pre-crisis period [27].

7.5. Program Deficiencies and Their Consequences

First generation programs (STF and SBA) that aimed to establish basic macroeconomic stability generally achieved their goals. Although at varying rates, inflation in all five countries was brought down to lower two-digit numbers. This stabilization was not, however, underpinned by fiscal adjustments and was therefore short-lived [28]. Second-generation programs aimed to close this gap. In this section we discuss two factors that in our opinion underlay the failure of the second-generation programs: lax conditionality and overoptimistic assumptions, whose fulfillment was a necessary condition for program sustainability. These factors led to a certain myopia in the Fund-supported programs that caused short-term macroeconomic stabilization to be perceived as a sign of the long-term sustainability of the economic situation.

7.5.1. Growth Assumptions

Partly due to the legacy of the 1930s and to the experience in the Fund after the debt crisis in the 1980s, it was almost impossible for the Fund to design a program that did not assume prompt real economic growth, led by exports. Assuming declines could raise questions concerning the Fund's mission of bringing sustainable growth and would bring criticism of austerity measures. Equilibri-

um with low levels of output and expenditures is largely viewed within the Fund as suppressed disequilibrium [29]. Obviously, it is now even clearer than before that debt service is viable only if there is real economic growth. However, it is one thing to realize this fact, and quite another to build programs on unrealistic growth assumptions, making them impossible to implement and, more importantly, unsustainable in the longer term. While it was understandable that "initially it was hoped that reforms would quickly lead to a pick-up of economic growth and inflows of foreign direct investment" [30], the continuation of such predictions at later dates was simply wishful thinking.

Growth figures predicted (mainly) under the medium-term programs (and program reviews) are presented below. Two groups of countries can be clearly distinguished: Russia, Ukraine and Moldova (RUM) with EFF programs, and Kyrgyzstan and Georgia with ESAF programs. In case of RUM, the IMF systematically overpredicted real growth rates. This is especially true in the case of the medium-term EFF programs, built on the assumption that implementation of the recommended structural measures would lead to growth. The growth performance in Georgia and Kyrgyzstan was rather different. In Georgia, the end of armed conflicts and the discovery of gold fields at roughly the same time as the implementation of the ESAF program brought economic growth at high rates. At later stages, however, projections overpredicted growth, especially in Georgia.

7.5.2. Fiscal Policy and Sustainability of Programs

These false assumptions had an important impact on the sustainability of the programs. First, prospects for high growth rates limited the pressure on adjustments, as debt

Table 7-4. Projected vs. actual debt in 1999

	Moldova		Georgia*		Kyrgyzstan**	
	projected in 1996	actual	projected in 1996	actual	projected in 1997	actual
External debt as % of GDP	25	80	24	63	67	112
Debt, US\$ mln	978	1041	1861	1720	1292	1382
GDP, US\$ mln	3912	1304	7754	2728	1928	1232

Source: IMF and WB (2001).

* There was revision of GDP methodology in Georgia after 1996. ** Excludes non-guaranteed debt

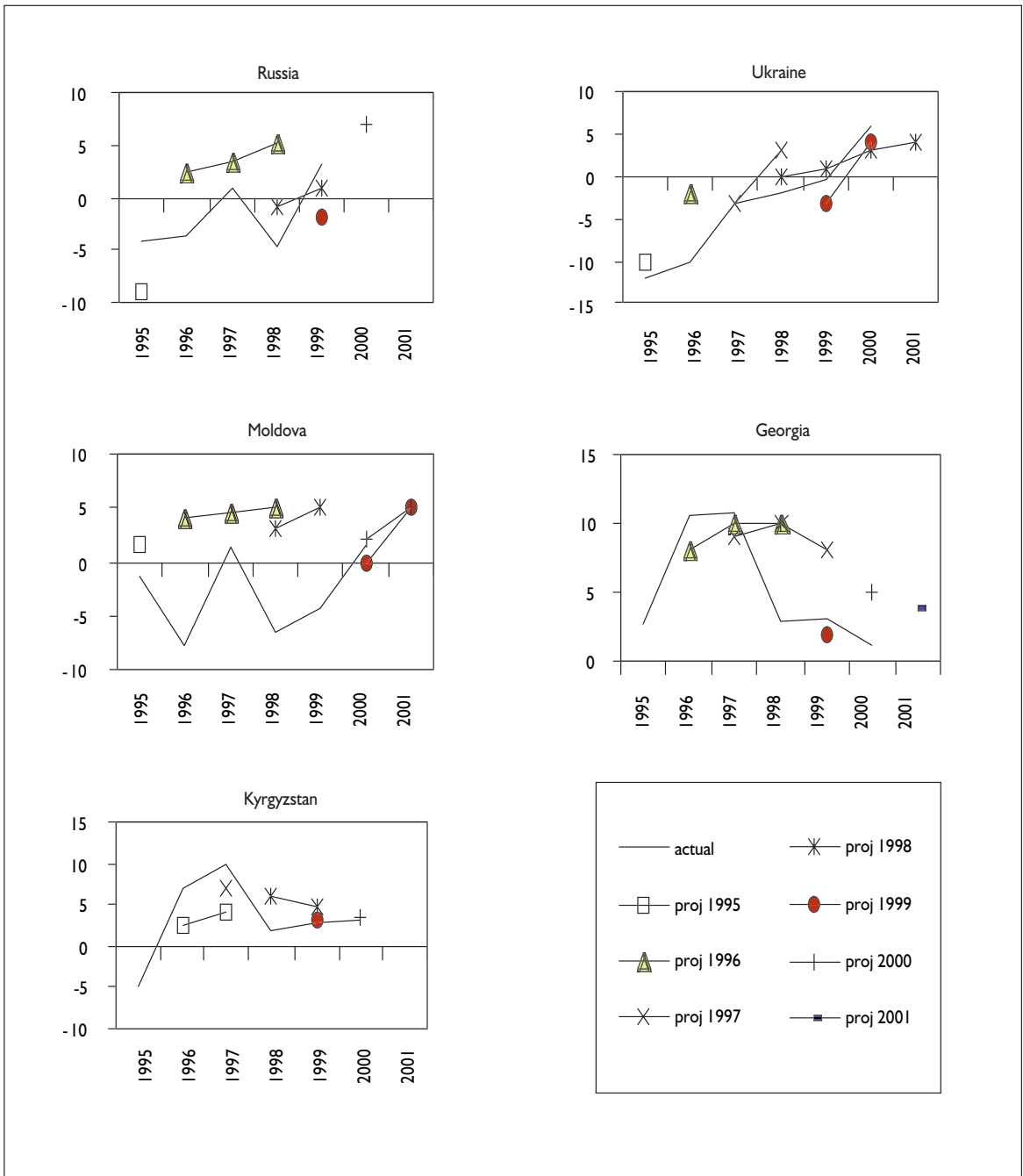
[27] Although in Moldova in 1998 new disbursements only insignificantly exceeded repurchases.

[28] Compare "unpleasant monetarist arithmetic": in the longer term, fiscal and monetary policies cannot be separated, and debt is inflationary (Sargent and Wallace, 1981).

[29] IMF (1987).

[30] IMF and WB (2001).

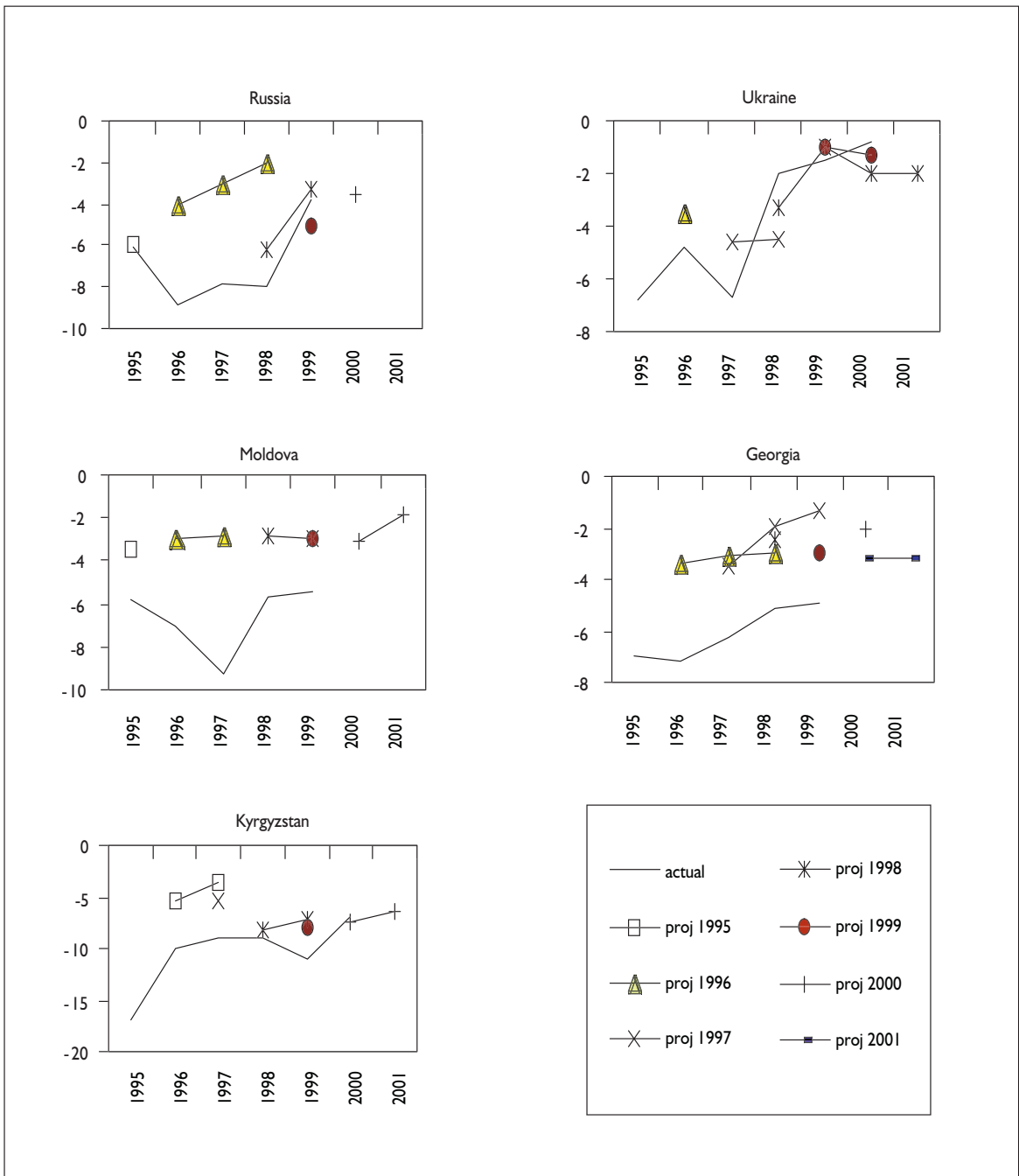
Figure 7-6. Real economic growth: predictions and reality (percent)



Source: IMF (MEP, LI, A4C, RED).

Notes: Series "proj xxxx" contains projections made in year xxxx.

Figure 7-7. Cash fiscal balances: IMF programs and reality (percent of GDP)



Source: IMF (MEP, LI, A4C, RED).

Notes: Series "proj xxxx" contains projections made in year xxxx.

accumulation did not significantly exceed real GDP growth and was, therefore, not seen as an important problem. According to the IMF, successful programs would require "some combination of increasing output and reducing absorption" [31]. Given high predicted rates of growth, however, reducing absorption did not receive enough attention.

This is especially visible when projections of indebtedness are compared (Table 7.4). Moreover, there is a more profound problem with this approach: in the economies of former socialist countries, with hypertrophied public sectors, growth without fiscal adjustment was impossible. The public sector share had to shrink to make room for the private sector, which is the main source of economic growth. In transition countries sound fiscal policy was therefore a precondition for achieving economic growth in the long run.

Second, if predictions for the revenue side of the budget (dependent on growth) are too high, the extent of adjustment in expenditure commitments necessary to achieve any given deficit is underestimated. As long as policy-makers tend to neglect realistic revenue forecasting, the chances for sustainable and efficient fiscal policy are low. But revenues were systematically below expectations [32], which led to increasing deficits.

In addition, fiscal performance criteria were calculated initially in the IMF programs on a cash basis. Accordingly, in many FSU countries arrears appeared to be the most important and persistent source of budget deficit financing (calculated on the accrual basis). In response to lower than expected revenues, the government was also more likely to introduce across the board cuts in expenditures and freeze pensions and wages of public employees. Such reduction in expenditures was also often short-lived, as the period of wage freezes was predictably followed by rapid growth of wages [33]. The failure of government to collect projected revenues and execute planned expenses also pushed the governments towards involvement in dubious non-cash operations that both decreased the efficiency of the government and distorted economic life. Yet the IMF adopted (at least until the crisis) quite a liberal approach to all these distortions, as these actions helped to keep cash deficits in check. Accordingly Buitert (1998) stated that the cash deficit indicators used widely by the IMF in its programs were "myopic" and "more than useless" in the evaluation and design of macroeconomic policy packages. Finally, the generally liberal attitude of the Fund towards fiscal slippages could also be partly blamed for the unprogrammed high budgetary outlays, as the external pressure from the IMF that governments faced was not strong enough to oppose

domestic pressures for more expansionary fiscal policies.

Due to the lack of necessary adjustments, the fiscal positions of all five countries were unsustainable throughout the transition. Table 5 below presents the results of the IMF study on fiscal sustainability conducted under relatively favorable assumptions. Even given the small interest rate differentials and relatively high rates of growth that indeed characterized FSU economies in 1997, the fiscal adjustment gap is exceeded by at least three percentage points in each country.

Table 7-5. Primary balances (percent of GDP)

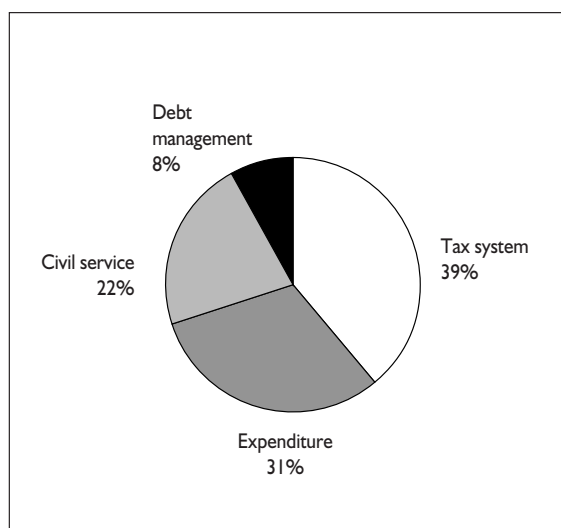
	1997 (actual)	Sustainable
Russia	-3.1	0.4
Ukraine	-3.2	0.4
Moldova	-3.1	0.8
Georgia	-2.4	0.6
Kyrgyzstan	-7.7	0.8

Source: IMF (1998b)

Notes: A sustainable primary balance is defined as the primary balance that would allow for stabilizing the public debt-to-GDP ratio at the end of 1996 level, under assumptions of nominal GDP growth of 8 percent and interest rate differentials of 2 percentage points.

This is not to claim that the IMF did not express concern about the fiscal position throughout the period. Indeed, fiscal adjustment was the declared aim of virtually all the programs, and the need for it was the basic message of all program reviews and Article IV consultations. Additionally, the

Figure 7-8. Distribution of fiscal oriented structural benchmarks



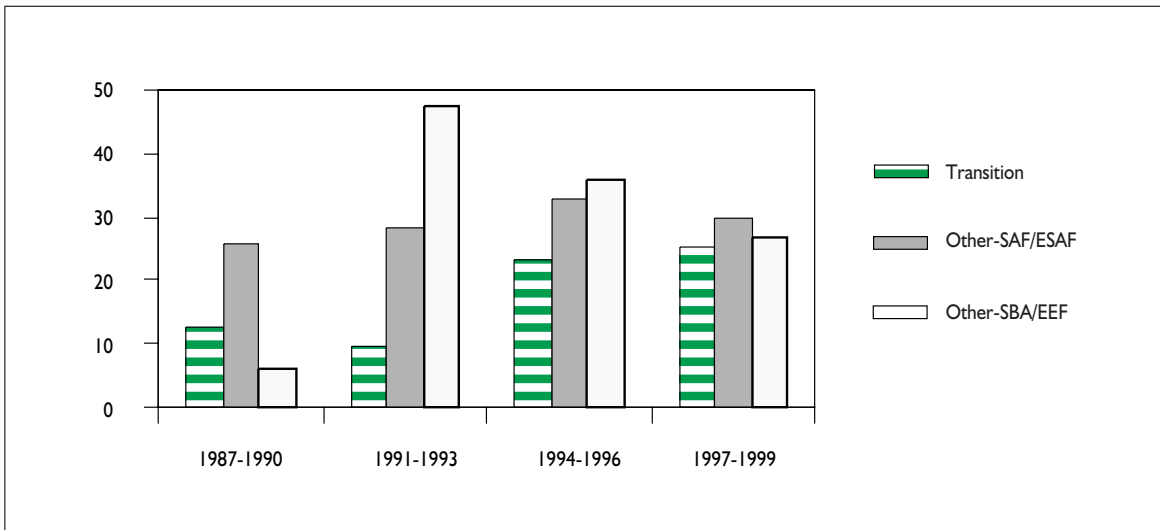
Source: IMF (2001b).

[31] IMF (1987).

[32] Programs also frequently assumed improvements in tax compliance.

[33] This is what happened in Russia in 1995 and in the beginning of 1996 before the presidential elections.

Figure 7-9. Share of overall number of structural benchmarks related to the reform of fiscal sphere 1987–1999 [34]



Source: IMF (2001a).

Notes: The second and third bars in each set represent non-transition economies (recipients of concessional and non-concessional IMF facilities, respectively, excluding programs for countries affected by the 1997 Asian crisis).

large and increasing share of the overall number of structural conditionality benchmarks was related to the reform of the fiscal sector. The latter trend was peculiar to transition economies in the second half of the 1990s.

But as we have seen, this lip service was very poorly reflected in performance criteria, which were relatively lenient and exhibited poor conditionality. The fiscal adjustment that the IMF advocated as the crucial element of stabilization programs simply did not happen. Still, the IMF continued to provide support to countries with very high fiscal imbalances, often praising them for the progress towards the market economy, stabilization, and long-term growth. Even if fiscal slippages led to a program's going off-track, new programs were granted almost immediately. Therefore, we argue that fiscal outcomes have been so weak partly because of the IMF's misconceptions about growth prospects and its reluctance to insist on unpopular and difficult fiscal adjustment measures. Nevertheless, while long-term fiscal sustainability was somehow neglected, the negative influence of budget deficits in the short term had to be tackled in order to maintain shorter-term stabilization.

7.5.3. Myopia in Action

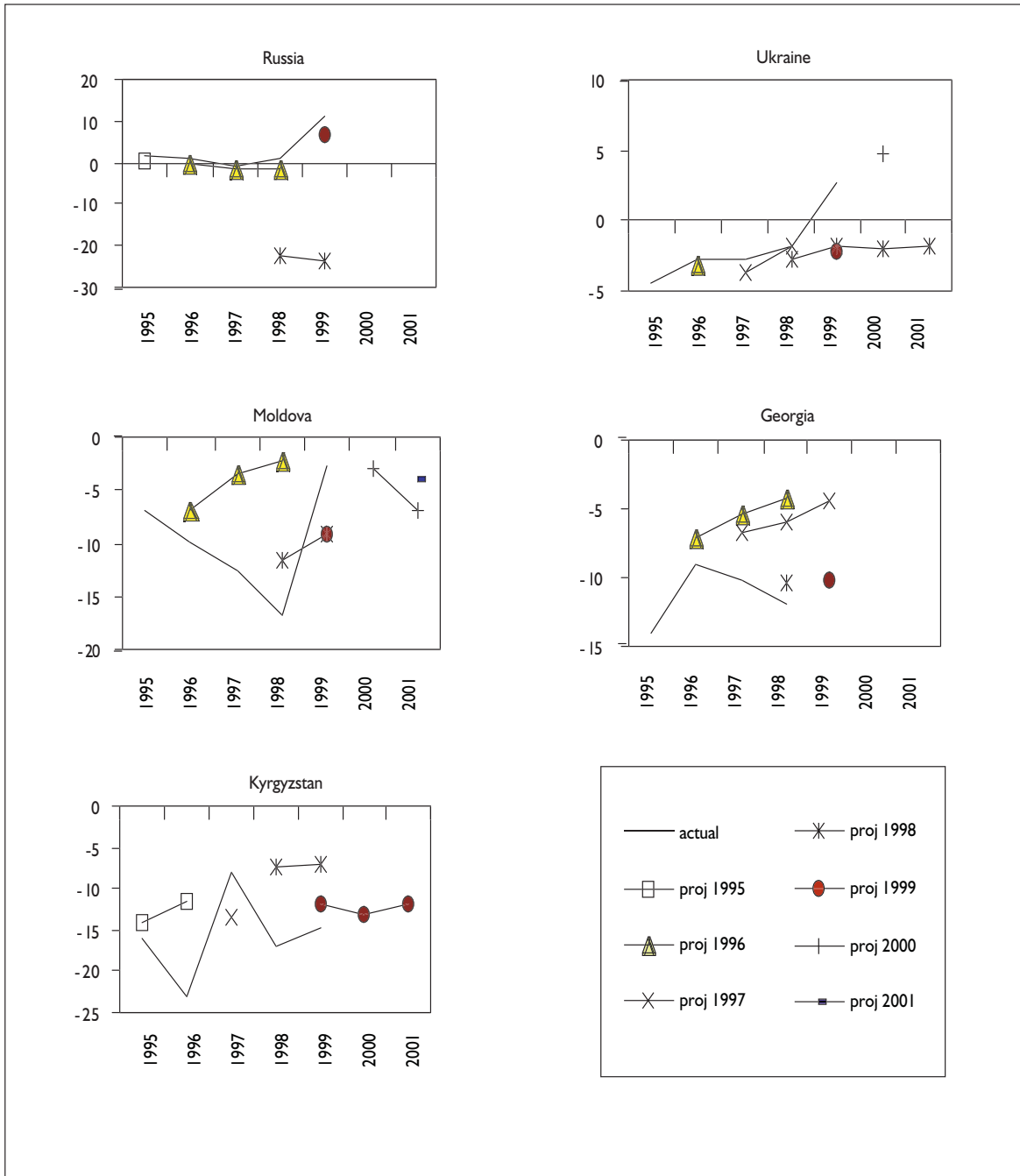
Expansionary fiscal policies led to excess aggregate demand that was not met by a supply side response. Given the very limited stock of domestic savings and low monetization

constraining the accumulation of internal debt, this pressure could be resolved either by increases in the price level or by an increase in the current account deficit. The first scenario was particularly likely if budget deficits were financed by central bank credits, as the corresponding increases in the money supply inevitably led to inflation. The second alternative was more likely if budget deficits were financed by foreign borrowing. Under this scenario, capital inflows led to real exchange rate appreciation and growth of imports. Therefore, the IMF had to decide whether to concentrate on fighting inflation or avoiding external debt accumulation. Clearly, the chief consideration of the Fund in making such decisions was consolidating the major achievement of the first-generation programs; namely, the short-term stabilization, reflected in low inflation and stable exchange rates.

The focus on short-term inflation targets, with some neglect of the debt problem, can be clearly seen if we compare the outcomes of inflation and current account predictions in the smaller countries with those in the bigger ones. In the smaller countries monetary policy was much more disciplined for several reasons: central banks were stronger, the influence of the IMF greater and the external borrowing smaller in absolute terms (is it easier to generate credits of several million rather than several billion dollars). Accordingly, the disinflation process under second-generation programs was generally successful. Unfortunately, monetary discipline did not lead to improvement of fiscal balances,

[34] The lower share of number of structural measures related to fiscal sector in transition economies in comparison to other recipients is the result of great number of benchmarks related to the transition process, especially privatization.

Figure 7-10. Current account balances: IMF programs and reality (percent of GDP)

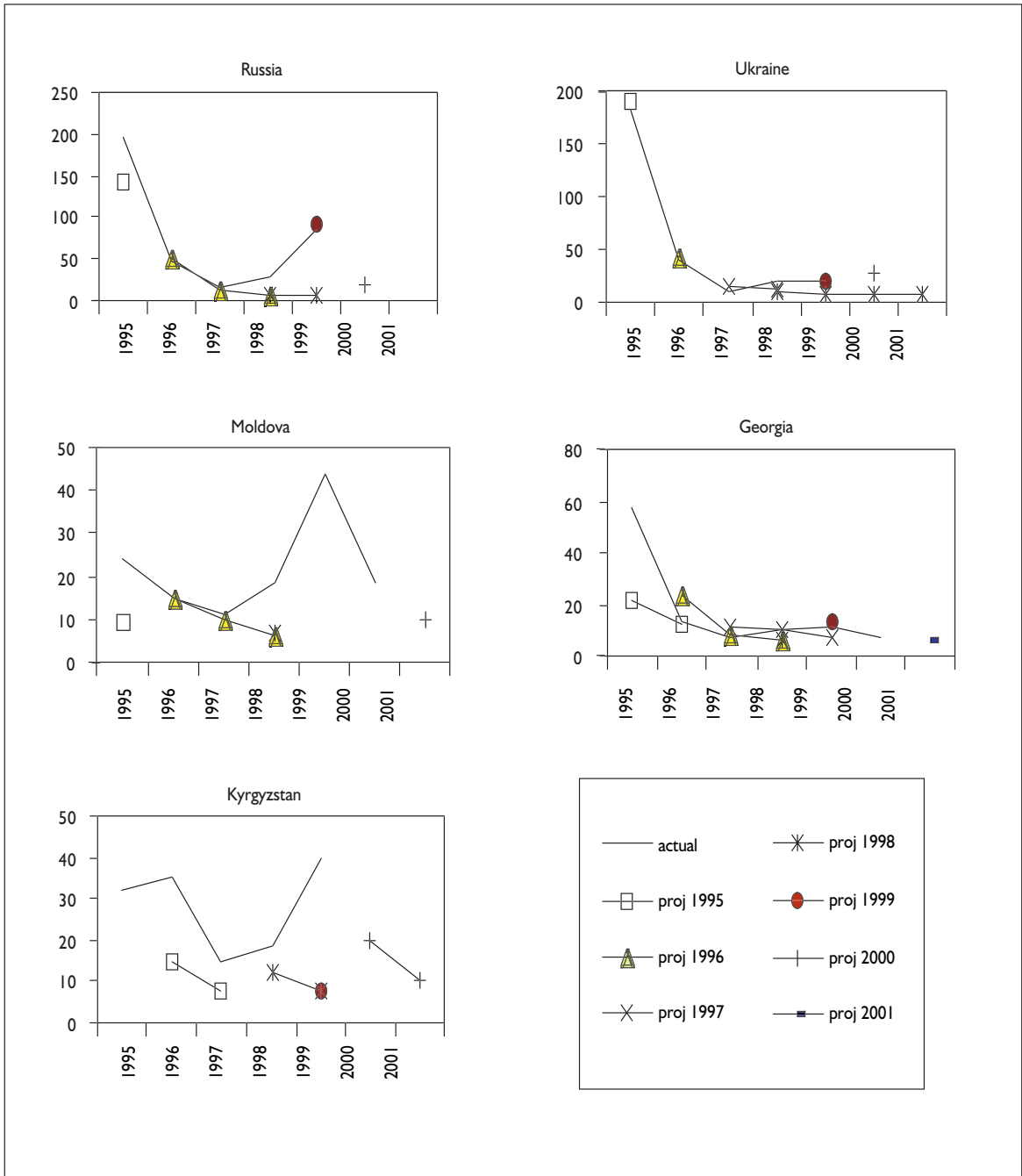


Source: IMF (MEP, LI, A4C, RED).

Notes: Series "proj xxxx" contains projections made in year xxxx.

For Georgia, official transfers are excluded. For Kyrgyzstan, grants are excluded.

Figure 7-11. End-period annual CPI inflation: programs and reality (in percent)



Source: IMF (MEP, LI, A4C, RED).

Notes: Series "proj xxxx" contains projections made in year xxxx.

For Georgia, official transfers are excluded. For Kyrgyzstan, grants are excluded.

and non-monetized budget deficits led to rapid accumulation of external debt. Substantial current account deficits (systematically over 10 percent of GDP in Moldova, Georgia, and Kyrgyzstan) were the flip side of this coin. An interesting example comes from Moldova, where in the first quarter of 1998 the IMF saw a need for appreciation of the exchange rate in order to maintain low inflation [35], as the budgetary sector was continuing to borrow abroad. This advice was given irrespective of a current account deficit that had, in the previous year, exceeded 13 percent of GDP and been covered mainly by short-term borrowing [36]. This is a somewhat surprising attitude given the original role of the IMF as the balance-of-payments watchdog.

In Russia and Ukraine, current accounts did not constitute a threat to macroeconomic stability, and program projections were generally met. This was due partly to the relatively loose monetary policy: internal imbalances were reflected mainly in inflation. These countries had stronger negotiation positions vis-a-vis the IMF and weaker central banks. Still, one quite spectacular event occurred with respect to the Russian current account. Just before the crisis, on July 20th, 1998, the IMF predicted that the current account deficit would reach 9.6 billion US\$ and 10.4 billion US\$ in 1998 and 1999, respectively (above 20 percent of GDP). This shows again how unwilling the IMF was to acknowledge the unsustainability of current policies.

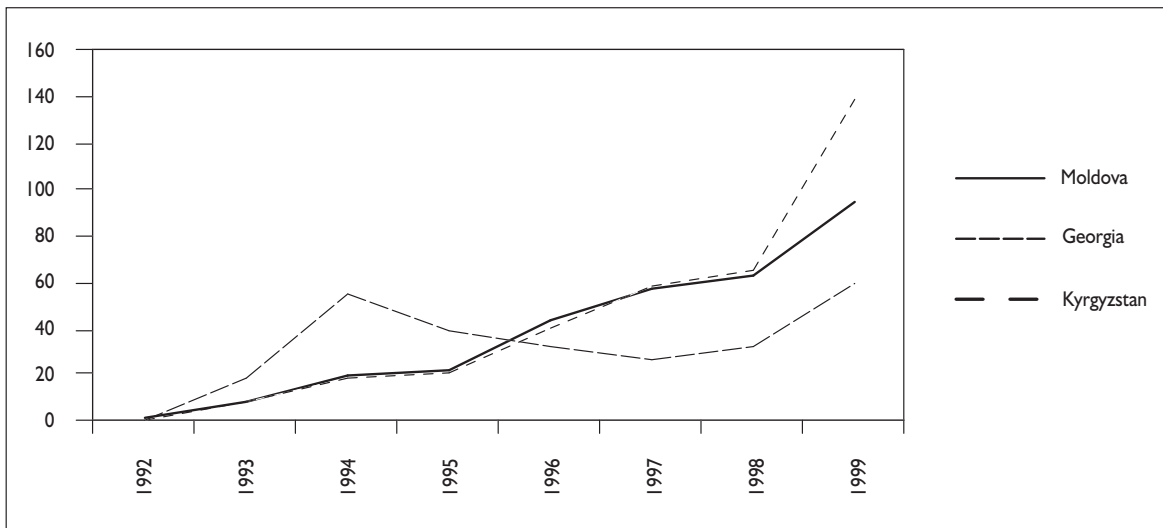
Our criticism is not intended to advocate more expansionary monetary policies, but rather we argue that the IMF

was advocating delaying the crisis (adjustment) for too long, while sending wrong signals both to governments and investors. Unfortunately, such policy advice was welcomed by domestic authorities, as "a finance minister faced with this choice will almost always prefer to avoid the crisis now, at the risk of a future larger crisis, than accept the crisis now when may critics are ready to claim that the crisis is avoidable" [37].

High debt ratios are very costly because they press up real interest rates and increase the debt service component of the deficit. In the five countries under consideration, debt-servicing expenditures became one of the most important items on the expenditure side of the budget. The long-term costs of short-lived disinflation under loose fiscal policy appear to have been especially high for small and highly indebted countries. Georgia and Kyrgyzstan are following the path of long-term dependence on external aid. Moldova, having disappointed initial hopes, is also set to follow this path.

When financial market participants finally refused to buy new treasury bills, governments faced three choices: a decrease in the fiscal deficit, an increase in seigniorage revenues, and a delay in debt repayment. In all five countries we observe a mix of these measures. Fiscal adjustment was carried out with higher levels of debt, high real interest rates, limited demand for treasury securities, under mandatory debt restructuring (e.g. Russia, Ukraine) and with weakened central bank independence.

Figure 7-12. Government external debt (percent of GDP)



Source: IMF and WB (2001).

[35] IMF (1998c). The same document argues, however, that fiscal policy tightening is the major instrument for reducing macroeconomic imbalances and points to the increasing risk of financial and currency crisis.

[36] Real exchange rate appreciation additionally aggravated the problem due to high elasticity of import with respect to exchange rate movements.

[37] Meltzer (1998).

7.5.4. Weak Conditionality

The IMF-supported programs, in spite of discussion of fiscal problems, failed to bring any significant fiscal consolidation. This failure is linked to the important issue of reform ownership. The most fundamental problems can be solved only if national authorities with broad political support assume the ownership and full responsibility for reforms and necessary policy corrections. Unfortunately, in countries of weak reform ownership, policies were assumed (and reluctantly followed) just to please the IMF and receive disbursements, rather than to solve the problems of the country [38]. But even in such cases, the programs could induce better policies, through enhancing the credibility of reforms and helping reformist governments to overcome political opposition to the program. But this is possible only if the IMF program provides a binding commitment. With "soft" conditionality this goal cannot be reached, even if in most cases there was a relevant (although standard) set of performance criteria. Usually, the key quantitative benchmarks are as follows:

- The upper limit for the cumulative change in net credit (of the monetary authorities and/or the banking system) [39] to the general government;
- The upper limit for the cumulative deficit of the general government (later also the accumulation of arrears);
- The upper limit for the cumulative change in net

domestic assets (of the monetary authorities and/or the banking system);

- The lower limit for the cumulative change in net international reserves (of the monetary authorities and/or the banking system)

The IMF study shows that compliance with such performance criteria is strongly associated with growth [40] (although there is no causation established; rather, it is rightly supposed that reform ownership is a common immeasurable factor for the two). This is borne out by the experience of the most advanced reformers in Central Europe, which have, by far, the highest scores in this ranking. But compliance under the medium-term programs declined sharply in all countries under investigation (with the exception of Kyrgyzstan), which partly explained the failure of second-generation programs. However, non-compliance rarely led to program suspension.

Another aspect of conditionality is the implementation of structural benchmarks. It is easily seen that the number of structural benchmarks varies significantly across SBA programs and is much higher in the case of medium-term programs (both EFF and ESAF). This reflects the different logic behind the second-generation programs. The share of benchmarks applied to the key fiscal sector also varies greatly, but somewhat surprisingly there is no more focus on this sector in the case of EFFs (with the exception of the EFF for Russia, with almost half of the benchmarks related to fiscal reform) [41].

Table 7-6. Compliance with the IMF quantitative conditionality

Country	Program	Compliance (full = 100)
Russia	SBA (1995)	100
Russia	EFF (1996)	77
Ukraine	SBA (1995)	(off track) 76
Ukraine	SBA (1996)	99
Ukraine	SBA (1997)	(off track) 62
Moldova	SBA (1993)	86
Moldova	SBA (1995)	100
Moldova	EFF (1996)	82
Georgia	SBA (1995)	100
Georgia	ESAF (1996)	89
Kyrgyzstan	SBA (1993)	(off track) 70
Kyrgyzstan	ESAF (1994)	86

Source: Mercer-Blackman and Unigovskaya (2000).

Remarks: The index is calculated as the simple average of compliance on each performance criteria at each test date. Compliance on a given condition at a given date is evaluated using the following scale: met=100, waived=50, met after modification=50, waived after modification=30, not met=0.

[38] In some cases the letter of intent and economic policy memorandum are not prepared by the member country, but by the IMF staff, subject to bargaining on selected performance criteria. This is in contradiction to official line of the IMF, whereby "each IMF-supported program is designed by the member country in the close collaboration with the IMF staff" (IMF, 1998a).

[39] The choice of the monetary authorities or the banking system depends on the specific situation of each country and the rigidity of the program.

[40] Mercer-Blackman and Unigovskaya (2000)

[41] Also in the EFF program for Ukraine, 35 of 88 condition were related to the fiscal sector, but this program was initiated after the crisis.

Table 7-7. Compliance with IMF structural conditionality

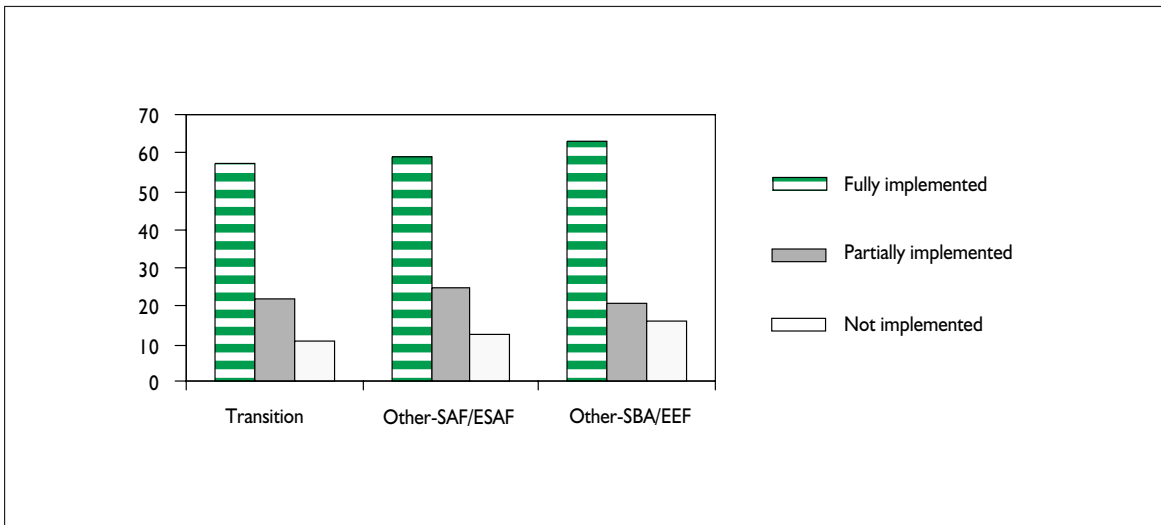
Country	Program	Number of structural benchmarks								Compliance (full = 100)
		Trade/Exchange System	Pricing	Public Enterprise	Fiscal sector	Financial sector	Privatization	Other	Total	
Russia	SBA	3	-	-	1	-	-	2	6	50
Russia	EFF	2	1	1	18	7	6	2	37	73
Ukraine	SBA	2	-	-	1	1	5	3	12	68
Ukraine	SBA	1	2	2	1	2	1	2	11	83
Moldova	SBA	4	1	-	3	2	3	-	13	81
Moldova	SBA	2	-	1	-	-	2	-	5	75
Moldova	EFF	6	1	1	2	1	4	1	16	90
Georgia	SBA	1	-	3	8	2	3	-	17	77
Georgia	ESAF	-	2	1	5	5	4	5	22	79
Kyrgyzstan	SBA	-	4	-	-	-	1	1	6	0
Kyrgyzstan	ESAF	1	-	7	10	8	4	5	35	79

Source: Mercer-Blackman and Unigovskaya (2000).

Remarks: The index of compliance (last column) is calculated as the simple average of compliance on each structural benchmark at each test date. Compliance on a given benchmark at a given date is evaluated using the following scale: met=100, met to certain extent or with insignificant delay=50, insufficient information about outcome=50, not met=0.

The compliance index is consistently higher when medium-term programs are considered. Overall Moldova, Georgia and (surprisingly) Ukraine are countries with the best record of compliance with structural benchmarks, while Kyrgyzstan and Russia improved their low compliance records only under medium-term programs. This international comparison also shows that implementation of the structural benchmarks in transition economies was not extraordinarily low. A comment is in order, however, concerning the role of structural benchmarks in the assessment of reform performance. Apart from

the difficulties in measuring compliance, quite often fulfillment of structural benchmarks implied only "paper reforms"; i.e., passage of laws that were never enforced. On the other hand, detailed conditionality that captured particular elements of the reform was missing the broad picture and the final aim of the reform. Therefore, structural benchmarks reflected rather purely fundamental improvements in the institutional set up. What is characteristic, leading CEE reformers exhibit low scores and there is apparently no link between compliance and growth [42].

Figure 7-13. Compliance with IMF structural conditionality

Source: IMF (2001b).

Notes: The second and third sets of bars represent non-transition economies (recipients of concessional and non-concessional IMF facilities, respectively, excluding programs for countries affected by the 1997 Asian crisis).

[42] Ibid.

The official IMF evaluation of first- and second-generation programs in RUMGK indicates rather high compliance with IMF conditionality. In our opinion this is highly questionable. Russia, the FSU country most generously financed by the IMF,

provides the most striking evidence of non-compliance. We analyze this case in detail below. However, very similar patterns were clearly visible in the other four countries [43].

Box 1: IMF Conditionality: The case of Russia

The IMF decided not to put rigorous conditions on the SBA in 1992, and the Yeltsin-Gaidar reform program dealt mainly with liberalization, privatization, and institutional reforms, and not at all with detailed stabilization policies. The one distinctive feature of this stabilization plan was that neither the wage nor the exchange rate would serve as a nominal anchor. The inflation objective was below 5 percent per month, which was not very ambitious. The political weakness of the Yeltsin-Gaidar government became apparent with the nomination of Victor Gerashchenko, who represented interests of lobbies (industrialists, regions, FSU countries, etc.) demanding credits from the authorities, as Chairman of the Central Bank of Russia. Monetization of an enlarged government deficit representing almost 20 percent of GDP and generous credit lines to the FSU countries led to CPI inflation of over 20 percent monthly in the fourth quarter of 1992. Obviously, all the IMF targets were exceeded at the very beginning of the program in September-October 1992. In the overall appraisal of the achievements of Yeltsin-Gaidar program, the defeats outnumbered the gains. The macroeconomic policy lacked monetary and fiscal tightening. The policy of the CBR was aimed at supporting production and propping up financially inefficient state enterprises and cooperative farms. Foreign trade was only partly liberalized. Incomplete deregulation of prices (combined with the slow pace of demonopolization of the economy) caused shortages, and pressure for massive state interventions (softening of monetary and fiscal policies) grew. The Yeltsin-Gaidar government decided not to start privatization of agriculture. Finally, both the IMF and the Russian authorities followed an inconsistent policy related to abandoning the ruble zone with other ex-Soviet republics, which led to huge transfers of the Russian GDP and further boosted inflation. In December 1992 Yegor Gaidar was replaced by Victor Chernomyrdin, a moderate representative of the "red directors" lobby preferred by the majority of parliamentarians.

The first Article IV consultation was concluded on April 21, 1993 [44]. On June 30, 1993, the Executive Board approved an economic program to be supported by a two-tranche purchase under the Systemic Transformation Facility (STF). Russia purchased the first tranche of SDR 1,078.3 million (equivalent to 25 percent of quota) from the IMF on July 6, 1993. The STF, as a brand-new IMF facility, made it possible to credit the new Russian government irrespective of the failure of the previous program. Also, there were many new features in the program. Firstly, the STF specified that the purchase from the IMF would not have to be added to the stock of Russia's official international reserves but would be available to provide additional credit to the economy (and to the budget). This represented a major departure from the IMF's primary goal of providing financial assistance to countries experiencing temporary balance of payments problems. In doing so, the IMF entered terrain usually reserved for the World Bank and its agencies financing government projects (or, more precisely, budgetary expenditures). The conditions of the STF program remained broadly the same as those of the SBA, but this time included explicit targets rather than soft projections.

The program got off to a good start, but as early as the third and the fourth quarters of 1993, targets were exceeded by wide margins. The reason was that tight monetary policy was not accompanied by fiscal adjustment, as President Boris Yeltsin vetoed the 1993 budget (with a deficit of 20 percent of GDP) and then dissolved the Supreme Soviet. In the last months of 1993, Minister of Finance Boris Fedorov made an attempt to limit expenditures and refused to pay. The result of sequestration was a buildup in government arrears, some of which would have to be repaid. Therefore, most monetary and fiscal conditions were not fulfilled. Also, the fulfillment of the monetary conditions was spurious as the official increase in the CBR interest rate brought preferential central banks credits below this rate. Accordingly, the next IMF condition, concerning liberalization of the exchange rate, ended up in CBR interventions to maintain the exchange rate of around 1000 rubles per U.S. dollar. Real appreciation of the ruble led to an increase in imports, dwindling reserves, and finally depreciation of the ruble by 20 percent in September-October 1993. The second tranche of STF was to be disbursed in September 1993, after a review of the program; however, the failures of 1992 were repeated, and all conditions were broken within a quarter after the signing of the agreement.

[43] These cases are not included in this article in order to avoid repetition.

[44] According to Article IV, Section 3 of the IMF Articles of Agreement, the IMF has the mandate to oversee the compliance of each member with its obligations, and each member should provide the IMF with necessary information.

On April 20, 1994, the IMF Executive Board approved the next program of the new Russian government [45] supported by a second tranche of SDR 1,078.3 million under the STF. The major goal of the program was to safeguard the fragile achievements in the Russian reforms, especially in the areas of price and exchange rate liberalization, and foster structural reforms, including privatization, foreign trade liberalization, increased competition, and transparency. Gradualism was officially the key operating concept both for Prime Minister Victor Chernomyrdin and the IMF. Again, conditions of the second STF program were similar to those of the first STF.

The second STF combined the macroeconomic conditionality of the first STF with structural reforms, especially mass privatization, managed by Anatoly Chubais, who was in charge of the State Privatization Committee. In the second quarter of 1994 program implementation was on target. The monthly inflation rate fell to 6 percent in June 1994 and to 4.5 percent in August 1994. The government managed to keep its borrowing from the central bank within the program targets, but mainly through aggressive sequestration of expenditures as budget revenues collapsed. In the third quarter, however, credits from the central bank surged as revenues fell in relation to GDP and subsidies to agricultural sector, the Northern Territories, and other customary recipients of budget financing rose sharply. The government's ability to use sequestration diminished and the Parliament rejected most of the revenue measures specified in the second STF. In mid-1994, the authorities ran down official reserves in an attempt to offset the impact of the surge in net credit to the government on the monetary base and inflation. After international reserves dropped by almost US\$4 billion in the third quarter of 1994, foreign exchange market participants started to speculate against the ruble. Market participants were fully aware of the inconsistencies in the expansionary fiscal policy and quasi-tightening of monetary policy, which limited credits to banks but expanded financing of the deficit. On October 11, 1994, the ruble tumbled in the Moscow interbank market by over 20 percent against the U.S. dollar. "Black Tuesday" became the first currency crisis in post-communist Russia. In the fourth quarter of 1994, the central bank limited credit expansion to banks and the government, and the Ministry of Finance restricted expenditures but also started issuing government securities well below the market rate [46]. The credit crunch led to a rise in interest rates, but inflation continued to increase reaching a monthly rate of 16 percent in December 1994 - twice the STF projection. Fiscal targets were exceeded by wide margins, the stock of international reserves dropped below the target, the exchange rate depreciated by 45 percent during the second half of 1994, and the majority of liberalization measures was not implemented. The second STF failed as completely as its predecessor.

The rise in inflation, the accumulation of government arrears, and the exchange rate crisis on October 11, 1994, led to the next reshuffling of the Russian Cabinet. Finance Minister Sergei Dubinin and CBR governor Victor Gerashchenko were fired. Anatoly Chubais was appointed First Deputy Prime Minister in charge of economic policy, Yevgeny Yasin became Minister of the Economy, and Tatyana Paramonova became Acting Chairperson of the CBR. Negotiations with the IMF resumed, this time concerning a program that would be supported by a stand-by credit of up to SDR 4,313 million (100 percent of quota). As in previous years, a major tightening of monetary and fiscal policies took place at the beginning of 1995. In January, the stock of credit to the government was frozen, the CBR increased reserve requirements, and - as international reserves kept declining - the monetary base shrank by 9 percent. Inflation slowed to 10-11 percent in February-March. On March 10, 1995, in a letter to IMF Managing Director Michel Camdessus, President Boris Yeltsin expressed his support for the new arrangement. On April 11, 1995, the IMF Executive Board approved the stand-by arrangement supported by a credit of SDR 4,313.1 million for a period of 12 months. Additionally, the IMF waived Article V, Section 3(b)(iii), and increased the limit of lending to 200 percent of the Russia's quota. According to official statements, the SBA was aimed at decisive progress in stabilization and structural reform during 1995 and envisaged the same measures as in the previous programs, both from macroeconomic and structural perspective.

In the course of the stand-by program quantitative targets were all met month by month with comfortable margins. The most vulnerable situation remained in the fiscal sector, because of substantial revenue shortfalls that persisted throughout 1995. Measures to improve revenues were implemented only partially or with a lag. Major revenue categories barely exceeded the program's projections in nominal terms in spite of substantially increased inflation, and for 1995 the ratio of revenue to GDP turned out to be nearly 3 percentage points below the programmed level. Under these circumstances, in order to meet the deficit target the authorities contained spending (in relation to GDP), keeping it below programmed levels. On the monetary side, while credit targets were met, large capital inflows put pressure on the ruble, leading to nominal and real appreciation and/or growth of the monetary base (given limited capacity for sterilization). Growing confidence in the ruble and the increase in reserves allowed for introduction of an exchange rate cor-

[45] Victor Chernomyrdin remained Prime Minister and Sergei Dubinin was nominated as Minister of Finance.

[46] Issuance of new kinds of government bonds, including medium-term ones, was planned in the second STF program with a goal to establish a market for government securities and increase the portion of non-inflationary financing of the budget deficit.

ridor on July 5, 1995 (4,300 - 4,900 ruble per U.S. dollar). However, in the second half of October, pre-election pressure became evident as fiscal policy started to drift away from targets. The previously accumulated margins (with respect to the cumulative ceilings for the credit aggregates, fiscal deficit, and international reserves) allowed the targets for October and November to be met. In December (especially in the last ten days of the month), the authorities probably used "window dressing" to achieve the targets. Therefore, the tendency of policies to drift in the last quarter continued in 1995, and as with the previous programs, it had a negative impact on inflation (3.5 percent in December 1995, instead of 1 percent).

Structural reforms, especially bank restructuring, were considered relatively sluggish. This became evident when an interbank liquidity crisis emerged toward the end of August 1995. The pace and scale of privatization fell short of expectations, and transparency of the whole process due to the introduction of the loans-for-shares scheme became doubtful. Finally, little progress was achieved in the area of land reform.

Summing up, in 1995 the Russian authorities apparently decided to fulfill macroeconomic targets but abandon structural reforms that conflicted with the interests of various lobbies and were therefore politically difficult. The relative success of the 1995 stand-by (in comparison with the performance of the previous arrangements) allowed the Russian authorities to request IMF support for the medium-term program of macroeconomic stabilization and structural reform.

In a letter dated March 6, 1996, the Russian government requested a three-year arrangement under the EFF in the amount of SDR 6,901 million, or 160 percent of the quota. The ongoing stand-by program would then be cancelled as of the date of approval of the extended arrangement. This trade off yielded positive results: almost immediately, on March 26, 1996, the IMF Board approved the program (and again waived Article V).

The proposed strategy for 1996–1998 aimed at establishing a foundation for sustainable growth by lowering inflation to a single-digit annual rate, implementing key structural reforms, and achieving medium-term viability of the balance of payments. The 1996 program was based on quite optimistic forecasts, such as a high annual rate of GDP growth (6 percent starting in 1997), 1 percent inflation monthly beginning at the end of 1996, recovery of money demand, repatriation of flight capital, increase in foreign direct investments, and a comprehensive restructuring of debt obligations (US\$7 billion). The debt service burden was especially large for the federal budget, as the accumulation of maturities and arrears during the following years was already foreseen in 1996. However, the critical element of the medium-term strategy was a further reduction in the overall fiscal deficit of the general government from around 6 percent of GDP in 1995 to 4 percent of GDP in 1996 and 2 percent of GDP in 1998. Local governments and off-budget funds were to balance their budgets or finance deficits from non-inflationary sources (without credits from the CBR). A net increase in revenues of close to 5 percentage points of GDP was planned for the medium term (via an increase in tax rates and broadening of the tax base through elimination of tax exemptions and preferential treatment, especially for fuel producers). The monetary framework targeted the same parameters as previous programs, limiting the pace of credit expansion and monetization of the budget deficit. The programmed domestic assets expansion would not result in growth of the monetary base because it was exactly offset by a decline in the monetary authorities' net international reserves. The same was true of the 1995 program – the sale or use of government reserves was included as part of the monetary authorities' net credit to the federal and enlarged governments. Therefore, the IMF's intention was clearly non-inflationary deficit financing.

The period of 1996–1998 reflected elusive macroeconomic stabilization. Since 1995, Russia had not been able to achieve its main fiscal policy objectives, which were a reduction in the unsustainably high deficit, a reversal of the decline in budget revenues, and a reduction of expenditures. The general government primary deficit rose from 2.6 percent of GDP in 1995 to 3.1 percent of GDP in 1997, and the overall deficit increased from 6.1 percent to 7.7 percent of GDP in the same period. At the same time, general government revenues only increased from 33.5 percent of GDP in 1995 to 35.5 percent of GDP in 1997, whereas expenditures increased from 39.6 percent to 43.2 percent of GDP in the same period. This reflected a number of fundamental factors, but perhaps the most important among them was a continued recourse to non-monetary fiscal operations and tax offset schemes on the revenue side and expansion of interest payments on the debt on the expenditure side [47].

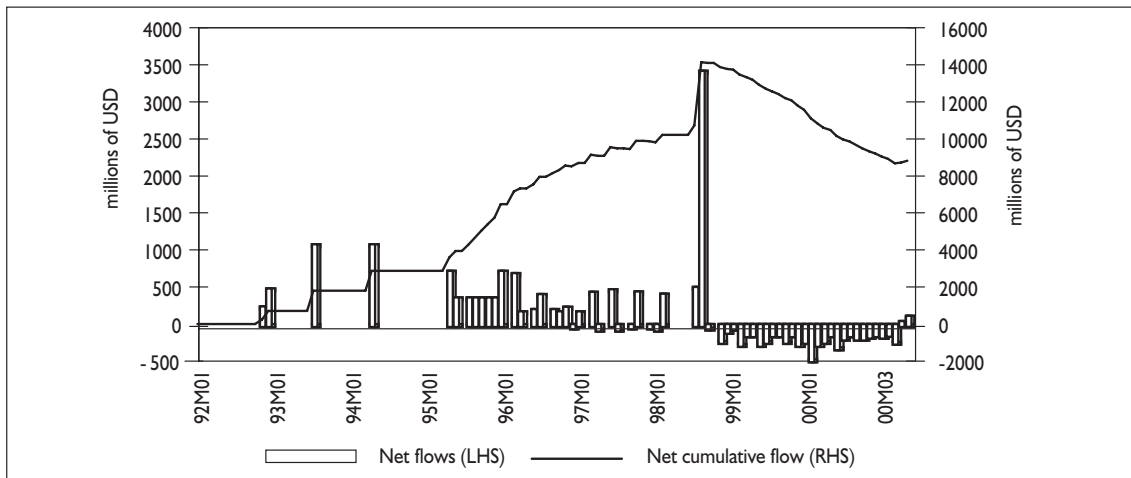
In mid-1998, the accumulation of macro- and microeconomic problems coincided with the cumulating maturity of debt payments due in the third quarter of 1998, amounting to one third of budget revenues, and with a current account deficit resulting from a decline in world fuel prices. Moreover, the Asian crisis in 1997–1998 had increased financial market volatility and investor pessimism about the performance of the Russian economy.

Some adjustment measures implemented at the beginning of 1998 by the government of Prime Minister Sergei Kiriyenko, especially sequestration of expenditures and proposed changes in tax law, were not effective (the Parliament's

[47] See Antczak (2000) for an analysis of the Russian crisis in 1998.

willingness to support the government's plans was very limited). Capital flows remained volatile and market confidence was not restored. The Russian authorities proposed to implement radical measures and expected support from the IMF. On July 16, 1998, a Memorandum of the Government of the Russian Federation and the Central Bank of the Russian Federation on Economic and Financial Stabilization Policies was signed with the IMF. The government program was basically identical to those supported by the IMF but not realized throughout the previous five years. It aimed at radically tightening the federal budget and lengthening debt maturity, and the authorities expected "substantial foreign financing" for the program. The proposed package of measures for 1998 was partially based on the ongoing EFF arrangement. However, the Duma rejected the proposed changes in tax policy (broadening the base of the Personal Income Tax and transferring a higher share of PIT revenues to the federal budget, increasing the land tax, and balancing the budget of the Pension Fund). The Russian government was to provide a supplementary memorandum to the IMF on July 20. On July 31, the IMF tried to avert crisis by disbursing a SDR 3.4 billion tranche, irrespective of the lack of a formal agreement. However, this

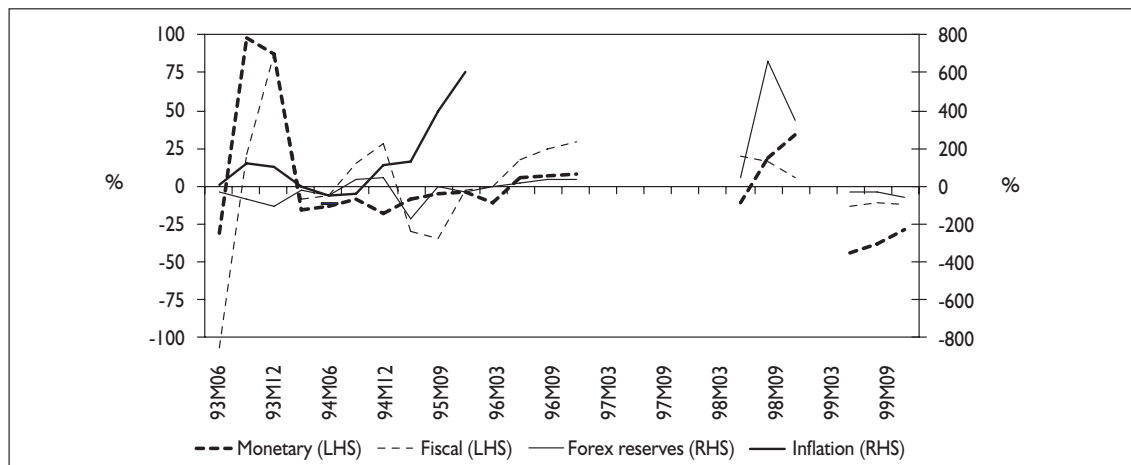
Figure 7-14. Russian Federation, compliance with the IMF quantitative monetary, fiscal, and exchange rate targets in 1993-1999 (%)



Source: IMF (A4C, IFS, RED, SP)

Note: Exceeding of targets should be viewed as noncompliance with conditionality. Targets are equally weighted. The inflation target was officially stated as an objective or projection, and after 1995 was not included in the IMF conditionality.

Figure 7-15. IMF net disbursements to Russia in 1992-2001 (millions of US\$)



Source: www.imf.org.

in fact only hastened the inevitable deep correction of the exchange rate made necessary by accumulated macroeconomic imbalances.

With the crisis of August 1998, Russia exceeded all quantitative targets established in the EFF program. IMF disbursements to Russia came to a halt. The latest program, an SBA for SDR 3.3 billion (55.5 percent of quota) for a period of 17 months, was signed on July 28, 1999. Through the end of 2000, Russia has made only one purchase. Quantitative performance criteria for the end of July, the end of September, and the end of December 1999 were reached (many with large margins). However, there were many shortfalls relative to structural benchmarks for the third and fourth quarters of 1999.

The example of Russia (to which we could easily add similar cases from the other four countries) clearly shows that from the very beginning of the transformation the IMF was not insistent enough on its conditionality, especially in the area of fiscal adjustment. It also shows that the conditionality was effectively much weaker than is suggested by the relatively high scores on compliance presented by IMF sources. This inconsistency stems from issues of transparency in the performance criteria. The attempts to circumvent imprecision were also one of the reasons for the proliferation of arrears, sequestration, explicit and implicit guarantees, and quasi-fiscal operations. It is important that the majority of "more than useless" indicators were created in the crucial sector of public finance. While the promotion of public awareness and responsibility should be one of key functions of the Fund [48], it has long given a rather idealized picture of the FSU countries. The public could not generally access surveillance data or memoranda on policies or criteria breaching. Instead, as Boris Fedorov put it, "the IMF was pretending that it was seeing a lot reforms. Russia was pretending to conduct reforms" [49]. Similarly, The Economist (1996) quotes an anonymous Russian minister's comments on the March 1996 negotiations to the effect that "bookkeeping tricks were pulled on both sides".

A further factor in the weakening of conditionality was the changing weight given to performance criteria and program reviews. Performance criteria (and prior actions) should generally be very precisely defined and provide a ready test for the compliance of policies with the program. Non-implementation can still be accepted through the issuance of a waiver; however, conditionality based on performance criteria is generally less lax and less likely to be affected by political considerations. On the other hand, program reviews that mix ex-post evaluation with expectations towards future actions provide much more room for discretion. Coupled with the increasing number of waivers and modification in the program criteria, this undermined the "binding commitment" role of conditionality. The final, and

probably most important, factor behind lax conditionality is the ease with which the Fund continued to work with countries with very bad track records. Again, the case study of Russia shows this very clearly, but a similar pattern can be observed in most of the countries under investigation here: new programs were continually covering up the fundamental weakness of the FSU economies.

To sum up, the conditionality exhibited excessive leniency, allowing recipient countries to avoid fiscal and other kinds of necessary adjustment. While flexibility is important, as it allows for corrective measures in cases of external shocks, it has been clearly abused in the case of the FSU. Again, the prior experience of the IMF appears to be at fault. Instead of promoting good policies in a decisive manner, the Fund was showing that it "pays due regard to the domestic social and political objectives" [50] - even if these objectives were detrimental to long-term growth and stabilization.

7.5.5. Soft Financing

Throughout this paper we have argued that the IMF was not insistent enough on fiscal adjustment. We now wish to take this argument further and show that the IMF programs were actually detrimental to true fiscal adjustment. As the IMF was consistently softening governments' "hard budget constraints" by providing non-monetary sources of deficit financing, the political support for fiscal tightening was even more difficult to generate than would have been the case in the absence of IMF programs.

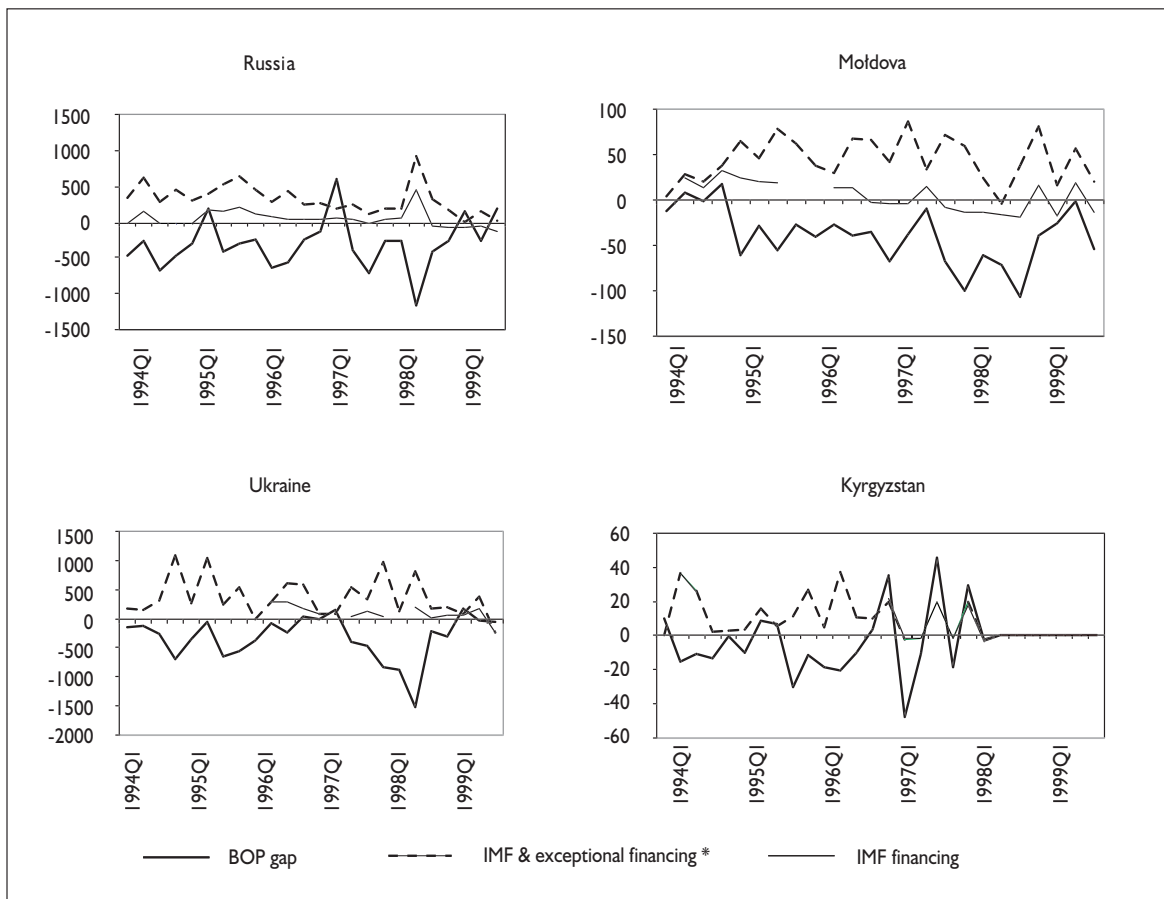
The support of the IMF for the development of non-monetary deficit financing in RUMGK was twofold. First, the IMF was willing to indirectly finance FSU governments. The STF in 1993 specified that the purchase from the IMF would not have to be added to the stock of Russia's official international reserves but would be available to provide additional credit to the economy (and to the budget). The same

[48] Compare, for example, Brown (1998).

[49] Cited in McQuillan (1998).

[50] IMF (2001a). Compare also Camdessus (1994): "(...) policies may indeed need to be adjusted pragmatically in light of circumstances and developments. One example has been fiscal policy. (...) In many cases, after careful assessments, the Fund has agreed in these circumstances to the temporary relaxation of fiscal deficit targets in programs it has supported, while of course continuing to focus on the requirements of lowering inflation and achieving medium-term fiscal sustainability". Developments proved, however, that it is extremely difficult to achieve sustainability when adjustments are repeatedly delayed and "temporary relaxations" persist.

Figure 7-16. Balance of payment gap and financing (1994-1999)



Source: IMF (IFS)

Note: The balance of payments gap is defined here as the sum of the current account, capital account, financial account, and errors and omissions. IMF and exceptional financing are financing items in the balance of payments. The residual from these two is the change in net international reserves of the monetary authorities.

was the case of the 1995 program: the sale or use of government holdings of reserves was included as part of the monetary authorities' net credit to the federal and enlarged governments. In so doing, the IMF was attempting to finance the budget deficit in a non-inflationary manner. Indeed, in our five countries, all of whose central banks were directly financing the budgets, the IMF funding was transferred to the budget and consumed. Ukraine serves as a good example. The Ukrainian EFF program included a target for central bank gross purchases of treasury bills from the primary market. Agreements with the IMF also allowed for negotiations with debtors on rescheduling of payments. Such reschedulings were to constitute a source of balance of payment financing referred to as "exceptional financing". Russia, as the legal successor to the debt (as well as the assets) of the USSR and net creditor to the rest of the FSU countries, received the largest rescheduling of debt payments. The existence of the ruble area until July 1993, inter-republican

trade and financial links, and the similarity of transformation problems led to the adoption of a common approach to all FSU countries by the Western governments and international financial institutions. In practice, informal rescheduling of the Russian debt payments was often conditioned on the Russian government's rescheduling of debt payments it was owed by Ukraine, Moldova, Georgia, or Kyrgyzstan. This multilateral credit approach was used in relations amongst most FSU countries. Therefore, the IMF disbursements can – together with exceptional financing (i.e., debt relief and arrears) – be treated as a form of financing of the twin deficits (balance of payments and budget deficits).

The unjustified "seal of good housekeeping" further softened budget constraints, as the economic policy memorandum with the IMF opened the door to cooperation with other multilateral and bilateral donors. IMF programs constituted a stamp of approval for government policies, tending to bring improvements in the countries' ratings and new capi-

tal inflows. This catalytic role is explicitly recognized as one of the main functions of the IMF in support of adjustment. However, when the IMF underwrites unsustainable policies, the effect is disastrous for the borrowing country: external debt accumulates and incentives for adjustments are diminished.

For smaller countries this foreign financing led to a debt trap. Wrong signals sent to private creditors and governments had a highly detrimental impact on the economic situation of these countries. Policies based on increasing debt-to-GDP ratios were unsustainable, but could be maintained as long as financial markets did not fully realize this. An interesting example of such an attempt to change market sentiment was the arrangement negotiated for Russia in 1998, which aimed to use external financing to prolong the fragile stabilization [51]. Later on, however, the IMF admitted that crisis was inevitable unless the "steadier process at work" were fundamentally reversed [52].

Worse, a general sense of implicit guarantees ("too big to fail"), especially in case of Russia, was built up over the course of years. While the role of IMF in the modern world should be the prevention of crisis through the surveillance of national policies, transparent information and reduction of moral hazard, the practice was exactly opposite. Meltzer (1999) concludes: "Moral hazard lending to Russia, encouraged by the bail out of foreign lenders to Mexico, permitted Russia and other countries to finance large unbalanced budgets by borrowing externally. The result is a much larger financial problem for international lenders and for the economies of other countries". In consequence, the IMF's opening of access to external savings delayed the change in direction of capital flows and therefore induced reluctance to apply remedies. Without the IMF, Russia and other countries in the region might have had better policies.

7.6. Conclusions: Political and Institutional Considerations

How could the IMF have made such mistakes? The answer to this question is basically beyond scope of this paper. We will simply note that it is most likely of a political nature. As Meltzer (1999) [53] explains: "The G-7 governments either were unwilling or believed themselves unable

to obtain funding for the transformation from their parliaments. The IMF agreed to accept responsibility. In doing so, it reached far beyond its competence". The influence of politics over economics, and especially on the quality of conditionality, can be summarized in the popular adage that "saving Russia from communism matters more than the niceties of monthly bookkeeping" [54]. Another group of factors that could contribute to this problem is related to the system of incentives facing the IMF bureaucracy [55]. The IMF as an institution has a stake in the "success" of the program. It is, therefore, difficult for its officials to declare the program a failure, even if it cannot impose its real implementation. Finally, the IMF wants to stay in the country, as it considers some influence on policy to be better than no influence at all. This is, however, not the case if it leads the Fund to underwrite bad policies.

[51] Stanley Fischer (1998) stated at the beginning of 1998 that "the Russian economy has broadly achieved stabilization and the future should bring much more peaceful days".

[52] IMF (RED) on Russia, issued in September 1999.

[53] Compare also Dabrowski (1995). Several authors argue that a politically independent IMF would be more effective at promoting international financial stability; compare De Gregorio et al. (2000).

[54] *The Economist* (1996)

[55] Vauber (1994)

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