Financial System Development, Regulation and Economic Growth:
Evidence from Russia

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Abstract

Recent contributions to the empirical analysis of the relationship between
financial system development and economic growth found that an exogenous
component of financial system development causes economic growth, is a good
predictor of future growth and that its growth impact is relatively large. In addition,
the empirical literature on banking crises predicts that their adverse effects on
economic growth will rise in the absence of an adequate response by the
government. Given these findings and considering that the Russian government
failed to respond adequately to the 1998 banking crisis, Russia's strong economic
growth since the crisis is a puzzle. The paper attempts to empirically make visible
the growth impact of this banking crisis using a quantitative assessment of the
contribution of the financial system to economic growth. It is the first empirical
study for a transition country on the contribution of financial system development
to economic growth. It is found that the growth costs of the crisis may have been
even larger than suggested by a simulation that uses growth coefficients from the
literature. This growth impact was compensated by other expansionary effects. The
paper also evaluates the Russian banking sector reform and proposes improvements.

1.   Introduction

The Russian banking crisis of 1998 may be historically unique for two main reasons: Firstly, its immediate adverse effects on deposits, lending, and net worth of commercial banks were extreme, and secondly, there was no official response for more than four years with any serious banking restructuring program. Instead the banking system was "stabilized" through central bank credit and forbearance concerning rule enforcement. This offers the opportunity to study the economic growth effects of a banking crisis under the condition that the authorities do not respond with serious banking restructuring measures.

In addition, since the empirical literature on banking crises unanimously concludes that their adverse effects on economic growth and thus their costs will rise without a comprehensive banking restructuring program, Russia's strong economic growth since the banking crisis is a puzzle. The large ruble real devaluation in 1998 served as the immediate trigger of the banking crisis but also liberated the economy from the ruble overvaluation supported by advice and loans from the IMF. Thus, it may be hypothesized that the Russian banking crisis dampened economic growth but its effect was compensated by other expansionary effects such as the currency depreciation. This paper attempts to empirically make visible the growth costs of the banking crisis using -for the first time that this has been done for a transition country- a quantitative assessment of the contribution of the financial system to economic growth in Russia. Simulations illustrate how real GDP could have evolved had there not been the banking crisis. The analysis is based on the cross-country empirical analysis of the relationship between financial system development and economic growth, especially the causality aspect, as analyzed in Levine, Loayza, and Beck (2000), who found that an exogenous component of financial system development causes economic growth and is a good predictor of future economic growth. The empirical analysis of banking crises (e.g. Dziobek and Pazarbasioglu, 1997, Tang et al., 2000) identifies requirements for minimizing their economic costs, which were clearly not carved out in the Russian case. The failure of the Russian government to meet the requirements for successful banking restructuring calls into question the effectiveness of western loan conditionality and necessitates a broader discussion. The analysis challenges the view that "given the small size of the financial sector, the macro-economy would be relatively little affected by the immediate impact of financial sector distress" (IMF, 2003, p.1), and it has implications beyond Russia also because such an assessment for a key transition country has not yet been undertaken.

The paper starts in section 2 with highlighting major causes of Russia's banking crisis, and showing in section 3 that after the crisis the mentioned requirements for successful banking restructuring were not met. Section 4 presents the empirical analysis of the impact of the banking crisis on economic growth including illustrative growth simulations. Section 5 discusses then selected policy options and section 6 concludes.

2.   Background of the crisis

At the end of 1997 an evaluation of the progress toward "a market-based financial system" in the 15 successor states of the former Soviet-Union was published.[1] The high ranking that Russia received in this assessment apparently was overly optimistic, particularly with regard to banking supervision. The most fundamental prudential rules for banking had not been enforced before the crisis, in particular regarding the foreign exchange rate risk and provisioning for bad debt. This together with a rapidly growing public debt to GDP ratio on account of issuance of short- and medium-term high interest yielding treasury bills (GKO/OFZ debt), sold to a large extent to commercial banks[2], caused three major weaknesses in the latter's aggregate balance sheet and in their off-balance sheet transactions: Banks were overexposed to the foreign exchange rate risk, to the credit risk (aggravated, for instance, by a Ruble depreciation, which could cause borrowers with foreign debt and no foreign currency income to become insolvent) and to the risk of default of the government.[3] Thus, the large currency depreciation in August/September 1998 and the government's default on its domestic Ruble debt in August 1998 became instantaneously an open banking crisis. It caused the transitory collapse of the payments system and, to some extent, of new lending.

A very important contributory factor to the crisis has been (as in several other Asian and Eastern European countries who experienced a currency crisis during 1997 and 1998) the fixed exchange rate corridor (adopted in the beginning of 1998) backed by IMF lending. Given Russia's little diversified export structure, considering the slow structural reform progress and other adverse developments such as the fall of oil prices and withdrawal of foreign investors from emerging markets, it proved to be a fundamental mistake.[4] This promise of relative nominal exchange rate stability with lax enforcement of prudential requirements for banks contributed decisively to the overexposure of banks to the exchange rate risk: For banks it thus appeared

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[1] The study distinguished six functional areas of "central banking reforms": Monetary operations and government securities markets, foreign exchange operations and market, banking supervision, bank restructuring, payments system, and central bank accounting and internal audit. Marks from 1 (indicating limited progress) to 3 (indicating substantial progress) for each of these reform areas were given and for an overall ranking. Russia received a mark of 3 with regard to the three first mentioned areas and a mark of 2 for the three last mentioned areas. See Knight et al. (1997).

[2] The share of credit to the government in bank's total assets had steadily increased from about 5 percent at end of 1994 to about one third at end June 1998, mostly treasury bills (see Table 1).

[3] This corresponds to the findings of a "due diligence survey" of 18 Russian banks (15 of which were among the 30 largest Russian banks), performed by the World Bank in the second half of 1998: 14 of these 18 banks had a negative own capital! The losses incurred by the 18 banks were identified as having been loan losses (45 percent of the aggregate loss), foreign exchange related losses (37 percent) and losses on government debt (18 percent). The large state-owned Sberbank was not reviewed. See Russian European Center for Economic Policy (1999), p. 84.

[4] Most analyses agree that the exchange rate policy has been crucially flawed. See, among others, Welfens (1999), Roubini and Wachtel (1998), Dornbusch (2001), Chapman and Mulino (2001). In this respect the Russian devaluation and banking crisis of August/September 1998 is very similar to the crises experienced in 1997 by several East-Asian countries casting doubt on the policy advise the countries received from western institutions.

profitable to borrow at relatively low foreign interest rates (foreign currency debt amounted to about 30% of bank's balance sheet total, Table 1), lend at high domestic interest rates and to enter into unhedged off-balance sheet currency forward contracts. Not considering off-balance sheet items, Table 1 shows that just prior to the crisis the open foreign currency position amounted to about 18 percent of the balance sheet total. This open position may have even been larger when those foreign assets are excluded that were reported to have been diverted funds from IMF loans.[5] The risky lending to the government (mostly T-bills) had increased to one third of the balance sheet total.

Table 1:
Russia: Consolidated balance sheet of commercial banks at the eve of the currency and banking crisis (at end June 1998)

Assets	bn Rubel	in percent	Liabilities	bn Rubel	in percent
Bank reserves	58.7	9.4	Demand deposits	136.7	21.9
Foreign assets	73.1	11.7	Time and savings deposits	97.8	15.7
Claims on general government	207.8	33.3	Deposits with temporarily suspended access	18.2	2.9
Claims on non-financial government enterprises	30.1	4.8	Foreign currency deposits and other foreign liabilities	183.0	29.3
Claims on private sector	249.3	39.9	Money market instruments	38.9	6.2
Claims on financial institutions	5.0	0.8	General government deposits	15.1	2.4
			Credit from monetary authorities	10.5	1.7
			Other items	-32.3	-5.2
			Capital accounts	156.2	25.0
Total	624.1	100.0	Total	624.1	100.0
Memorandum item: In percent of GDP:	24.0	-		-	-

Source: Central Bank of Russia (2001).

Nevertheless, some authors (e.g. Buchs, 1999) did not regard the flawed exchange rate policy to have been one root cause of the crisis but rather the dramatic decline in tax revenues between 1992 and 1997 (from above 16% to 9.3% of GDP) and the large fiscal deficits. Buchs argued that they were the primary cause for the very high real interest rates on loans and treasury bills especially since 1996 until the crisis making fiscal policy not only vulnerable but unsustainable and attracting

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[5] By definition IMF loans are supposed to increase the international reserves of the central bank and should not be passed on to commercial banks. Italian newspapers cited in October 1999 analyses performed by Russian judicial authorities which found that during the three months just prior to the currency crisis in 1998 a very substantial fraction of IMF loans (about several billion US-Dollars) had been diverted to Russian commercial banks.

relatively large speculative short-term capital inflows. Buchs also argued that the Russian crisis was a typical example of crisis contagion and that its timing was caused by the Asian currency crisis. The real interest rate level is of particular importance here, because empirical studies found it to be the only variable, which is a consistently highly statistically significant determinant of both banking crises and of the costs of banking crises (e.g. Barth et al., 2000, Demirgüc-Kunt and Detragiache, 2000). In contrast to Buchs it may, however, also be argued that with a different exchange rate policy, i.e. a flexible exchange rate, and assuming that market participants could not have speculated on IMF lending to support an overvalued exchange rate, real interest rates on loans may never have climbed to their high and long lasting levels and the government would have been forced earlier to consider its solvency. The reason for this view is that under a flexible exchange rate regime the deteriorating solvency of the government is likely to have caused upward pressure on the exchange rate and thus on inflation, which would have forced market participants and the government to reduce the risks involved. It may be *precisely* the prevention of these market forces in the first place through the promise of a relatively stable exchange rate backed by IMF lending to uphold an unsustainable exchange rate, which allowed the government to continue its borrowing policy and banks to increase their risk exposure. In other words, had the exchange rate policy been different, the increasing underlying risks may have become apparent and corrected much earlier without a sudden extremely large currency devaluation.[6] Figure 1 shows that in the beginning of 2003, i.e. three years after strong capital investment during 2000-2002 associated with a drastic reduction in capital flight, the real exchange rate was still about one quarter below its level before the crisis and real interest rates have been rather moderate on average during this time. At least ex-post this may corroborate the many voices that argued during 1996 and 1997 that the currency was overvalued and that real interest rates were at a dangerously high level, views which were discredited by the IMF as contributing to destabilizing the economy.

Figure 1

As a starting point to assess the immediate effects of the currency and banking crisis, Table 1a shows the (official) aggregate balance sheet of commercial banks at end 1998 in constant Rubles of June 1998 allowing to evaluate the impact on the real credit, real deposit holdings, and real own capital of banks by eliminating the distortionary effect of the surge of inflation that followed the crisis.

Table 1a:

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[6] This is also true with regard to the Asian currency crisis, see Dornbusch (2001). Roubini and Wachtel (1998) argued that IMF loans are often a signal of unsustainable current account imbalances. Therefore it is suprising that among the many indicators tested in the most prominent study on early warning signals of currency crises, IMF loans were not included in the list of potential candidates. See Kaminsky, M., Lizondo, and C. Reinhardt (1998).

Russia: Consolidated balance sheet of commercial banks after the currency crisis at end 1998 in constant Rubel of June 1998

Assets	bn constant Rubel	in Percent	Change to June 1998 a)	Liabilities	bn constant Rubel	in percent	Change to June 1998 a)
Bank reserves	38,2	7,3	-34,9	Demand deposits	84,3	16,0	-38,3
Foreign assets	123,9	23,5	69,5	Time and savings Deposits	52,6	10,0	-46,3
Claims on general government	146,4	27,8	-29,6	Deposits with Temporarily Suspended access	12,8	2,4	-29,9
Claims on non-financial govern-ment enterprises	18,7	3,5	-38,0	Foreign currency deposits and other foreign liabilities	222,3	42,2	21,5
Claims on private sector	195,2	37,1	-21,7	Money market instruments	24,4	4,6	-37,2
Claims on financial institutions	4,1	0,8	-17,9	General government deposits	11,7	2,2	-22,7
				Credit from monetary authorities	40,6	7,7	286,4
				Other items	-11,1	-2,1	-65,8
				Capital accounts	88,9	16,9	-43,1
Total	526,5	100,0	-15,6	Total	526,5	100,0	-15,6

a) Percentage change of the respective asset or liability in real terms during July and December 1998.
Source: Central Bank of Russia (2001); nominal figures were deflated using the respective increase in the CPI.

It thus becomes clear that the central bank initially bore the major burden of stabilizing the banking system since it increased its lending to commercial banks in the 6 months after June 1998 by three times in real terms. This, of course, meant that the success in reducing base money growth to an annualized 11% during January-August 1998 came to an abrupt end. (Growth of base money exploded to an annualized 72% during August-December 1998, and it grew by 54% during 1999 and 60% in 2000). CPI inflation exploded from an annualized 7.2% during the first 7 months of 1998 to an annualized 185% during August–December 1998, falling thereafter continuously to below 10% in early 2003.[7]

The rise of inflation and run on deposits caused drastic declines in real Rubel denominated deposits and in real own capital of banks, which are even understated with regard to most banks. The reason is that due to a lack of published disaggregated data, the balance sheets shown here include the relatively large Sberbank (Russia´s state savings bank), which was regarded as relatively save by depositors since it was the only bank whose deposits were insured by the

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[7] Despite the initial inflation surge measures of the real effective exchange rate increased only relatively moderately since 1999 because of nominal currency depreciation (figure1).

government, and thus there was a major shift in deposits from commercial banks to the Sberbank.[8] Table 1a shows also that foreign assets of banks increased by 70% in real terms, which appears surprisingly low and thus suggests the disappearance of a considerable amount of foreign assets if one considers that the real currency devaluation during this six month period amounted to 88% and if one assumes that some of the alleged large transfer of foreign assets just before the crisis to banks occurred.[9]

Table 1a also shows a credit crunch. However, many observers will argue that since lending to the private sector and other enterprises was relatively small -amounting to about 40% of banks' balance sheet total and less than 12% of GDP in 1998- the adverse impact of the credit crunch on the economy may have been muted. But this ratio -as other financial indicators- was rising before the crisis, and the crisis reversed this improving trend, so that a consideration of the growth impact should take into account the potential further improvement of these indicators in the absence of a crisis as is done in the simulations below.

About three years after the currency crisis (in mid 2001) banks had reduced further their risk exposure to the government and to foreign exchange rate changes.[10] The shares of deposits and own capital recovered somewhat and particularly real lending to the private sector rose again. However, for two main reasons this mid 2001 situation is mentioned: until about this time real lending to commercial banks by the central bank strongly accelerated (its level reached 600% in real terms compared to June 1998 and almost 10% of banks' balance sheet total) although banks were not forced into restructuring through a comprehensive banking restructuring program in exchange for this support. And, secondly, the open foreign currency position started to widen again after 2001. In early 2003 it had almost reached its pre-crisis level (Table 1c), indicating that since 2001 banks are repeating a fundamental mistake once again: This is inconsistent with an improved banking supervision.

Table 1c:

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[8] During August 1998 and May 1999 about 60 percent of Ruble deposits at commercial banks excluding the Sberbank were transferred to the Sberbank. The latter´s share in total Ruble denominated deposits increased from close to 80 percent before the crisis to nearly 90 percent in Summer 1999. While Ruble depositors incurred real losses mainly due to inflation, foreign currency depositors incurred losses due to the following reasons: when these deposits were transferred to the Sberbank, they were converted into Rubles using the exchange rate of September 1, 1998. When they were not transferred, in many instances the banks were not able to repay them. Several banks engaged in asset stripping. A popular method of this practice has been the establishment of new banks that took over assets but not liabilities. This, of course, demonstrates poor banking supervision, lacking property rights and weak law enforcement.

[9] The long process of "asset stripping" under the eye of supervisors is assessed in MFK Renaissance Capital (2000), pp. 6-9.

[10] The share of claims against the government in total assets decreased from one third to 23% and the open foreign currency position (neglecting off-balance sheet items) fell from 18% to 7% of the balance sheet total (for reasons of space the corresponding balance sheet is not shown).

Russia: Consolidated balance sheet of commercial banks at end February 2003 in constant Rubel of June 1998

Assets	bn constant Rubel	in Percent	Change to June 1998 a)	Liabilities	bn constant Rubel	in percent	Change to June 1998 a)
Bank reserves	123.0	12.8	109.5	Demand deposits	163.5	17.0	19.6
Foreign assets	143.7	15.0	96.6	Time and savings deposits	162.2	16.9	65.9
Claims on general government	178.4	18.6	-14.1	Deposits with temporarily suspended access	11.2	1.2	-38.5
Claims on non-financial government enterprises	30.3	3.2	0.7	Foreign currency deposits and other foreign liabilities	287.2	29.9	57.0
Claims on private sector	474.9	49.5	90.5	Money market instruments	94.8	9.9	143.8
Claims on financial institutions	9.0	0.9	80.1	General government deposits	19.8	2.1	30.9
				Credit from monetary authorities	52.5	5.5	400.0
				Other items	-43.7	-4.6	35.3
				Capital accounts	211.8	22.1	35.6
Total	959.3	100.0	53.7	Total	959.3	100.0	53.7

a) Percentage change of the respective asset or liability in real terms during July 1998 and February 2003.
Source: Central Bank of Russia (2003); nominal figures were deflated using the respective increase in the CPI.

Thus, despite the strong economic recovery since 1999, which resulted in improvements in real lending, deposit taking and in a recovery of own capital[11], the banking system is still highly vulnerable to a macroeconomic adverse shock. This was also confirmed by a "stress test" analysis performed by a joint World Bank and IMF study group (IMF, 2003). These tests show that a large adverse shock similar to the one experienced in 1998 but excluding the possibility of yet another government default, would have an impact on banks' balance sheets of about 3-5% of GDP. Since such an event is likely to be associated with a loss of confidence, deposit withdrawals and thus further pressure on the banking system, and considering that the ratio of stated own capital to GDP in early 2003 amounted to about 8% of GDP, the high vulnerability of the banking system becomes obvious.

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[11] Output recovered quickly and strongly, following the currency crisis. The recovery started already in October 1998 and real GDP growth reached 3.5% and 7.7% in 1999 and 2000, respectively. Since the crisis inflicted high costs on the economy, this is impressive. There are two main explanations for the recovery. The first is that the real currency depreciation "liberated" the economy from the brakes put on it by the previous long lasting overvaluation. The depreciation caused import substitution and growth of real non-energy exports. The second explanation is the strong rise of oil prices during 1999 and 2000 associated with a continuous moderate increase in oil production since October 1998 boosting energy export revenues. Econometric analysis below attempts to clarify the role of these factors during the recovery.

In the absence of any significant banking sector reform since the currency crisis, the danger is that the moderate recovery of the banking sector in the wake of the increase in real production covers up an underlying poor banking sector performance, which may impose high costs on Russia´s long term economic development. This is especially true if financial market development does not simply follow economic growth but "exerts a first-order influence" on it and is a good predictor of future growth (King and Levine, 1993, Levine, Loayza, and Beck, 2000).

3.   Evaluation of the bank restructuring approach of the authorities

a)   The Russian bank restructuring approach

Since at the outset of a banking crisis it is difficult to distinguish between insolvent banks and temporarily illiquid ones, the Central Bank of Russia (CBR) met its lender of last resort function by providing liquidity to most banks that faced liquidity problems so as to mitigate further adverse effects. Thus, since the crisis the CBR:
- allowed banks to draw on their reserve requirements to make payments,
- supported off-sets of liabilities between banks,
- provided „stabilization credits" to problem banks,
- guaranteed the deposits of the relatively large state owned Sberbank, and
- allowed depositors of other 32 banks to transfer their savings to Sberbank[12].
These measures were, however, associated with serious flaws because this process was neither transparent nor orderly.[13] Perhaps more crucially, the CBR (who has the responsibility for banking regulation and supervision) and the government failed to implement promptly both a transparent bank restructuring program and improvement and enforcement of prudential regulations for banks. The government failed to implement promptly an indispensable program to deal with bank debtors, i.e. restructuring of non-financial enterprises, and enforcement of liability for any overdue debt with property of the debtor.[14] This lack of action reinforced incentives for bank managements and their owners to "gamble for resurrection" of their banks. Even if the initial credit crunch is interpreted favorably as casting doubt on the hypothesis that banks increased lending to bad debtors, the delay in adopting a restructuring plan in connection with both leniency of the central bank regarding the violation of prudential rules and its generously granted "stabilization credits", most

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[12] See, for instance, Russian European Center for Economic Policy (1999).

[13] There was little control over the use of the funds provided, the criteria regarding the selection of banks that received support were not defined, and the transfer of deposits from commercial banks to the Sberbank has in many cases not been associated with a transfer of assets to Sberbank of equal market value. To some extent these problems may have been the result of political influences on the CBR. See, for instance, the very critical assessment by MFK Renaissance Capital (2000).

[14] Although the improved bankruptcy law, which came into effect in March 1998, caused a substantial increase in the number of bankruptcies, many enterprises, particularly large ones, large debtors to energy producers, and also the latter, continued to enjoy leniency.

of which were uncollateralized, has caused adverse incentives for bank managements and/or their owners. These incentives refer to take high risks, distribute "profits" despite solvency problems, prolong non-performing loans instead of restructuring them and/or writing them off, engage in asset stripping and lobbying for state support.

In mid-1999 the authorities began developing a bank restructuring strategy with three main elements:

- A restructuring of relatively large problem banks with the help of a special "Agency for Restructuring Credit Organizations" (ARCO), established in late 1998, and on the basis of a broadened legal basis. The latter was intended to improve substantially the rules governing supervision, restructuring and bankruptcy of banks and to define the duties and powers of both the central bank and ARCO regarding identifying, supervising, restructuring or liquidating problem banks (MFK Renaissance Capital (2000).[15] However, major flaws of this approach were that ARCO is allowed to work only with institutions, which are referred to it by the CBR and that if it decides to take over a bank it may do so only within its very limited financial means[16] and for a maximum period of four years. In addition, it may remove the bank's management only for a period of up to one month, which is one example of rules that are not consistent with the provision that ARCO is entitled to assume the rights of the general shareholder's meeting. As a result of these problems, most of the bankrupt banks were not liquidated. In fact, Table 2 shows that after the financial crisis the number of revoked licenses for credit institutions surprisingly did not increase but it decreased drastically every year. The number of institutions liquidated on the ground of violation of legislation increased after the crisis but many banks were not liquidated despite having lost their license, which resulted in the phenomenon of "phantom banks".

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[15] These rules imply that banks that fulfill certain criteria regarding their size and financial problems need to be referred to ARCO by the central bank. The central bank should disfranchise the respective bank's shareholders from the bank and may replace management by a temporary one. ARCO will then decide (within a 90-day period) whether to manage or liquidate the bank.

[16] ARCO was capitalized with 10 billion Ruble, about 0,25 percent of expected GDP in 1999. The amount needed to restore solvency of the largest 18 banks was estimated to amount to at least over 100 billion Ruble, about 2.1 percent of GDP at that time.

Table 2
Russia: Number of credit institutions and revoked licenses 1995-2002
(End of period)

	1995	1996	1997	1998	1999	2000	2001	2002
Number of credit institutions registered by CBR	n.a.	2589	2562	2481	2376	2124	2004	1826
Change	n.a.	n.a.	-27	-81	-105	-252	-120	-178
Revoked licenses	216	275	329	227	127	33	12	10
Credit institutions liquidated owing to revocation of license for violation of banking legislation	n.a.	n.a.	52	73	100	258	144	216

Source: IMF (2002), Central Bank of Russia, Bulletin of Banking Statistics, various issues.

- Continuation of the policy of a transfer of deposits from those problem banks that were not yet restructured by ARCO to the state-owned Sberbank. Since the outbreak of the banking crisis these transfers were, however, often not associated with adequate transfers of assets even in those cases where assets were available. The dominating Sberbank was planned to be submitted to international auditing and a government's business strategy. However, given the quasi-monopoly of Sberbank in household deposit taking and lending these goals were not sufficient to improve competition in the banking sector.
- Formal introduction of deposit insurance for all banks. A „Law on guarantee of bank deposits of citizens" was supposed to provide for deposit insurance with broad coverage and financed by relatively low contributions from banks and by a government guarantee. There was no mentioning, however, of insurance premiums being dependent on the riskiness of a bank's assets, which appears necessary to avoid giving wrong incentives to bank managers. However, until preparation of this paper in mid 2003 deposit insurance for commercial banks was not introduced. On the one hand this implies that a precondition for offering a level playing field for competition in banking is violated since deposits of the dominating state bank have a state guarantee and the bank is increasing further its dominance in deposit taking and in the market for loans to enterprises. On the other hand it may be argued that serious banking restructuring is a precondition for both credibility of deposit insurance and avoidance of setting new adverse incentives for bank managers so that deposit insurance should be postponed until bank restructuring finally is implemented.

On paper these rules indicated a breach with the laissez-faire approach and forbearance exercised by the Russian authorities and central bank during the first 10 months or so after the outbreak of the banking crisis but, in fact, a comprehensive banking restructuring program was never implemented. The CBR formulated a second banking reform program during 2001. This program aimed primarily at

improving supervision and better protection of creditor rights but in reality the actual "laissez-faire" or "benign neglect" approach of the authorities continued as is also indicated by Table 2, which shows that withdrawals of licenses during 2001 and 2002 declined to a negligible number and the large number of institutions that should have been liquidated already years ago declined only slowly.

b)   Successful banking restructuring programs

The empirical analysis of banking crises (e.g. Dziobek and Pazarbasioglu, 1997, Tang et al., 2000) identifies requirements for minimizing their economic costs, which are:

- comprehensiveness of a banking restructuring program, i.e. operational and systemic restructuring of the banking sector. Successful systemic restructuring of banks implies that both the stock of non-performing loans and the flow of new bad loans are reduced to very small proportions. Operational restructuring means improvement of the internal operations of banks, including their risk-management systems, and possibly replacement of managements and owners.
- prompt corrective action (i.e. implementing a restructuring program within a time period that does not exceed say 10 months following the crisis), and
- bank restructuring undertaken by the government and not the central bank (in order to avoid the risk that non-transparent central bank financial support to banks inflates the costs of restructuring that eventually fall on the budget and may risk high inflation).

The "laissez-faire" approach of Russian authorities to the banking crisis of 1998, augmented by generously granted credit to banks from the central bank, contradicted the lessons learned from international experiences with banking crises. Prompt action (within about 10 months after the crisis starts) with regard to the diagnosis of the nature and extent of systemic banking problems, identification of problem banks and the beginning of both their restructuring and the improvement of the accounting, regulatory and legal framework were identified as important factors determining success in restoring the conditions for a sound banking system and a sound macroeconomic performance (Dziobek and Pazarbasioglu, 1997). Several stylized restructuring approaches may be distinguished.[17] In practice, however, some overlapping of these approaches occurs:

a) establishing a lead agency, which takes over bad loans and possibly, provides new capital for banks (e.g. Spain 1979-85, USA 1989-95, Czech and Slovak Republics in 1992-93, Hungary in 1991-1994, Kyrgyz Republic since 1997, Russia since 1999),

b) capital injections directly from the central bank which assumes bad loans from commercial banks (e.g. Chile 1981-84),

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[17] See, for instance, Sundararajan and Balino (1991), Borish et al. (1995), Dziobek and Pazarbasioglu (1997).

c) replacement of bad loans in banks' balance sheets through long-term government bonds (e.g. Germany following WWII, Kazakstan since 1995[18]),

d) establishing an institutional framework without a lead agency to recover nonperforming loans, involving, for instance, loan committees that decide on reorganizations of insolvent non-financial enterprises and involving also capital injections from the government (e.g. Poland in 1993-94, Hungary in 1995-96),

e) the government takes over problem banks and tries to sell them after several years (e.g. Sweden in 1992-96) and

f) case by case decisions where government support is granted dependent on the case (e.g. Latvia 1995-96).

In the context of eastern Europe the approach taken by the Polish authorities, whose main ideas were also incorporated in the second major Hungarian bank restructuring process during 1995-96, is widely considered to have been comparatively successful.[19] The Polish authorities named their banking reform approach „Enterprise and Bank Restructuring Program", underlining the search for a comprehensive solution. The program aimed at privatizing the major public banks within specified time limits. It was based on a „Restructuring law" that forced banks and problem debtors to tackle their bad debt problems on their own through numerous permitted avenues (banks had to set up work-out units that agreed on loan restructuring, loan sales, loan write-offs, exercise of collateral, debt-equity swaps, improved governance and management of debtor enterprises, and court-led bankruptcy/liquidation procedures). The law prohibited banks from extending new credit to bad debtors unless there had been a restructuring agreement or liquidation or regained creditworthiness of the debtor. Otherwise the bank had to sell the loan in the open market. In addition, independent supervisory boards for banks were established, banks were audited by international auditing firms and long-term technical assistance contracts with reputable foreign banks were signed. Recapitalization occurred and was based on an initial audit of the banks and not linked to the collection of bad debt. This important feature caused strong incentives for banks to collect bad debt. Recapitalization was implemented mainly through a transfer of government bonds to the recipient bank (bonds with a 15 year maturity that were non-negotiable for 3 years and with delayed amortization so as to prevent a misuse of public funds). The solvency of public banks was restored within a period of about two years and the flow of bad loans was stopped. The estimated share of non-performing loans in total loans of commercial banks declined rapidly (from more than one third at end of 1992 to about 13 percent at end of 1996 and continuously further afterwards).

c)   Evaluation of the Russian approach

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[18] In Kazakstan much of banks bad debt was converted into long term government debt vis-à-vis the central bank.

[19] See, for instance, Dziobek and Pazarbasioglu (1997), Gray and Holle (1996, 1997), and Borish, Long and Noel (1995).

Using this background to evaluate the Russian approach, the latter lacks comprehensiveness and clarity in addition to the flaw that the central bank was at the forefront of bank restructuring:
- Although the Polish approach was initially, like the Russian one, limited to a certain number of banks, its requirements for new bank supervisory boards, explicitly listed avenues for a reduction of bad debt and enforcement of bad debt work out units in the banks through strong incentives both to collect bad debt and to improve the quality of bank managements are much less visible in the Russian approach;
- The role of foreign banks and international auditing firms is not addressed in the Russian program;
- The probability for survival of a bank in the Polish program was not dependent on either the funds provided by the government for recapitalization or the order in which banks were reviewed by supervisory authorities but this appears to have happened in the Russian program;
- The stock and flow of bad debt were effectively reduced in Poland despite institutional weaknesses, because of clarity and enforcement of the "bank restructuring law" with relatively rapid court conciliations, whereas ambiguities in the Russian program cause prolonged court suits that prevented fast bank restructuring.

Additional drawbacks of the Russian approach are the postponement of the introduction of the International Accounting Standards (IAS) to an indefinite time in future, which seriously impairs banking supervision and restructuring. But the latter should be a precondition for introduction of the planned deposit insurance, and as long as this scheme is not introduced, the dominant state-owned Sberbank enjoys an unfair competitive advantage. In fact, the postponement of a reform with regard to the monopoly-like Sberbank is an important hindrance to improving the healthiness of the banking system. Given that Sberbank administers about 90 percent of household ruble deposits, the bank appears to have nearly monopoly power vis-à-vis depositors and many firms and used it in the past, for instance, by paying an interest rate on deposits lower than the inflation rate. This means that Russia still does not have a ruble denominated relatively safe and liquid financial asset that yields at least a zero or slightly positive real interest rate. Without such an asset the financial system has little long-run credibility (Diaz-Alejandro, 1985) and the necessary promotion of domestic savings is impaired. Without a break-up of this monopoly-like bank the financial system may not develop as favorably as under competition. In addition, the banking restructuring approach does not address the problems of severely underdeveloped financial services in many regions, where they are sometimes even absent, and of relatively large regional differences in interest rates.

In sum, the overview revealed that the preconditions for successful banking restructuring were clearly not carved out in Russia. Thus, the financial crisis of

1998 was allowed to impact on economic growth unhindered, all other things held equal. For this unique case, where the authorities are not implementing any serious banking restructuring program in response to a major banking crisis, we attempt in the following section to simulate the growth costs. This is also the first time such an analysis is carried out for a transition country.

4 Empirical analysis

4.1 The impact of financial development on economic growth

In their empirical study of the relationship between financial market development and economic growth, King and Levine (1993) suggested four indicators to define financial development. Since their study used a large sample of some 80 developing and developed countries, their indicators were limited by data availability and thus they were relatively crude. Nevertheless, these indicators proved quite powerful in describing financial development and are readily available for transition countries including Russia. King and Levine's financial indicators are given in table 3 in columns one to four for different groups of countries. The table also includes two advanced transition countries (Hungary and Poland) and Russia for 1993 and 2002. For later use in simulations, maximum values of these financial indicators worldwide are shown in column 5. In addition, for the transition countries two indicators not used by King and Levine (1993) are shown, namely the ratio of total bonds outstanding to GDP and the ratio of stock market capitalization to GDP.

Table 3
Average levels of financial development of a large sample of developing and developed countries (excluding major oil exporters) during the period 1960-1989, and for Poland, Hungary and Russia in 1993 and 2002

	(1) Very slow grow-ing coun-tries 1)	(2) Slow grow-ing coun-tries 2)	(3) Fast grow-ing coun-tries 3)	(4) Very fast grow-ing coun-tries 4)	(5) Maximum average levels during 1960-1995 found for a group of 71 countries 5)	(6) Hungary 1993 2002	(7) Poland 1993 2002	(8) Average level of Hungary and Poland 2002	(9) Russia 1993 2002
Indicator 1: Financial depth (broad money /GDP)	0.22	0.29	0.38	0.60	143 (Malta)	0.46 0.47	0.31 0.45	0.46	0.13 0.22
Indicator 2: Importance of banks relative to central bank 6)	0.60	0.71	0.73	0.81	0.98 (Austria)	0.55 0.88	0.60 0.96	0.92	0.59 0.79
Indicator 3: Share of credit to nonfinancial private sector in total credit	0.51	0.61	0.56	0.70	n.a.	0.42 0.68	0.30 0.70	0.69	0.39 0.68
Indicator 4: Ratio of credit to nonfinancial private sector to GDP	0.13	0.20	0.27	0.35	141 (Switzerland)	0.28 0.34	0.12 0.25	0.30	0.07 0.15
Indicator 5: Ratio of total bonds outstan-ding to GDP 7)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a. 0.37	n.a. 0.26	0.32	n.a. 0.05
Indicator 6: Ratio of stock market capitalization to GDP	n.a.	n.a.	n.a.	n.a.	n.a.	0.02 0.19	0.00 0.15	0.17	0.00 0.37
Memorandum item: Long run per-capita real GDP growth rate 8)	4.5	2.6	1.4	-0.5	-	1.1	2.8	-	-2.7

1) Annual real GDP per capita growth rate < 0.5.

2) Annual real GDP per capita growth rate > 0.5 < 2.0.

3) Annual real GDP per capita growth rate > 2.0 and < 3.0.

4) Annual real GDP per capita growth rate > 3.0.

5) Levine, Loayza, and Beck (2000), Table 8, pp. 64-66

6) Ratio of deposit money bank domestic assets to deposit money bank domestic assets plus central bank domestic assets.

7) Bonds denominated in domestic currency.

8) for Hungary, Poland, and Russia: 1990-2002.

Note: Data for 2002 are preliminary. Arithmetic averages of this years end-of-period and last years end-of-period financial stocks are used to mitigate the problem of deflating financial stocks by GDP flow.
Sources: Central Bank of Russia (2003), EBRD (2002), International Monetary Fund, International Financial Statistics, King and Levine (1993), Levine, Loayza, and Beck (2000).

As can be seen, for the long period examined by King and Levine (1993), higher per capita growth is associated with higher levels of financial development. (The indicators tend to rise with higher economic growth). Their regressions do not only find statistically significant contemporaneous correlations between financial indicators and per capita growth, capital accumulation and a measure of total factor productivity growth, but also significant correlations between *initial* levels of financial development and subsequent economic growth, capital accumulation and TFP growth.[20] The latter finding supports the hypothesis that financial development can cause economic growth and be a predictor of long-run growth. In the cross-sectional study by Levine, Loayza, and Beck (2000) the causality between financial development and economic growth was explicitly analyzed.[21] It was found that economic growth is at least partly explained by the effect of the exogenous component of financial development and that this quantitative impact is relatively large as estimated in the following also for Russia.

Table 3 shows also that financial indicators of Hungary and Poland during 1993-2002 improved substantially to levels of fast or very fast growing countries. By contrast, Russia´s financial development indicators during this period were retarded (Table 4).[22]

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[20] In King and Levine (1993) the cross-country per capita growth regressions are based on a standard modern growth model that includes as independent variables alternatingly the first four financial indicators given in table 2 (significant at least at the 5% level) and that controls for initial income, initial secondary school enrollment rate, ratio of trade to GDP, ratio of government spending to GDP, and average inflation rate.

[21] Two econometric methods were used that address specifically the problems induced by endogeniety of the explanatory variables such as in growth regressions, and which enable one to extract the exogenous component of financial intermediary development: Dynamic GMM panel estimators, which the authors use with data for 74 countries averaged over seven 5-year intervals composing the period 1960-95, and, in addition, a purely cross-sectional estimator but with instrumental variables technique and using averaged data for 71 countries over the same period, i.e. one observation per country. Although these estimations do not reject the view that financial development is influenced by economic growth, they show that the latter is not the only cause for the significant positive correlation between the two.

[22] The levels of indicators 1 and 4 in 2002 were still at a level comparable to that of the group of very slow growing countries. And regarding indicators 2 and 3 a substantial improvement occurred only recently during 2001 and 2002.

Table 4
Russia: Evolution of financial market indicators 1993-2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Indicator 1 Financial depth (broad money/GDP)	0.13	0.13	0.13	0.15	0.17	0.17	0.16	0.18	0.21	0.22
Indicator 2 Importance of banks relative to central bank	0.59	0.61	0.65	0.67	0.70	0.63	0.58	0.67	0.74	0.79
Indicator 3 Share of credit to nonfinancial private sector in total credit	0.39	0.38	0.39	0.32	0.32	0.34	0.32	0.45	0.61	0.68
Indicator 4 Ratio of credit to nonfinancial private sector to GDP	0.07	0.07	0.07	0.07	0.08	0.10	0.09	0.09	0.13	0.15
Indicator 5 Ratio of total bonds outstanding (denominated in domestic currency) to GDP	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.03	0.05
Indicator 6 Ratio of stock market capitalization to GDP	0.0	0.1	4.6	9.7	29.5	16.5	41.7	15.3	25.7	37.4
Memorandum items:										
EBRD Index of banking sector reform	1.0	2.0	2.0	2.0	2.3	2.0	1.7	1.7	1.7	2.0
EBRD Index of reform of non-banking financial institutions	1.7	1.7	2.0	3.0	3.0	1.7	1.7	1.7	1.7	2.3

Note: Indicators 1-4: The annual figures are averages of four quarterly values. Indicators 5-6: end of period. The EBRD indices for policy reforms are based on a scale ranging from 1, which is the lowest grade, to 4+, representing the highest score. They are explained in detail in the annual transition reports by the EBRD.
Sources: EBRD (2002), International Monetary Fund, International Financial Statistics (2003), Russian Central Bank (2003).

Only Russia's stock market capitalization indicator developed better than those of Hungary and Poland, which was due to Russia's wealth in energy and raw materials in association with the rise in oil prices since 1999. Table 4 shows that the currency and banking crisis of 1998 had a substantial impact on Russia's financial indicators. Until 1998 most indicators had improved almost continuously.[23]

The crisis reversed this rising trend but since about 2000 the positive trend returned. The table also shows the annual evaluation of financial sector reforms by the EBRD, which corroborate the findings of the previous section, namely that the quality level of financial system supervision and regulation was relatively low even

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[23] The substantial decrease of indicator 3 in 1996 is due to banks' buying of short-term Russian government treasury bills, which crowded out lending to the private sector. This was one cause for the banking crisis due to the government's default on its debt. The decease of indicator 3 during two years prior to the crisis is thus highly interconnected with the crisis. This is a relevant aspect in the following simulations of developments that assume absence of the banking crisis. The reader may ask why indicator 4, which has the same numerator as indicator 3, did not decrease in 1996. The reason is that the denominator of indicator 4, nominal GDP, was strongly dampened due to the drastic reduction of inflation during 1996 and 1997 so that this ratio remained constant.

before the crisis and that it fell after the crisis to very low standards through several years until 2002.

4.2   Simulations of the impact of the 1998 banking crisis on economic growth

We perform two types of simulations to assess the impact of the banking crisis on economic growth. Firstly, growth regressions for Russia are estimated, which, following King and Levine (1993) and Levine, Loayza, and Beck (2000), include as explanatory variables the financial indicators. Secondly, these results are then briefly compared with those obtained using the estimated coefficients of the impact of the same financial indicators on per capita economic growth from the cross-country analysis by Levine, Loayza, and Beck (2000).

a)   Economic growth regressions for Russia

Growth regressions for Russia were estimated using quarterly data for the period 1995:1-2003:1. In order to base the regressions on a theoretical model, a natural starting point is the Mankiw, Romer, and Weil (1992) augmented Solow growth model. In this model per capita economic growth[24] (log ($GDPRPC_t/GDPRPC_{t-1}$)), is a function of the log of initial per capita income, the log of the investment to GDP ratio (I/GDP), the log of human capital (proxied by a school enrollment ratio, school), and the log of the sum of working age population growth (n), long run growth of the level of technology (g) and the depreciation rate of the capital stock (δ), where the latter two variables are assumed to be a constant. Since Mankiw, Romer, Weil (1992) performed a cross-section analysis with only one long run average observation per country, whereas this study is a one country time series analysis, the variable initial income must be replaced by a time series variable, which was the lagged level of real per capita GDP. Although this "base equation" performed relatively well,[25] it could be spurious since tests for unit root nonstationarity showed that the dependent variable per capita GDP growth is stationary whereas all other variables appear to have a unit root and thus are nonstationary, when basing this analysis on the entire period under consideration (1995-2003, Table 5). Differencing the explanatory variables until they became stationary and re-estimating the equation resulted in a drastic fall of the R^2 and insignificant regressors.

Table 5

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[24] To be precise, MRW used as the dependent variable the log difference with regard to the whole period examined of income per working age person but here we use simply the annual real per capita GDP growth rate.
[25] The adjusted R^2 was 0.3, the D.W. was 1.80, the coefficient of the lagged level of per capita GDP had the expected negative sign and was statistically significant at the 1% level, the investment ratio and the school enrollment ratio had the expected positive sign being significant at the 10% and the 1% level, respectively.

Tests for unit roots of variables used in regressions

Therefore, a more pragmatic approach following King and Levine (1993) and Levine, Loayza, and Beck (2000) was taken. This approach is not based on a particular theoretical growth model but uses as explanatory variables a set of those that have been found statistically significant in previous growth studies. These include initial per capita GDP and the initial level of educational attainment (such as school enrollment), variables that control for economic policies such as measures of government size, inflation, the black market exchange rate premium, and openness to international trade, and also variables that measure political stability and ethnic diversity. All of these are essentially control variables in estimating the coefficient of primary interest, which is that of each of the discussed financial development indicators, where one equation is estimated for each indicator. Of these variables government size (proxied by the log of the ratio of consolidated government expenditures to GDP), the CPI inflation rate, and openness to trade (proxied by the log of the sum of the ratios of exports and imports to GDP) were used as successive additional explanatory variables in the growth regression for Russia. In addition, variables were successively included that may have been important growth determinants during transition, namely the log of the share of industry in GDP as an indicator of structural difficulties, the ratio of the fiscal balance to GDP, the log of the real exchange rate, and the log of the US-Dollar oil price, all differenced until they became stationary. But these experiments could not improve the initial "base" equation, since most of the variables were statistically insignificant. In addition, both the Chow breakpoint and Chow forecast test strongly rejected the hypothesis of parameter constancy before and after the financial crisis in 1998. This underlines the complexity of the growth process in Russia during transition, and it suggests to treat the two periods before and after the crisis separately or to at least include in regressions that cover the whole transition period a dummy variable that represents the structural break in 1998.

Given the problems when using the per capita growth rate as the dependent variable, the logarithm of the level of real per capita GDP was used instead. In addition, since the goal of the exercise was to produce an ex-post forecast for real per capita GDP development as accurately as possible, the further estimations concentrated on the period after the structural break. According to table 5 almost all potential explanatory variables are stationary for this period since 1999.[26] As before, preliminary equations were estimated using as successively included explanatory variables all those that were considered in the per capita growth regressions. It was found that the investment ratio and the oil price were the only

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[26] Admittedly, the limited number of observations is a qualification for the reliability not only of these tests but for the entire simulation analysis. But the data constraint needs to be accepted and it suggests to repeat these regressions in future with more data.

variables whose estimated sign and high statistical significance was robust to the inclusion of other independent variables.[27] Therefore, this equation was used as the "base" regression for estimating the association between real per capita GDP and financial development. This "base" regression result is shown in Table 6, equation 1.

Table 6
Economic growth regression results

The equation had to be corrected for autocorrelation of the residuals of first order, indicating that the specification was not yet satisfactory, although the forecast quality was already very good as judged by the root mean squared error and Theil's inequality coefficient (see Table 6, last two columns) and by a visual evaluation of the fitted real GDP development. Following King and Levine (1993) and Levine et al. (2000), the equation was augmented with the four financial indicators, one at a time, and a composite indicator of these, which gives them equal weight.[28] This resulted in a considerable improvement of the overall quality of the estimated equation, including a substantially higher adjusted R^2, an improved D.W. statistic, higher significance of the explanatory variables of the base regression, and also each of the financial indicators had the expected positive sign and was highly statistically significant. However, before proceeding it is, of course, a question, whether these equations may suffer from potential endogeneity of the financial development indicators.

To answer this question, there are, firstly, the cross-section studies by King and Levine (1993) and Levine et al. (2000), who found that for their large country sample and long period examined, financial development is leading economic growth. They based this conclusion mainly on an examination of the relationship between initial values of financial development and subsequent economic growth and on dynamic panel estimates, which use the GMM estimators and instruments (to deal with the endogeneity of the explanatory variables), where they tested the validity of these instruments before using them. Secondly, a formal test for endogeneity of the financial development indicators in the regressions for Russia, the Hausman specification test, was carried out.[29] The null hypothesis, that there is no simultaneity, was rejected. However, with regard to the use of lagged financial indicators, the null hypothesis could not be rejected, because the relevant

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[27] Also, in this sensitivity analysis the estimated coefficient values of these variables appeared to be more robust than the coefficient values of the other regressors.

[28] To calculate the composite indicator, each of the four indicators was transformed into an index set to 1 for December 1994 and these four indices were multiplied by 0.25 and then added.

[29] To perform the test, first, a regression was run of the financial indicators on the two other explanatory variables. The residual of these estimated equations was then used in a regression of the log of real per capita GDP on estimated financial indicator values from the previous regression (or, according to Pindyck and Rubinfeld, 1990, p. 304, actual financial indicator values). The coefficient of the residual should be zero, asymptotically, under the null hypothesis that there is no simultaneity.

coefficient of the test was highly statistically insignificant This was true irrespective whether the lag was one or two or three quarters. Thus, lagged financial indicators were used to augment the base equation, and it was also found that this improved the overall quality of the estimated equations considerably further.

Table 6 shows the results, namely those equations for each financial indicator that yielded the best overall results, i.e. indicators 1 and 4 were lagged by one quarter and indicators 2, 3 and the composite indicator were lagged by two quarters. Endogeneity of these lagged indicators was rejected, all variables were stationary, all explanatory variables had the expected sign and were highly statistically significant and, moreover, these results were relatively robust to the inclusion of the other discussed potential explanatory variables. Hence, equation 6, which uses the composite financial indicator and has the best forecasting power, was used to perform the simulations.

Figure 2 shows the actual real per capita GDP development and the ex-post forecast based on equation 6.

Figure 2
Real GDP per capita 1995-2003: Actual and Fitted Values

As can be seen, for the period since 1999 the forecast is excellent but for the earlier period real per capita GDP is heavily underestimated confirming that the financial crisis in 1998 and the large real currency depreciation caused a significant structural change in the economic growth process and that simulations of the growth impact of financial development for the period since 1999 should be based on equations estimated for this period and not earlier.

b)   Simulations based on growth regressions for Russia

Three simulations of the impact of financial system development on economic growth were run: The first assumes that Russia's financial indicators continued their trend improvement before the financial crisis in 1998. As shown in figure 3, indicators 1 and 2 were steadily rising in the years 1996-1997. This trend is assumed to have continued as shown by the curves denoted simulation 1.

Figure 3
Actual and simulated evolution of financial indicators 1 and 2,1993-2002

Also indicator 4 was rising in 1997 (Figure 3a) and this increase is assumed to have continued during the years 1998-2002 shown by simulation 1.

Figure 3a
Actual and simulated evolution of financial indicators 3 and 4, 1993-2002

By contrast, indicator 3 decreased two years before the crisis. But this development reflected the enormous increase in lending by banks to the government relative to their lending to other sectors of the economy. Since the government defaulted on its debt in 1998, this decline can be interpreted as an early warning signal of the crisis in 1998. It was very closely associated with the crisis, which gives this financial indicator a different quality compared to the other three indicators. In principle, it could be argued that in a scenario that assumes absence of the financial crisis, this indicator would not have declined during 1996 but instead it may have maintained its previous level or perhaps even improved as the other indicators did. However, in order to prevent any impression that this simulation 1 is based on unrealistically optimistic assumptions regarding the hypothetical financial development in the absence of the crisis, a moderate steady improvement of this indicator 3 from its low level in 1997 is assumed for the period 1998-2002, which is even less strong than the actual improvement for the years 2001 and 2002.

In the second scenario, denoted simulation 2 in figures 3 and 3a, it is assumed that Russia's financial indicators would have risen linearly during 1998:2-2002:4 to reach the average level each indicator had in Hungary and Poland in the year 2002. It should be noted that this average level in Hungary and Poland is not very high by international comparison. As shown in Table 3 above, with regard to two of the four indicators, this level was considerably below the respective average level in the group of fast growing countries. Only with regard to indicator 2 the average in Hungary and Poland was higher than this benchmark level.

Finally, the third scenario is run as an illustrative sensitivity analysis. It makes the assumption that Russia's financial indicators rise from 1998:2-2002:4 to the highest levels found on average during 1960-1995 for a sample of 71 countries by Levine et al. (2000), which were shown in Table 3, column 5.[30] All scenarios use an index of the four indicators, which gives them equal weight. Figure 4 presents the results in log levels.

Figure 4
Actual and simulated evolution of financial indicators 1993-2002

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[30] Since the authors did not include indicator 3 in their study this scenario is built on indicators 1, 2 and 4 only.

In order not to allow the forecast error to influence the calculated impact of the simulations on the per capita growth rate, this impact is calculated by comparing simulated per capita GDP growth rates with forecasted growth rates using equation 6, Table 6.[31] However, as a memorandum item and as an additional sensitivity analysis, the differences between the simulated growth rates and actual growth rates are also shown in Table 7.

Table 7
Impact of simulations of financial market development on Russia's average annual per capita growth rate during 1998-2002 using equation 6, Table 6.

	Simulation 1: a)	Simulation 2: b)	Simulation 3: c) (Sensitivity analysis):
Difference between the simulated average annual real per capita GDP growth rate during 1998-2002 and the forecasted average growth rate (pure simulation impact)	0.010	0.069	0.517
Memorandum item (sensitivity analysis): Difference between the simulated average annual real per capita GDP growth rate during 1998-2002 and the actual average growth rate	0.037	0.097	0.545

a) Assuming Russia´s financial indicators had continued since 1998:2 their approximate trend improvement before the financial crisis in 1998.
b) Assuming Russia´s financial indicators had increased linearly during 1998:2 until 2002:4 to the respective average level achieved by Poland and Hungary in 2002.
c) It is hypothetically assumed that Russia's financial indicators 1, 2 and 4 would have increased linearly from 1998:2–2002:4 to the maximum levels found on average during 1960-1995 for a group of 71 countries by Levine, Loayza, and Beck (2000). These levels are shown in Table 3, column 5.
Source: Author's calculations.

As can be seen, the simulations predict a considerably higher per capita growth rate ex-post than was forecasted on the basis of actual financial development: According to simulation 1 the per capita growth rate would have been 1 percentage point higher on average during 1998-2002 in each of these five years, had the banking crisis not occurred and had financial development continued the trend improvement it showed before the crisis.[32] Simulation 2 predicts an even 6.9 percentage points higher average annual growth rate, and simulation 3, which is an admittedly unrealistic scenario chosen for illustrative purposes, predicts a theoretical 52 percentage points higher average annual growth rate. In sum, three main messages

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[31] In other words, only the impact on economic growth, which is solely due to changing the financial indicator values, is considered.
[32] If the average per capita growth rate obtained in simulation 1 is compared not with the forecasted one but with the actual growth rate, an even larger difference of 3,7 percentage points on average per year during 1998-2002 is obtained, see Table 7, column 1, second row.

result from the simulations: Firstly, only considering the adverse effects of the financial crisis of 1998 on financial development indicators, the loss of economic growth is estimated to have been considerable, namely at least at about 1 percentage point on average during the years 1998-2002, if simulation 1 is recognized as a "minimum" financial development that, in the absence of a financial crisis, would at least have been met. Of course, the estimated economic growth loss is larger in the first year, 1999, that followed the crisis than in later years. Secondly, Russia's government could have significantly promoted economic growth by implementing financial reforms that would have resulted in increases of the financial indicators. Thirdly, the simulations suggest that financial development has a substantial impact on economic growth in Russia and thus they are first time evidence for a singly country that corroborates the cross-section analyses by King and Levine (1993) and Levine et al. (2000).

c)   Results of simulations based on growth coefficients from the literature

For the second approach of estimating the growth impact of Russia's financial crisis, the average growth coefficients estimated by Levine et al. (2000) for a large country sample and long period were used, which are shown in column 1 of Table 8.[33]

Table 8
Impact of simulations of financial market development on Russia's average annual per capita growth rate during 1998-2002 using growth coefficients from the literature. 1)

Financial indicator	Per capita growth coefficient 2)	Simulation 1:	Simulation 2:	Simulation 3: (Sensitivity analysis):
Indicator 1	0.034	0.009	0.022	0.057
Indicator 2	0.113	0.020	0.024	0.030
Indicator 4	0.028	0.002	0.020	0.061
Impact on the average annual per capita growth rate during 1998-2002	-	0.010	0.022	0.049

1)The simulations are described in Table 7 and in the text above. Levine et al. (2000) did not include in their estimations indicator 3, which is therefore missing here. The impact on per capita growth is calculated by multiplying the growth coefficients with the annual difference between the log of the simulated and the log of the actual financial market indicator. Logs need to be used because the coefficients were estimated using logs of the financial indicators.
2) Largest growth coefficients estimated by Levine et al. (2000), Table 3, p. 46, in their regression "with full information set" for a sample of 71 countries and for the period 1960-1995.
Source: Author's calculations.

The same three simulations are run as before and the results are shown in columns 2-4: In simulation 1 (which assumes that the trend improvement of the financial

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[33] The coefficients were estimated by the authors only for indicators 1, 2 and 4.

indicators before the financial crisis of 1998 would have continued after the crisis), the average annual real GDP per capita growth rate during 1998-2002 would have been 1 percentage point higher than it actually was. Very surprisingly, this result is exactly the same as found in the previous section (i.e. using the regressions for Russia).

In simulation 2 (i.e. the catch up during 1998-2002 to the average Hungarian and Polish financial development level) the annual per capita growth rate would have been 2.2 percentage points higher. Although still sizable, this result is, however, 4 times smaller than the result above. And in simulation 3 (i.e. the illustrative scenario where Russia's financial development reaches by 2002 those highest average financial development levels, which were found for the period 1960-1995 for 71 countries) the growth rate difference would have been 4.9 percentage points each year, which is 10 times smaller than the estimated impact above. Thus, only for simulations that use relatively small deviations of hypothetical from actual financial development do these two approaches yield the same result. The larger the deviation of hypothetical financial development to actual one, the larger will also be the difference between the forecasted average annual growth rates in the approach that is based on regressions for Russia and in the approach that uses estimated average financial growth coefficients for a large set of countries. Or, in other words, the simulations based on growth coefficients from the literature yield a progressively lower impact of financial development on per capita growth when raising the assumed financial development indicators than the simulations based on regressions for Russia. However, this may not be an inconsistency: Since the growth coefficients from the literature are averages for a large country sample and long time period, it is possible that behind this average exists a large and unknown deviation between the largest and lowest coefficient for individual countries. The coefficients estimated above for Russia. may be comparable to the largest invisible coefficients. Other factors that may be important are that Russia's circumstances in the five years after the crisis may have been different than those average circumstances during the 35 year period used by Levine et al. (2000) and that the latter derived their result by using a large set of statistically significant explanatory variables, most of whom were either not significant or not available in the Russian case.

In sum, the analysis shows that irrespective of the estimation approach, simulation 1 yields the same considerable economic growth impact of 1 percentage point each year, and in simulation 2 the minimum estimated growth impact amounts to about 2.2 percentage points each year. This corroborates the hypothesis for financial development in Russia to have a considerable effect on economic growth and, thus, all reforms that raise the financial development indicators can also promote economic growth.

5   Policy Options

a)   Weaknesses of western prudential regulation

Even without the banking crisis in 1998, Russia's financial system has been unstable and not been able to fulfill its functions. Improvements of the regulation of the financial system prior and since the crisis have been insufficient. The important point is, however, that even had there been a fully enforced prudential regulation of Russia's financial system according to western standards, the crisis may not have been averted:

Western prudential regulation centers around the capital adequacy rule according to the BIS (1988, 1996, 2003) definition (updated Cook ratio). This rule determines that the ratio of own capital of a bank to its risk-weighted on and off-balance sheet assets needs to be no less than 8 percent, where own capital is defined as equity and retained earnings (core capital or tier I capital) plus certain financial instruments bearing characteristics that make them similar to equity (subordinated debt or tier II capital and also, since 1998, tier III capital). Although the capital adequacy rules are regularly revised in an attempt to consider the changing spectrum of risks and risk mitigating techniques in banking, there are currently still considerable drawbacks of the updated Cooke ratio. Some of them are addressed in the recent proposals for a new capital adequacy framework "Basel II" (BIS 1999, 2003). However, it may take considerable time until compromise on this proposal is reached and it also has substantial drawbacks (some of them are described in Adamson et al., 1999).

The problems begin with the definition of own capital, which is even not intended to be changed. The recognition of (even short-term) subordinated debt (up to certain limits) as own capital may not contribute to promote stability of the banking system: In case of, for instance, successive adverse shocks to a bank the latter's capital costs are likely to increase. Especially in transition and other emerging market economies this increase could be very substantial even to the point that it would not be possible to raise additional capital.

With regard to consideration of market risks in the required capital ratio, portfolio diversification of a bank and the interest rate risk are considered with regard to the trading book of a bank (financial assets intentionally held for short-term purposes) and not with regard to the banking book[34]. In addition, although there have been improvements regarding consideration of risk-increasing and risk-mitigating effects of off-balance sheet transactions, the mitigating effects are considered only rudimentarily. Several approaches for improvement are suggested in the BIS (1999, 2003) reform proposals which, owing to their complex nature, are likely to require considerable time until a compromise is implemented.[35]

Regarding credit risk it is also widely acknowledged that the current risk weighting of assets is too crude to be a satisfactory measure. Currently, the main determinants of risk weighting are the distinction between OECD and non-OECD countries on the one hand, and between governments, banks, and other entities, on the other. For

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[34] The recent 1999 and 2003 BIS proposal suggests to consider explicitly interest rate risks in the banking book for those banks where these risks are significantly above average.

[35] Currently, it is envisaged that new rules are introduced by the end of 2006.

instance, claims with maturity of up to one year on banks incorporated in non-OECD countries, such as Russia, carry a risk weight of only 20 percent, (i.e. a capital charge of only 1,6 percent of such loans is levied). Non-OECD central governments are assigned a risk weight of zero percent (if the claim is denominated and funded in the respective national currency) or 100 percent (all other cases). Claims on banks from non-OECD countries with a maturity of over one year are assigned a risk weight of 100 percent (equivalent to a capital charge of 8 percent).

Given the arbitrariness of these assignments it is proposed to replace the current risk weighting with credit ratings (BIS 1999, 2003). The fundamental merit of this could be to make capital charges more sensitive to actual credit risk. However, it leaves in place a system of arbitrary asset allocation and capital charges: The proposed jumps in risk weights from one rating level to a higher or lower level are considerable. In addition, crucial still unanswered questions, which are very relevant for countries like Russia, concern the effects of a sudden downgrading of ratings during a crisis, the quality of the assessments of rating agencies, the selection of eligible agencies, and to what extent the behavior of these agencies is affected (and potential new conflicts of interest are created) should such a system come into effect. Another problem of the proposal appears to be that unrated banks, corporates and sovereigns receive a much lower risk weight than entities with a poor rating. This could provide incentives not to receive a rating.

b)   Could the banking crisis of August 1998 have been prevented had western prudential regulation for banks been enforced?

Given the apprehensions about some aspects of the proposed reform of the capital adequacy framework and given the uncertainty regarding its implementation, it may not be warranted currently to rely on it as the new western model of prudential regulation. Using then the current capital adequacy framework it appears that several of its weaknesses, in particular a weak definition of capital, unsatisfactory consideration of portfolio diversification, interest rate risk and credit risk in the banking book, and unsatisfactory consideration of liquidity and operational risks, are more pronounced during transition. This is because of the mentioned legal and institutional imperfections, the higher volatility of macroeconomic variables and the solvency problem of the government.

For instance, under this current framework and assuming that national supervisors do not impose further restrictions, banks would not need to back up credit to the Russian government denominated and funded in Rubel with own capital. Hence, under this regulation the default of the Russian government on a substantial part of its debt (as occurred in August/September 1998) consumes own capital of banks holding such debt. However, this own capital is needed as a buffer for other risks.

Secondly, although western prudential regulation would have limited banks' open foreign exchange positions, thus limiting banks' direct losses from the large currency depreciation shock, it may not have provided sufficient protection against the decline of the quality of the loan portfolio of the banking sector that is likely to be associated with a large currency devaluation, i.e. against the rise of the aggregate

share of non-performing loans: Under a large currency devaluation this decline may be substantial if the institutional infrastructure does not facilitate structural change on the enterprise level. It takes time for the economy to adjust to a devaluation and to benefit from it, so that initially adverse effects on production dominate. In addition, even those sectors of the economy that may instantaneously benefit from the devaluation are unlikely in an unstable situation to increase their deposits at banks. Rather they may join other economic agents in attempting to shift deposits out of banks to assets considered to be save. Thus, the adverse effect on banks' aggregate balance sheet and profitability caused by those sectors of the economy that are initially hurt by the devaluation (and that face liquidity problems, become a higher risk and require more intense monitoring) is likely to dominate potential favorable effects on banks' balance sheets and profitability caused by sectors that benefit from the devaluation. As a result, initially after a large devaluation, increased losses on loans and deposit withdrawals are likely. If, under the assumption of enforced western prudential regulation, banks react to this with increased credit rationing, the credit crunch would intensify and production would even be more adversely affected. In sum, even under western prudential regulation and even under the new proposed Basel II capital adequacy framework, stability of the financial system in a situation of large currency depreciation can prove to be difficult to be maintained.

c)   Adaptation of some western prudential rules

Concerning capital adequacy, several authors argued that capital-asset ratios in transition countries should be higher than in industrial countries (e.g. Goldstein, 1997). Others argued that it would be unrealistic to recommend a more demanding standard (e.g. Steinherr, 1994 and 1997) and that the additional costs of such higher capital requirement would put banks in transition countries at a disadvantage; it could dampen lending and restrict entry into banking.
There are reservations to the view that transition countries should not put themselves at a disadvantage to industrial countries by adopting stricter capital regulations. On the one hand and considering the short run, it may occur that higher capital requirements have a dampening effect on bank lending. With regard to industrial countries there is, however, little empirical evidence for this assumption (Jackson, 1999). On the other hand, and adopting a medium and long-term view, capital requirements contribute to financial stability and thus their effect on economic growth may be positive. Given the often still very low money demand regarding bank deposits in transition countries, particularly in Russia, deposit growth and thus more lending, not less, due to improved stability of banks may occur. The quality of lending could also be improved if excessive risk taking would be dampened through capital requirements. Given, however, that in Russia particularly capital adequacy is likely to continue to be difficult to enforce[36], if only

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[36] The current minimum capital requirement amounts to 8 to 9 percent, depending on the size of the bank.

due to the asset valuation problem in the absence of IAS, reserve requirements need to remain relatively high and unremunerated, so as to indirectly enforce capital adequacy through relatively high cost of deposits.

Unremuneration of reserve requirements appears also warranted as an insurance premium for implicit or explicit guarantees the central bank should extend (Steinherr and Gilibert, 1994). These guarantees should include the lender of last resort function, provision of liquidity, and provision of deposit insurance (capped and partial, and perhaps existing only as long as it takes to establish a private insurance with regulatory oversight).

Regarding the risk weights in the capital asset ratio, the default of the Russian government on a part of its debt made clear that the weight for government debt (even if denominated and funded in domestic currency) cannot remain low. Arguments that this weight may be lower than 100 percent for Russian government debt appear difficult to justify. Analogously, the risk weight for bank debt would have to be raised. A weight less than 100 percent appears warranted only for such bank debt that is short-term and incurred by a bank who's creditworthiness is proven, for instance, by quarterly publication of financial statements that meet western standards. A large increase in these weights would, of course, only increase pressure on banks to raise their own capital ratio.

Regarding the limitation of interest rate risk, the current BIS rules should be adapted so that capital requirements apply to all maturity weighted asset-liability imbalances. The BIS (1999, 2003) proposal to levy an interest rate risk capital charge only for banks where interest rate risk is significantly above average, appears not to be adequate for Russia, since interest rate volatility is large and management capacity scarce (Steinherr and Gilibert, 1994).

Also risk diversification rules need to be adjusted so that not only the risk increasing effects of on-balance and off-balance sheet transactions on the exposure of a bank to individual borrowers, group of borrowers, and sectors of the economy are considered and limited with regard to the own capital of the bank but also, to the extent possible, the risk diminishing effects of off-balance sheet transactions.

Explicit consideration of other risks in prudential regulation (such as operational, reputational, and legal risks) would, on the one hand, demonstrate how the legal, institutional and other imperfections burden financial intermediation while, on the other hand, it would provide a buffer for banks against these risks. Given their difficult quantification, supervisory authorities need to make a qualitative judgement in assessing them.

As to equity investments of banks in non-financial enterprises the difficulty to find qualified participants willing to exert effective corporate governance may argue for a liberal regulation enabling banks to hold substantial investments. For instance, such investments could be limited to 20 percent of the non-financial enterprise's own capital with an even larger share permitted if the holding is transitory.[37] When allowing banks to hold substantial investments in non-financial enterprises,

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[37] If a bank claims the holding to be transitory, the latter would have to be sold within a certain period.

governance of bank managements becomes an even more crucial issue than it already is. Steinherr and Gilibert (1994) proposed to reserve seats on a bank's supervisory board to the government, the central bank, a foreign auditing firm having no relationship with the bank, and to provide incentives to pension and investment funds to invest in banks and to acquire a board seat. In addition, they proposed that the government could retain a minority share in banks. The main disadvantages of this proposal are potential conflicts of interest on the part of the government and central bank. Solvency problems of the government may increase such conflicts so that particularly regarding Russia it may be preferable not to involve the government. Whether the proposal could make it more difficult to attract foreigners to invest in Russian banks -which appears to be a sine qua non for improving Russia's banking system- is not obvious, since foreign investors may not necessarily consider the presence of the government and central bank as a hindrance. Assuming that the participation of the government is dropped from the proposal its main advantage appears to be an almost certain increase in quality of the supervision of bank managements.

In sum, Russia should adapt the current western capital adequacy framework so as to narrow the definition of own capital of banks and improve the consideration of credit risk, interest rate risk, portfolio diversification, and liquidity and operational risks. On the other hand, relatively liberal rules regarding equity investments of banks could apply while at the same time improving banks' governance for instance through rules concerning the supervisory board of a bank.

d)   Adoption of a bank restructuring approach that is comprehensive

But another major concern is that the Russian banking reform process so far was not comprehensive as in the described relatively successful Polish and Hungarian banking reform programs: Enforcement of an improved "bank restructuring law", where ambiguities are avoided and relatively rapid court conciliations promoted could contribute to an effective reduction of the stock and flow of bad debt. The probability for survival of a bank should not be dependent on either the funds provided by the government for recapitalization or the order in which banks are reviewed by supervisory authorities. Giving foreign banks and international auditing firms an explicit role in the restructuring process would also contribute to efficient restructuring. It should also be considered that not the central bank but the government should be at the forefront of bank restructuring. The postponement of the introduction of the IAS to an indefinite time in future is another serious problem. And finally, the postponement of a reform with regard to the monopoly-like state-owned Sberbank is an important hindrance to improving the healthiness of the banking system. Given Sberbank's size and regional importance, its liquidation and even its break-up may appear unreasonable An alternative could be to try to use it as an institution promoting savings and, in particular, rural financial market development with initial subsidies and guidance from international organizations (World Bank, EBRD). For instance, an empirical study by the World Bank analyzed

a policy change in a government program of providing rural financial services in Indonesia in the mid 1990s. It was found that with an initial subsidy and a major policy change in this program from disbursing credit to innovative incentives for loan recovery, and to mobilizing savings, broadening the clientele, maintaining a sufficient interest-rate spread to cover the high costs of servicing small loans and deposits, the program increased lending and deposit taking and became profitable (Yaron et al., 1998). This could mean that an initial investment by international institutions into Sberbank and following such lines of reforming the bank could not only improve Sberbank's function but also possibly counteract Russia's substantial regional financial development problem, where often financial intermediation has simply not developed (see, for instance, OECD, 1997).

6   Concluding remarks

Russia's banking crisis showed that assessments of the progress made in banking supervision, in improving the legal and regulatory framework and in its enforcement had been overly optimistic. Together with the crisis banking sector reform and supervision even deteriorated and for several years the sector was left largely on its own with supervisory authorities not even able or willing to close institutions whose license was revoked. Given these deficiencies and the large empirical literature on banking crises that argues that not implementing structural reforms in the banking sector after a crisis is very likely to increase the economic damage caused by the crisis, one may expect that Russia's banking crisis and the response of the authorities to it had a pronounced impact on economic growth. The evidence found in this paper supports this view that indeed the banking crisis and the response by the authorities were dampening economic growth substantially despite the good growth performance soon after the crisis. Depending on the simulation, the impact during 1998-2002 on the average annual per capita growth rate is estimated to have been at least 1 percentage point and, depending on the simulation, possibly even up to 7 percentage points. The latter estimate assumes that in the absence of the crisis, Russia's financial development would have been relatively strong to reach the average development level in Hungary and Poland. These estimates corroborate the findings of recent cross-sectional empirical studies on the impact of financial system evolution on economic growth. The fact that such a sizable impact of financial development on per capita growth is estimated for Russia, whose financial sector development is still very considerably lagging behind other advanced transition countries, does not only call into question the hypotheses for the financial sector in Russia to be of little importance for macroeconomic stability and development but it is also the first evidence presented for one single transition country with regard to the contribution of financial system development to economic growth. Thus, this finding corroborates strongly those studies that argued for the importance of financial system development in promoting growth in transition countries.

Further it was argued that Russia's banking restructuring program has important drawbacks when compared with relatively successful bank restructuring programs

in transition countries, in particular it is much less comprehensive. This refers to its systematic improvement of the legal and regulatory framework, including, of course, enforcement of this framework. Important examples of room for such improvements are to provide incentives for otherwise passive creditors to take action against bad debtors, owners and managements of banks (to collect bad debt), to improve recapitalization without setting wrong incentives, to improve internal operations of banks, to enhance the role given to foreign participants, and to improve regional financial development. And it was argued that several standard western prudential rules need to be adjusted for a transition country like Russia: The definition of own capital of banks should be narrowed, several risk weights in the capital-asset ratio should be increased (in particular those for Russian government debt) and consideration of several other risks should be improved (such as interest rate risk, liquidity risk, and operational risk). Further it was argued that restrictions of equity investments of banks in non-financial enterprises could be sufficiently liberal so as to enable banks to assume an important role in corporate governance, which, however, makes improvements of the governance of banks even more important. The latter may be likely to be improved through an additional regulation concerning the supervisory board of banks.

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Table 5
Tests for unit roots of variables used in regressions for the period 1999:1-2003:2

Variable	Description	ADF (Levels)	ADF (First differences)
log (GDPRPC)	Log of real GDP per capita	-5.88*** (2)	-7.63*** (1)
log (GDPRPC$_t$/GDPRPC$_{t-1}$)	Growth rate of real GDP per capita	-3.93** (2)	-5.48*** (2)
log (I/GDP)	Log of the ratio of total investment to GDP	-3.75** (2)	-12.03*** (2)
log (school)	Log of the secondary school enrollment ratio	-2.33 (1)	-3.55* (3)
log (n+g+δ)	Log of population growth (n) plus a constant of 0.05 (g+δ)	-4.62*** (3)	-5.24*** (3)
FB/GDP	Ratio of the fiscal balance to GDP	-3.26 (0)	-5.66*** (0)
log (rexr)	Log of the real exchange rate	-1.61 (1)	-10.91*** (1)
log (Oilp)	Log of the export price for crude oil in US-Dollar	-3.71** (1)	-3.22** (1)
CPI growth rate	CPI inflation	-4.15** (2)	-3.55** (2)
log (XM/GDP)	Log of the ratio of exports plus imports to GDP (openness)	-3.74** (3)	-5.24*** (2)
log (GX/GDP)	Log of the ratio of government expenditures to GDP	-2.61 (3)	-4.01*** (3)
log (Ind/GDP)	Log of the share of industry in GDP	-3.94** (1)	-4.35** (1)
Financial indicator 1	Ratio of broad money to GDP	-3.87** (1)	-8.68*** (1)
Financial indicator 2	Ratio of domestic assets of commercial banks to the sum of domestic assets of banks and of the central bank	-3.80** (5)	-7.69*** (3)
Financial indicator 3	Share of credit to nonfinancial private sector in total credit	-3.87** (4)	-4.04*** (4)
Financial indicator 4	Ratio of credit to nonfinancial private sector to GDP	-4.33** (5)	-4.96*** (1)
Composite index of financial indicators 1-4	Index of indicators 1-4 , each equally weighted	-3.74** (3)	-4.05*** (1)

Note: T-statistics in parentheses. Using MacKinnon critical values. * indicates statistical significance at the 10 percent level; ** indicates significance at the 5% percent level; *** indicates significance at the 1% percent level.
An intercept and time trend are included in the test equations for levels and an intercept is included in the test equations for first differences. The lag length is shown in parantheses behind estimated t-statistic. Choice of the lag length for the test is based on Akaike Info criterion.
Source: Author's calculations.

Table 6
Real GDP and financial development regression results. Dependent variable: Log of real GDP per capita, log (GDPRPC).

| Equation	Period	Constant	log (I/GDP)	log (Oilp)	Financial Indicator 1 $_{t-1}$	Financial Indicator 2 $_{t-2}$	Financial Indicator 3 $_{t-2}$	Financial Indicator 4 $_{t-1}$	Composite index of financial indicators 1- 4 $_{t-2}$	adj. R^2	observ.	Correction for auto-correlation of the residuals	S.E. of regression	D.W.	Ex-post forecast: RMS (root mean squared error)	Theil's inequality coefficient
(1)	1999:1 2003:1	-5.2409 (-20.989)***	0.1409 (2.316)**	0.4014 (2.844)**						0.773	17	yes	0.0706	1.51	0.0907	0.0147
(2)	1999:1 2003:1	-4.6599 (-14.109)***	0.2128 (3.183)***	0.2892 (5.331)***	2.837 (4.470)***					0.841	17	no	0.0591	1.66	0.0517	0.0083
(3)	1999:1 2003:1	-4.7706 (-13.976)***	0.1529 (2.262)**	0.2874 (5.176)***		0.802 (4.317)***				0.834	17	no	0.0604	1.65	0.0528	0.0085
(4)	1999:1 2003:1	-4.3962 (-15.047)***	0.1530 (2.598)**	0.2271 (5.564)***			0.506 (5.355)***			0.874	17	no	0.0526	1.87	0.0459	0.0074
(5)	1999:1 2003:1	-4.4708 (-15.455)***	0.2134 (3.622)***	0.2980 (6.289)***				2.710 (5.420)***		0.876	17	no	0.0521	2.01	0.0456	0.0073
(6)	1999:1 2003:1	-4.7268 (-19.400)***	0.1243 (2.534)**	0.2926 (7.397)***					0.3336 (6.929)***	0.914	17	no	0.0436	1.80	0.0380	0.0006

Note: Simple OLS method is used on the assumption that the explanatory variables are exogenous. A Hausman test rejected the null hypothesis for endogeneity of the lagged financial indicator variables.
T-statistics in parentheses. * indicates statistical significance of the respective variable at the 10 percent level; ** indicates significance at the 5% percent level;
*** indicates significance at the 1% percent level.
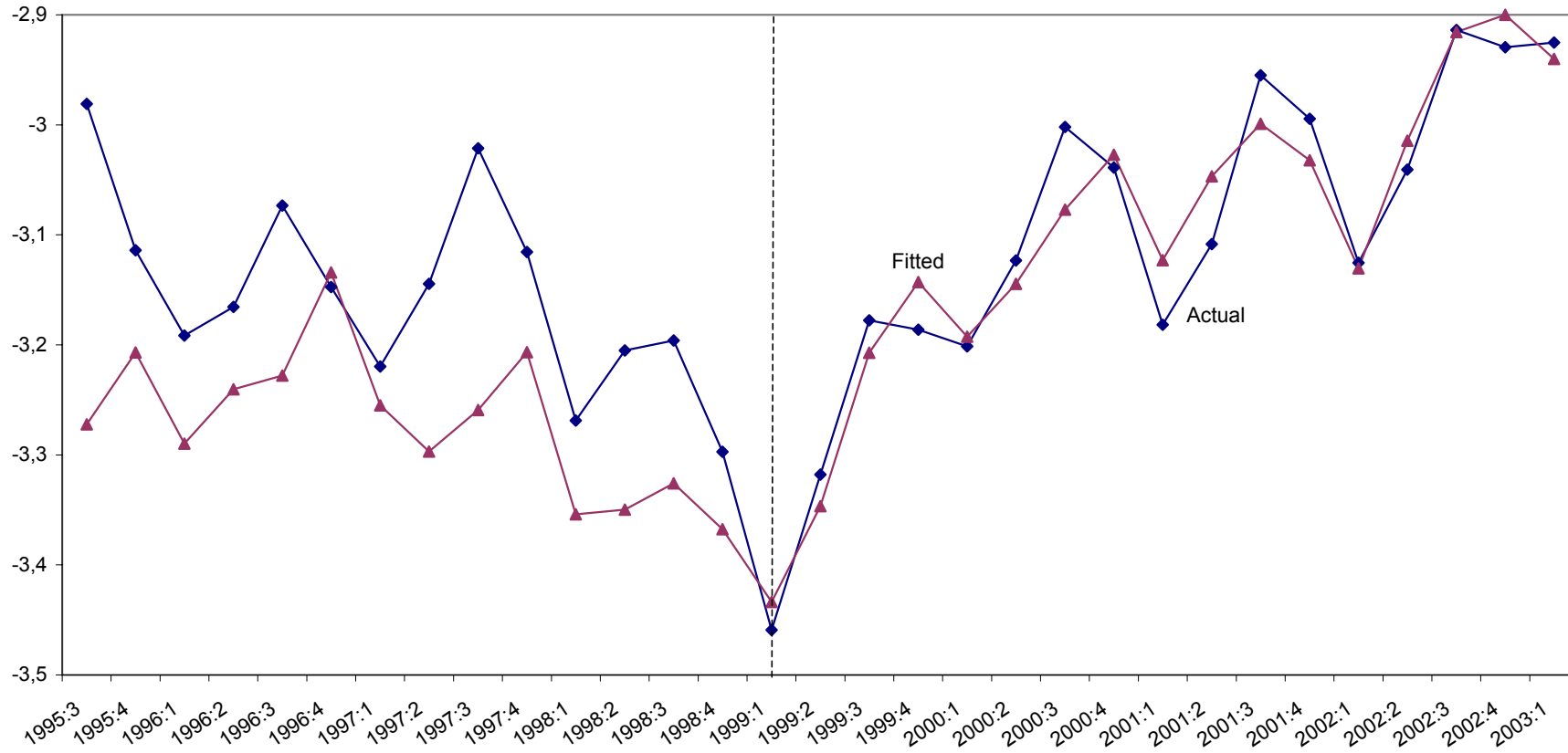Source: Author's calculations.

Figure 1
Russia: Real effective exchange rate and real interest rate measure 1994-2003

Real effective exchange rate

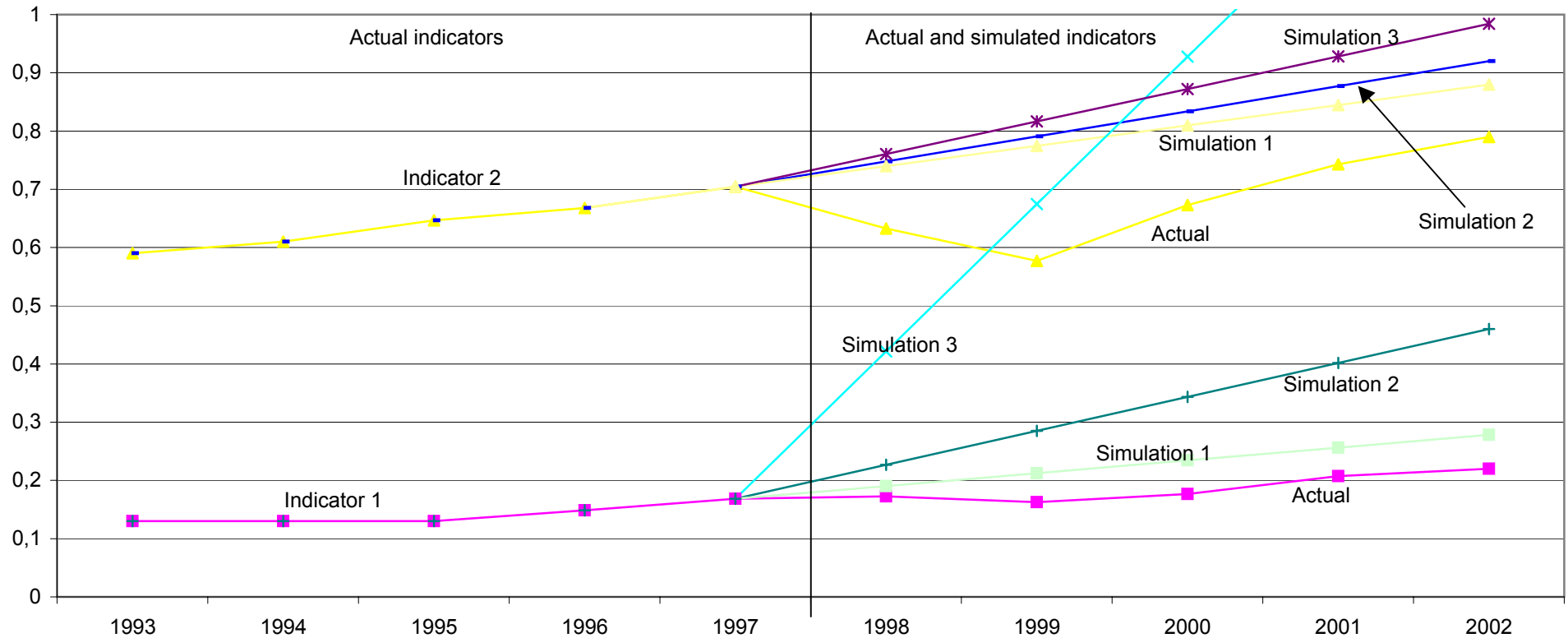Annualized real interest rate on loans
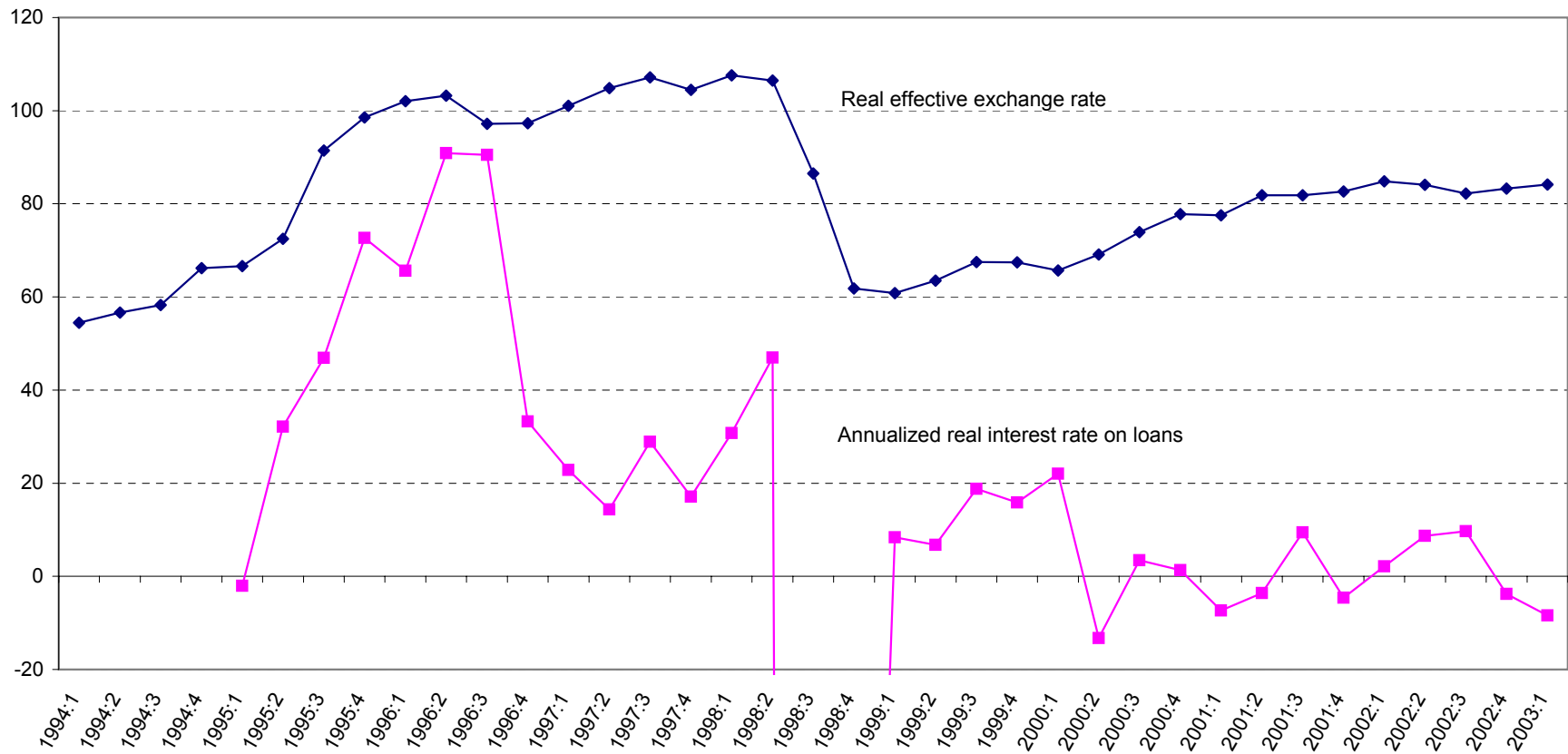
Figure 2
Real GDP per capita: Actual and Fitted Values 1995-2003
(in logs)

Fitted

Actual

Source: Author's calculations.

Figure 3
Russia: Actual and simulated evolution of financial indicators 1 and 2, 1993-2002
(ratios in percent as explained in Table 4)

Note: Simulation 1: Approximate continuation of improvements before the crisis in 1998. Simulation 2: Financial indicators increase linearly during 1998-
    2002 to the average level of each indicator reached in Hungary and Poland in 2002. Simulation 3: Indicators increase linearly during 1998:2-2002:4 to
    highest average levels found for a sample of 71 countries during 1960-95.
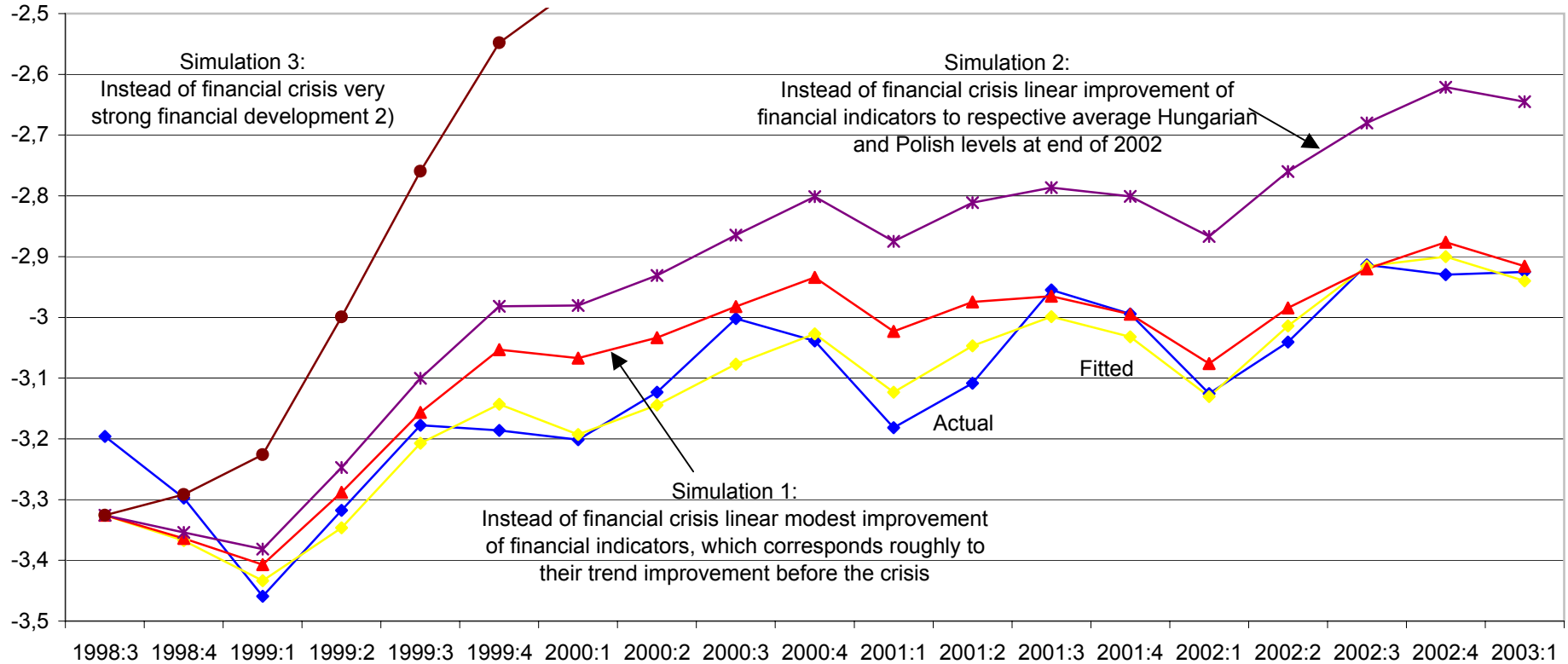Source: Central Bank of Russia and author's calculations.

Figure 3a
Russia: Actual and simulated evolution of financial indicators 3 and 4, 1993-2002
(ratios in percent as explained in Table 4)
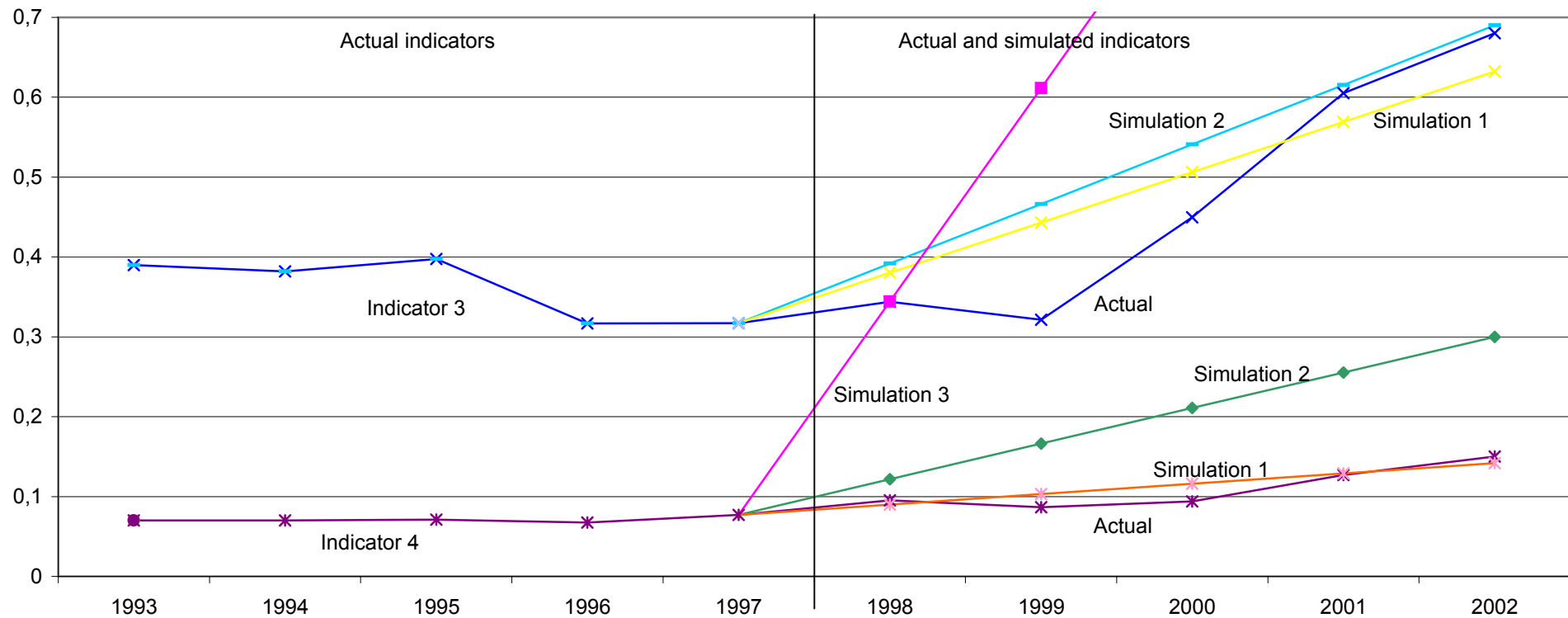
Note: Simulation 1: Approximate continuation of improvements before the crisis in 1998, except indicator 3 as explained in the text. Simulation 2: Financial indicators increase linearly during 1998:2-2002:4 to the average level of each indicator reached in Hungary and Poland in 2002. Simulation 3: Indicators increase linearly during 1998:2-2002:4 to highest average levels during 1960-95 found for a sample of 71 countries.
Source: Central Bank of Russia and author's calculations.

Figure 4
Evolution of real GDP per capita: Actual, fitted, and simulated 1998-2003 1)
(in logs)

Simulation 3:
Instead of financial crisis very strong financial development 2)

Simulation 2:
Instead of financial crisis linear improvement of financial indicators to respective average Hungarian and Polish levels at end of 2002

Simulation 1:
Instead of financial crisis linear modest improvement of financial indicators, which corresponds roughly to their trend improvement before the crisis

Fitted

Actual

1) Assumptions underlying the simulations are shown in Figures 3 and 3a.
2) During 1998:2 - 2002:4 financial indicators 1, 2 and 4 would have increased linearly to reach the highest average levels of these indicators
    found for a group of 71 countries during 1960-1995 by Levine, Loayza, and Beck (2000). Indicator 3 was not considered in this study.
Source: Author's calculations.