TITLE: **FORECASTING IN RUSSIA'S BANKING SECTOR**
and
MODELING INTEREST RATES EXPECTATIONS OF BANK MANAGERS IN RUSSIA

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NCEEER NOTE

This Report contains two brief economics papers on interest forecasting by Russian banks, and a technical paper on the modelling thereof.

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FORECASTING IN RUSSIA'S BANKING SECTOR

by
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Commercial banks are commonly recognized as the leading actors in the transition of the Russian economy from the centrally planned economy to a market system. It is here -- not in industry and agriculture -- where market behavior patterns were introduced most quickly and effectively. To what degree does this leading role extend to the art of forecasting? In particular, can we assert that bankers are better (more skilled) at forecasting changes in interest rates than, for example, industrial managers are at forecasting changes in prices?

The present paper studies 6-month forecasts of interest rates reported by the Russian Economic Barometer (REB) respondent banks in 1993-96. These forecasts are qualitatively compared with those forecasts of prices made by industrial enterprise managers included in the REB industrial sample (for details of the samples see Alexeev and Aukutsionek, 1997).

1. Forecasts of interest rates

It should be mentioned from the outset that forecasting economic indicators in Russia in '93-96 was exceedingly difficult, mostly because Russian managers were apparently not ready for the changes that took place in the economy. Most of them were dealing with both the onset of a market economy and a drastic reduction in output accompanied by high inflation for the first time in their lives. In addition, the range of changes of the relevant economic variables was enormous. For example, between 1993 and 1996 interest decreased by a factor of four (from about 200% to 50% on a yearly basis). Moreover, this decrease was not linear but somewhat cyclical.

How did the forecasting errors behave under these circumstances? The data in Table 1 show that interest rates were mostly overestimated. During the period under consideration (1993-96), only in 2 cases out of 18 (REB conducts bank surveys once every two months) did the anticipated interest rate exceed the actual rate. For the remaining cases, the interest rate was forecast to be higher than its actual realization.

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In order to measure the accuracy of forecasts, it is necessary first of all to establish the criterion for measuring forecasting errors. The relative error E is defined as follows

$$E = \left| R_f - R_a \right| : R_a ,$$

where R is the interest rate and the subscripts f and a denote its forecast and actual magnitudes, respectively.

Table 1: Interest Rates on Bank Loans

	Actual	Anticipated
1994		
April	206	238
June	216	244
August	166	245
October	143	183
December	164	178
1995		
February	169	173
April	177	169
June	163	178
August	136	175
October	128	169
December	124	147
1996		
February	119	140
April	108	124
June	101	120
August	100	100
October	82	91
December	71	92
1997		
February	59	71

Table 2 shows that the quality of forecasts of interest rates visibly improved in 1995 compared to those of 1994, and thereafter (through 1996) there was no observable improvement in forecasting.

Table 2. Bank Loan Interest Rates and Forecasting Errors (annual average data)

	Average annual interest rate	Forecasting error
1994 *	179	0.23
1995	150	0.16
1996	97	0.16

* March-December 1994.

Such a result looks somewhat surprising. At first glance, the pattern of change of interest rates was more straightforward in 1996 than in 1995 and we could have expected further improvement in the quality of forecasts. This, however, did not occur. During this period, the difficulties of forecasting seem to have been determined by the worsening situation of the banking sector as a whole. The sources of easy profit that used to exist earlier were gradually exhausted (mostly because inflation was being phased out), while new ones did not emerge.

The growth in the dispersion of interest rates in different banks in 1996 serves as indirect evidence of the worsening situation in the credit market. We measure the dispersion by the coefficient of variation (CV) of actual and forecast interest rates, which was calculated separately for each round of the survey and then averaged for each year (Table 3). Notice that the coefficients of variation increased significantly in 1996, suggesting an increasing divergence between banks.

Table 3. Coefficients of Variation in Bank Loan Interest Rates (REB respondent banks, annual averages)

	Actual interest rate	Anticipated interest rate
	CV	*CV*
1994 *	0.17	0.21
1995	0.20	0.19
1996	0.28	0.28

* March-December 1994.

Interestingly, bankers' forecasts seem to be closer to current interest rates than to the actual realizations of future interest rates. The average deviation of forecast interest rates from their actual realizations over the whole observation period amounted to 10%, whereas the forecast deviation from the current interest rates averaged only 8%. Note that a similar

result was recorded in the forecasts by industrial managers (See Aukutsionek (1996) and Alexeev and Aukutsionek, 1997).

2. Comparison of forecasts in the banking and industrial sectors

The comparison of the quality of industrial managers' and bankers' predictions is difficult to carry out properly. Indicators which could have played the same role for industrial enterprises as interest rates do for banks are unavailable. Conversely, it is virtually impossible to find satisfactory analogues for industrial forecasts of prices or output in the banking sector. Even when indicators are similar functionally (such as employment, wages, etc.), the comparison of forecasts would be made difficult by the different situations in the two sectors. Until recently the banking sector had enjoyed improvement, while the manufacturing sector has been struggling with seemingly perpetual fall in output. Still, the problem can be approached by choosing a pair of indicators which, though being of different nature, traveled along similar trajectories during approximately the same period. In this case, it would be possible to achieve at least formally comparable forecasting conditions for managers in both sectors.

Such a pair of indicators and such a time period do, in fact, exist. As data in Table 4 indicate, the interest rates and semi-annual indices of output prices from March 1994 to April 1996 behaved similarly between June 1994 and June 1996, both in their absolute levels and their rates of change. This similarity provides a unique opportunity for a valid comparison between bank and industrial managers with respect to the quality of their forecasts.

For the entire two-year period we have 10 semi-annual forecasts of interest rates and 7 semi-annual forecasts of price indices. The difference in the number of observations is explained by the different frequency of surveys (once every two months for bankers and quarterly for enterprise managers). During this period, the error of price index forecasts averaged 9% and the error of interest rate forecasts averaged 19%. The enterprise managers' forecasts were on average more accurate at 10% significance level.

This outcome could hardly be expected, considering that the banking sector is usually perceived as more sophisticated and much better adapted to a market environment than the industrial sector. One reason for this outcome may be that the credit market is more integrated and more competitive than most industrial markets. In other words, the monopoly power of industrial enterprises in Russia with respect to their output prices may be quite a bit greater than the monopoly power of the banks with respect to the interest rates they charge. Russia's medium-to-large industrial enterprises may have greater control over prices of their

output than banks have over interest rates.[2] If this is true, then the bankers' better understanding of a market economy is offset by objectively greater difficulty of forecasting interest rates compared to forecasting output prices of an industrial enterprise.

Table 4: Interest Rates and Semi-annual Output Price Indices

	Interest Rates	Prices
1994		
June	216	156
July		
August	166	
September		144
October	143	
November		
December	164	149
1995		
January		
February	169	
March		165
April	177	
May		
June	163	151
July		
August	136	
September		139
October	128	
November		
December	124	129
1996		
January		
February	119	
March		118
April	108	
May		
June	101	114

[2] An indirect evidence of this is provided by the comparison of the coefficients of variation for the price indices at various industrial enterprises in each round of the survey with the coefficients of variation for interest rates at various banks. Over the period from March 1993 to April 1996 the coefficient of variation of 6-month price indices averaged 30 percent, while that of interest rates averaged about 20 percent.

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Modeling Interest Rates Expectations of Bank Managers in Russia*

by
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1. *Introduction*

Forming correct expectations is important in any sector of any economy, but the importance of correct expectations in commercial banking is particularly great due to the leading role of the banking sector in a modern market economy. At the same time, commercial banking is one of newest areas of economic activity in transition economies and bank managers there usually do not have much relevant experience, making good forecasts more difficult. For these reasons, the study of expectations formation by bank managers in a transition economy such as Russia's, is both important and potentially useful for improving predictive abilities of bank managers.

The present paper uses data collected by the researchers from the Russian Economic Barometer, an independent survey and research organization in Moscow, to test the hypothesis of rationality of bank managers' expectations of interest rates on borrowed and loaned funds. In addition, we estimate the parameters of the models of adaptive and extrapolative expectations.

Substantial literature exists on testing rational expectations and estimating models of expectations formation in market economies.[1] Relatively little, however, has been written on expectations formation in Russia. In fact, we are aware of only one study addressing somewhat similar issues. Vorontsova (1996) estimated models of adaptive expectations using data from surveys of Moscow wholesalers, as well as macroeconomic models of inflationary expectations. Our work differs from Vorontsova's in several respects. First, she did not test rationality of expectations of market agents. Second, her survey data came entirely from Moscow, while our data cover a different group of agents (bank managers) dispersed over various regions of Russia. Third, Vorontsova did not compare the performance of an adaptive expectations model to performance of any other model of expectations formation. Moreover, some of Vorontsova's results are rather unusual, suggesting the need for estimating an adaptive expectations model on different data. For example, the point estimate of the coefficient of adaptation in her survey-based models of dollar exchange rate expectations turned out to be greater than one, suggesting that economic agents overreact to their forecast errors.

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[1] See, for example, Muth (1961, 1985), Lovell (1986), Ito (1990), and Dwyer et al. (1993).

This paper is organized as follows. Section 2 describes the data. Section 3 tests the hypothesis of rationality and estimates adaptive and extrapolative models of expectations formation. Section 4 provides brief conclusions and suggests directions for future research.

2. Description of the Data

The Russian Economic Barometer has been conducting bi-monthly surveys of bank managers since late 1993 in 25 regions of the Russian Federation.[2] More than half of the banks in the sample are commercial banks, created during the last six years. The rest of the banks were formed on the basis of regional branches of the former state-owned banks. The number of respondents in the bank surveys varies between 25 and 35. In the next section, we will use the bankers' six months forecasts of interest rates for borrowed and loaned funds in order to test the statistical properties of their expectations.

Ideally, individual forecasts should be compared with actual realizations of the variables in question at the same banks that made the forecasts. So far, however, data limitations forced us to compare instead average forecasts with average realizations for the entire sample. Given the relative "thickness" and homogeneity of the relevant markets, we do not expect this to bias our results significantly.

3. Tests of Rationality and Models of Expectations Formation

Tests of rationality of expectations. The modern formulation of the rational expectations hypothesis usually follows a well-known 1961 paper by Muth. This hypothesis asserts that the economic agent's forecast incorporates all the information available to the agent at the time of the forecast. Let P be the predicted value of the variable under consideration and let A denote its actual realization. The rational expectations hypothesis implies that P is an unbiased estimate of A, or formally

$$A = P + \varepsilon \qquad (1)$$

[2] Some surveys of bank managers were also conducted prior to that but on a quarterly basis. We decided not to use the earlier data in order to assure compatibility.

where ε has zero expected value and is uncorrelated with P. Therefore, this hypothesis can be tested by estimating the regression

$$A_t = \beta_0 + \beta_1 P_t + e_t \qquad (2)$$

If (1) is valid then the estimates of β_0 and β_1 should not be significantly different from 0 and 1, respectively. The regression results are summarized in Table 3.1. These results suggest that Russian bank managers' expectations were not rational in their forecasts of interest rates. In all regressions, coefficient β_1 was less than unity at 5% significance level. Notice, however, that both survey-based and experimental results often allow rejection of the rational expectations hypothesis.[3]

Table 3.1. Tests of rational expectations hypothesis for interest rates.

	Interest on loaned funds	Interest on borrowed funds
β_0	10.55	4.2
Standard error	12.8	9.5
β_1	0.79	0.76
Standard error	0.08	0.07
Adjusted R^2	0.86	0.86
Observations	18	18

One reason why bank managers might deviate from rationality in their forecasts is that they fail to utilize fully the information in their past forecasting errors. If so, then coefficient β_1 in the following regression would be different from zero:

$$(P_t - A_t) = \beta_0 + \beta_1 (P_{t-1} - A_{t-1}) + e_t \qquad (3)$$

The results for all three variables are presented in Table 3.2 below. Note that coefficient β_1 is significant at 5% level for interest on borrowed funds, and at 10% level for interest on loaned funds. Therefore, it appears quite likely that Russian bank managers do not fully incorporate past forecasting errors in the current forecasts.

[3] See, for example Figlewski and Wachtel (1981) and Williams (1987). Lovell (1986) provides a survey of many other empirical tests of the rational expectations hypothesis.

Table 3.2. Regression results for equation (3) for interest rates.

	Interest on loaned funds	Interest on borrowed funds
β_0	11.8	9.6
Standard error	7.0	6.8
β_1	0.44	0.53
Standard error	0.23	0.21
Adjusted R^2	0.14	0.24
Observations	17	17

Tests of the adaptive expectations model. The rational expectations hypothesis does not specify how expectations are formed. The fact that we can reject the rational expectations hypothesis for our forecast data does NOT imply anything about the implicit expectations formation models used by the respondents. We need to attempt to distinguish between such models by other means.

Two models are commonly used in applications, the adaptive expectations model and the extrapolative expectations model. There are no straightforward tests which would allow us to distinguish between the two models. Instead, researchers usually estimate both, and determine which model fits the available data best. We will begin with the adaptive expectations framework which essentially asserts that agents learn from their errors:

$$P_t = P_{t-1} + \lambda(A_{t-1} - P_{t-1}) \qquad (4)$$

where $0 \leq \lambda \leq 1$. This model can be estimated through the following regression

$$(P_t - P_{t-1}) = \beta_0 + \beta_1(A_{t-1} - P_{t-1}) + e_t \qquad (5)$$

If in this regression $\beta_0 = 0$ and $0 < \beta_1 < 1$, then (4) is a reasonable description of the agents' expectations formation process. If β_0 is different from zero, then it is likely that equation (4) is misspecified, i.e. that there are some important factors that influence the forecast and that are correlated with the independent variables in (4).

The regression results for our data, presented in Table 3.3, suggest that the adaptive expectations model fits the data quite well. The constant term is not significantly different from zero and we can reject the null hypothesis that β_1 is outside (0,1) interval with 99% confidence.

Table 3.3. Results of the test of the adaptive expectations model.

	Interest on loaned funds	Interest on borrowed funds
β_0	3.71	2.97
Standard error	4.35	4.56
β_1	0.59	0.53
Standard error	0.14	0.14
Adjusted R^2	0.49	0.46
Observations	17	17

Tests of the extrapolative expectations model. Good fit of the adaptive expectations model does not by itself allow us to reject the extrapolative expectations model, which essentially asserts that forecasters extrapolate the change in actual realizations of the variable, or formally

$$P_t = A_{t-1} + \lambda(A_{t-1} - A_{t-2}) \qquad (6)$$

In order to test for extrapolative expectations we can estimate the equation

$$(P_t - A_{t-1}) = \beta_0 + \beta_1(A_{t-1} - A_{t-2}) + e_t \qquad (7)$$

The extrapolative expectations hypothesis is supported if $\beta_0=0$ and $0<\beta_1<1$. The results of the tests (Table 3.4) rather strongly suggest that the hypothesis of extrapolative expectations does not fit the data well. First, β_0 is significantly greater than zero, implying specification error in equation (6). Second, it is by no means possible to reject the hypothesis that β_1 is less than zero.

Table 3.4. Results of the test of extrapolative expectations model.

	Interest on loaned funds	Interest on borrowed funds
β_0	10.19	10.55
Standard error	3.52	3.62
β_1	-0.29	-0.35
Standard error	0.19	0.22
Adjusted R^2	0.09	0.10
Observations	15	15

4. Conclusions

The analysis of the data shows that we can reject the hypothesis of rationality of bank managers' forecasts of interest rates. The data provide rather strong support for the adaptive expectations model but appear to reject the extrapolative expectations hypothesis. In our future research we will use individual bank cross-sectional data to analyze the dynamics of forecast quality, rationality, and changes in models of expectations formation.