Accuracy of the Core Inflation Forecast as a Forecast of Headline Inflation in the Russian Economy

One of the criteria of a core inflation measure is its ability to predict future headline inflation. Tons of literature dedicated whether the current dynamics of core inflation contains more information about future headline inflation than the current dynamics of headline inflation [1], [2], [3], in particular on the US economy [4], [5], [6]. But we are not aware of such studies in the Russian literature.

In this paper, we answer the question of whether core inflation contains more information about headline inflation than does headline inflation itself in Russian economy.

We consider two measures of core inflation: core of Rosstat and CPI, excluding fruits and vegetables, oil products and housing and communal services. The sample covered the period from Q1 2003 to Q2 2022. Data on seasonally adjusted core and headline inflation were taken from the website of the Bank of Russia. Inflation was determined using the formula $\pi_t = 400 * \log(p_t/p_{t-1})$, where p_t is the corresponding price index.

We considered 6 inflation forecasting models : 5 univariate (random walk (RW), sample mean (Mean), first order autoregression (AR(1)), first order moving average (MA(1)), automatically fitted ARIMA model), and vector autoregression model VAR(1) with 4 endogenous variables (inflation, output gap , exchange rate, RUONIA).

The criterion for comparing the quality of forecasts was the square root of the root mean square error of the out-of-sample forecast (RMSE). The train sample was from 1Q2003 to 4Q2018 with an expanding window. The test sample was divided into 2 subsamples: 1Q2019-4Q2021 and 1Q2019-2Q2022 to take into account the abnormally high values of actual inflation in 1Q2022. The forecast horizon was on one, two, four, six and eight quarters ahead. As a test (true) value of the indicator, headline inflation was used, regardless of which variable was used in the estimated model: headline inflation or core inflation.

Table 1 shows the headline inflation forecast errors constructed using alternative forecasting models for the case when the headline inflation indicator was included in the estimation sample. Table 1 shows that on the forecast horizon in 1 quarter is the best accuracy for a random walk model. On the horizon of 2-6 quarters, the best inflation forecast is given by the AR(1) model, and on the two-year horizon, the automatically fitted ARIMA model.

Table 1.
RMSE Headline Inflation Forecast (test sample 1Q2019-4Q2021)

CPI	1 Q	2 Q	4 Q	6 Q	8 Q.
VAR(1)	2.04	2.55	3.03	3.25	3.41
RW	1.17	1.59	2.36	2.78	3.17
Mean	3.19	3.39	3.61	3.77	3.97
AR(1)	1.26	1.57	1.98	2.28	2.67
MA(1)	2.45	3.00	3.32	3.52	3.74
AutoARIMA	1.57	1.95	2.38	2.48	2.51

Source: authors' calculations

The inclusion of the 1st and 2nd quarters of 2022 in the test sample leads to the forecast error increases significantly, and the AR(1) model gives the most accurate inflation forecast in all forecasting horizons.

Then, a headline inflation forecast based on models estimated at past core inflation rates was compared with a headline inflation forecast based on past headline inflation.

Table 2 shows the ratio of the headline inflation forecast error from the model that was estimated for the Rosstat core inflation indicator to the headline inflation forecast error from the same model that was estimated for the headline inflation indicator.

Table 2.
Using the Rosstat Core Inflation Forecast as a Headline Inflation Forecast (Test Sample 1Q2019-4Q2021)

Core Rosstat inflation	1 Q	2 Q	4 Q	6 Q	8 Q.
VAR(1)	0.736	0.882	0.973	0.994	0.925
RW	1.030	1.069	1.066	1.018	0.930
MEAN	0.912	0.904	0.888	0.883	0.887
AR(1)	1.009	1.147	1.158	1.231	1.094
MA(1)	0.760	0.854	0.865	0.860	0.868
AutoARIMA	0.860	0.970	0.957	0.923	0.918

Source: authors' calculations

If the value in table 2 is less than one, then using the core inflation forecast as the headline inflation forecast is preferable. Values less than one are observed for VAR(1), MA(1) and ARIMA models for all forecast horizons. Using core inflation in the VAR(1) model results in a 26.4% increase in forecast accuracy over a 1-quarter horizon compared to using headline inflation in the same model

Similar conclusions are drawn for the Mean, MA(1) and ARIMA models. For random walk and AR(1) models, there is no benefit from using the core inflation forecast as the headline forecast. Expansion of the test sample for the 1st and 2nd quarters of 2022 significantly reduces the benefits of using core inflation as a headline forecast, especially on short forecast horizons of 1-2 quarters.

If, instead of Rosstat's core inflation, to evaluate models, we use the inflation indicator excluding of fruits and vegetables, oil products and housing and communal services, then this will improve the forecast in the model of the mean (Mean) and MA(1) on all horizons, but would be comparable to the AR(1) and random walk forecasts when they are estimated for headline inflation. However, the accuracy of forecasting when using this core inflation metric increases by a smaller amount than when using Rosstat's core inflation.

The study made it possible to formulate the following conclusions.

First, the highest accuracy in forecasting headline inflation is obtained by using the first-order autoregressive model AR(1).

Second, for multivariate models and certain classes of univariate models, using a core inflation forecast as a headline inflation forecast improves forecast accuracy. The greatest increase in forecast accuracy is achieved using the Rosstat core inflation indicator.

Third, after Q1 2022, the inflation forecast error has increased significantly, and the gains from using a core inflation forecast instead of a headline inflation forecast have declined.

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