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MODEL CALCULATIONS OF SHORT-TERM FORECASTS OF RUSSIAN ECONOMIC TIME SERIES

M.Turuntseva, E.Astafieva, M.Bayeva, A.Bozhechkova, A.Buzaev, T.Kiblitskaya, Yu.Ponomarev and A.Skrobotov

INTRODUCTION TO ALL THE ISSUES

This Bulletin presents calculations of values of different economic indices of the Russian Federation in *May–October* of 2014 made on the basis on the time-series models developed as a result of research carried out by the IEP in the past few years[1]. The utilized method of forecasting belongs to the group of *formal* or *statistical* methods. In other words, the obtained values are not the expression of the *opinion* or *expert evaluation* of the researcher, but calculations of future values of the specific economic index made on the basis of formal models of ARIMA (p, d, q) time series with taking into account the existing trend and, in some cases, its significant changes. The presented forecasts are of inertial nature because the respective models take into account the dynamics of the data till the date of making of the forecast and, particularly, depend to a great extent on the trends which are typical of the time series in the period which is just before the time interval for which the forecast is made. The evaluations of the future values of the economic indices of the Russian Federation can be used for approval of decisions related to the economic policy provided that the general trends observed till the date on which the forecast is made in respect of each particular index do not change, that is, there will be no serious shocks or changes in the existing long-term trends.

Despite the fact that a large volume of the data related to the period prior to the 1998 crisis is available, the analysis and model building for forecasting were carried out in the period after August 1998. It was justified by outputs of the previous research[2] whose main conclusion was the fact that with the pre-crisis period taken into account the quality of forecasts in most cases declines. On the other hand, now it seems incorrect to use ever shorter series (after the 2008 crisis), as statistical qualities of the models built on the basis of such a short period happen to be rather low.

The evaluation of the models of the economic indices was carried out on the basis of the standard methods of analysis of time series. At the first stage, correlograms of the researched series and their first differences were analyzed in order to determine the maximum number of the delayed values which need to be included into the specifications of the model. Then, on the basis if the outputs of the analysis of the correlograms all the series were tested for weak stationarity (or stationarity around the trend) by means of the Dickey–Fuller test. In some cases, testing of series for stationarity around the segmented trend by means of the Perron and Zivot–Andrews tests for endogenous structural changes[3] was carried out.

Upon division of the series into those with weak stationary, trend stationary, segmented trend stationary or difference stationary, models corresponding to each of the above types were evaluated (as regards the levels and if necessary with inclusion of the trend, segmented trend or the differences). On the basis the Akaike and Schwartz information criteria and the parameters of the rest of the models (lack of autocorrelation, homoscedasticity and normality) and the quality of in-sample-forecasts obtained by means of those models, the best one was selected. Calculations of the forecast values were carried out on the basis of the best model which was built for each economic index.

In addition to the above, on the basis of the models developed by the IEP *the Bulletin* presents the calculations of future values of monthly indices of the CPI, the volume of the import from all

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1 See, for example, R.M. Entov, S.M. Drobyshevsky, V.P. Nosko, A.D. Yudin. *The Econometric Analysis of the Time Series of the Main Macroeconomic Indices.* M., IET, 2001; R.M. Entov, V.P. Nosko, A.D. Yudin, P.A. Kadochnikov, S.S. Ponomarenko. *Problems of Forecasting of Some Macroeconomic Indices.* M., IET, 2002; V. Nosko, A. Buzaev, P. Kadochnikov, S. Ponomarenko. *Analysis of the Forecasting Parameters of Structural Models and Models with the Outputs of the Polls of Industries.* M., IET, 2003; M.Yu. Turuntseva and T.R. Kiblitskaya, *Qualitative Properties of Different Approaches to Forecasting of Social and Economic Indices of the Russian Federation.* M.: IET, 2010.

2 Ibid.

3 See.: Perron, P. Further Evidence on Breaking Trend Functions in Macroeconomic Variables, *Journal of Econometrics*, 1997, 80, pp. 355–385; Zivot, E. and D.W.K. Andrews. Further Evidence on the Great Crash, the Oil-Price Shock, and Unit-Root Hypothesis. *Journal of Business and Economic Statistics,* 1992, 10, pp. 251–270.

the countries and the export to all the countries on the basis of structural models (SM). The forecast values obtained on the basis of structural models can in a number of cases produce better results as compared to ARIMA-models because in building of such models the additional information on the dynamics of exogenous variables is used. In addition to the above, inclusion of structural forecasts in building of aggregated forecasts (that is, forecasts obtained as an average value by a few models) may contribute to adjustment of forecast values.

In modeling the dynamics of the consumer price index, theoretical hypotheses resulting from the monetary theory were used. Utilized as explanatory variables were: the money supply, output volume and the dynamics of the nominal RUR/USD exchange rate which defines the dynamics of the alternative cost of money safe-keeping. Also, the model for the consumer price index included the index of prices on power because that index determined to a great extent the dynamics of manufacturers' costs.

It is to be noted that the main index which may have an effect on the value of the export and the import is the real exchange rate which fluctuations result in the change in the relative value of domestic and import goods. However, in the econometric models that effect is insignificant. The most important factors which determine the dynamics of the export are the global prices on the exported resources, particularly, oil prices: price rises result in growth in export of goods. Used as a parameter of relative competitiveness of Russian goods was the level of households' income in the economy (the cost of the work force). In order to take into account seasonal fluctuations of the export, fictitious variables D12 and D01 equal to one in December and January, respectively, and zero in the other periods were introduced. The dynamics of the import is influenced by the income of households and industries; growth in income results in growth in demand in all the goods, including imported ones. The parameter of the households' income is the real disposable cash income, while that of the income of industries is the index of industrial production.

The forecast values of currency exchange rates are also based on structural models of their dependence on international oil prices.

Forecast values of explanatory variables required for making of forecasts on the basis of structural models were calculated on the basis of ARIMA (p, d, q) models.

Also, the paper presents calculations of the values of the indices of industrial production, producer price index and the index of the total number of the unemployed calculated with use of the results of the business surveys (BS) carried out by the IEP. The empirical studies show[1] that utilization of the series of the business polls as explanatory variables[2] in prediction models improves on average the accuracy of the forecast. Calculations of future values of those indices were made on the basis of the ADL-model (with addition of seasonal autoregressive delays).

The consumer price index and producer price index are forecasted using the large dataset (factor models – FM) as well. The factor models are based on the estimate of the main components of a large dataset of social and economic indices (in our case – 112 indices). The lags of those main components and lags of the dependent variable are used as regressors in such models. On the basis of the analysis of the quality of forecasts received for various sets of factor models, as regards the consumer price index a model which included the 9th lag, 12th lag and 13th lag of the four main components, as well as the 1st lag and 12th lag of the variable proper was selected, while as regards the producer price index – the model which included the 8th lag, the 9th lag and the 12th lag of the four principal components, as well as the 1st, the 3rd lag and the 12th lag of the variable proper.

All the calculations were carried out with use of the Eviews econometric package.●

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1 See, for example: V. Nosko, A. Buzaev, P. Kadochnikov, S. Ponomarenko. *The Analysis of Forecasting Parameters of Structural Models and Models with Business Surveys Results.* M., IEP, 2003.

2 Used as explanatory variables were the following series of the business polls: the current/expected change in production, the expected changes in the solvent demand, the current/expected price changes and the expected change in employment.

Table 1

THE OUTPUTS OF CALCULATIONS OF FORECAST VALUES OF INDICES OF INDUSTRIAL PRODUCTION[1], (%)

| | Index of industrial production | | | | IIP for mining | | IIP for manufacturing | | IIP for utilities (electricity, water, and gas) | | IIP for food products | | IIP for coke and petroleum | | IIP for primary metals and fabricated metal products | | IIP for machinery | |
| | Rosstat | | NRU HSE | | | | | | | | | | | | | | | |
	ARIMA	BS	ARIMA	BS	Rosstat	NRU HSE	Rosstat	NRU HSE	Rosstat	NRU HSE	Rosstat	NRU HSE	Rosstat	NRU HSE	Rosstat	NRU HSE	Rosstat	NRU HSE
Expected growth on the respective month of the previous year																		
May 2014	0,9	2,3	-0,4	1,1	0.8	1.2	2.9	1.1	2.1	-0.1	0.5	1.2	2.9	2.8	0.2	1.0	-1.3	-4.5
June 2014	0,3	1,0	-0,7	-0,2	0.7	0.2	1.8	0.2	2.0	1.7	1.7	5.0	3.4	3.2	-0.1	-1.4	18.1	-10.5
July 2014	0,0	0,9	-0,7	0,1	0.2	0.7	0.9	-0.6	3.1	3.7	1.1	2.2	4.0	4.4	0.0	-2.0	7.7	-2.8
August 2014	-0,4	0,2	-0,6	-9,0	-0.2	0.0	1.1	-0.6	3.9	4.9	2.0	1.4	4.6	4.4	-1.6	-1.3	6.5	-3.5
September 2014	0,1	2,1	-0,2	1,3	-1.1	-0.1	0.5	-0.7	1.8	2.8	2.2	1.3	8.2	7.4	-3.5	-2.2	-0.4	-3.6
October 2014	0,4	1,2	0,3	0,2	-0.8	0.5	-1.6	-1.0	-0.8	2.1	2.3	2.9	8.0	7.7	-1.9	-1.9	-8.9	-5.0
For reference: actual growth in 2013 on the respective month of 2012																		
May 2013		-0.5		0.2	1.7	0.9	-1.9	-0.6	0.3	2.3	-1.0	-1.0	7.2	8.9	-1.4	-0.1	4.5	-10.1
June 2013		1.7		0.5	1.7	2.4	2.0	-0.5	-0.7	0.2	-4.1	-4.8	1.6	2.7	3.9	4.0	-6.8	-6.0
July 2013		0.8		0.8	0.1	0.7	1.5	1.3	-1.8	-1.4	2.4	1.4	4.0	4.9	0.3	2.1	-11.8	-14.0
August 2013		-0.2		0.2	1.0	1.6	-0.7	-0.3	-2.0	-1.9	-0.6	-1.0	3.0	4.3	-0.8	0.5	-5.4	-6.8
September 2013		1.3		0.8	1.9	1.0	1.1	0.5	0.0	2.0	1.4	0.8	1.5	2.1	1.8	0.1	-1.5	-4.0
October 2013		1.0		0.6	1.7	0.9	0.6	0.3	1.1	1.6	0.9	0.8	2.6	3.8	-0.2	-0.5	7.9	0.4

Note: in the time spans under review, the series of the Rosstat and NRU HSE chain indices of IIP, as well as the NRU HSE chain IIP for manufacturing are identified as stationary processes around the trend with an endogenous structural change; the series of the Rosstat and NRU HSE chain IIPs for manufacturing, for primary metals and fabricated metal products, as well as the NRU HSE chain IIP for mining and Rosstat chain IIP for machinery are identified as stationary processes around the trend with two endogenous structural changes. The time series of other chain indices are stationary at levels.

1 It is to be noted that for making of forecasts so-called "raw" indices (without seasonal and calendar adjustment) were used and for that reason in most models existence of the season factor is taken into account and, as a consequence, the obtained outputs reflect the seasonal dynamics of the series.

INDUSTRIAL PRODUCTION AND RETAIL SALES

Industrial production

For building of the forecast for May–October 2014, the series of monthly data of the indices of industrial production of the Federal State Statistics Service (Rosstat) from January 2002 till February 2014, as well as the series of the base indices of industrial production of the Center for the Economic Situation under the National Research University Higher School of Economics (NRU HSE[1]) in the period from January 1999 till March 2014 were used (the value of January 1995 was equal to 100%). The forecast values of the series were calculated on the basis of ARIMA-class models. The forecast values of the Rosstat and NRU HSE indices of industrial production are calculated with use of business surveys (BS) as well. The obtained outputs are shown in Table 1.

As seen from *Table 1*, the average decrease[2] in the NRU HSE index of industrial production in May–October 2014 on the corresponding period of the previous year as regards industry in general amounts to (-0.7%). As regards the Rosstat index of industrial production, it amounts to 0.8%.

In May–October 2014, the monthly average values of the Rosstat and NRU HSE indices of industrial production for mining amount to (-0.1% and 0.4%, respectively. The average growth in the indices for petroleum and coke of Rosstat and NRU HSE is expected at the level of 5.2% and 5.0%, respectively.

In May–October 2014, the average growth in the NRU HSE index of industrial production for manufacturing amounts to (-0.3%) on the corresponding period of the previous year, while that in the Rosstat index, to 0.9%. The monthly average values of the Rosstat and NRU HSE indices of industrial production for food products amount to 1.6% and 2.3%, respectively. In May–October 2014, the monthly average values of the Rosstat and NRU HSE indices of industrial production for primary metals and fabricated metal products amount to (-1.1%) and (-1.3%), respectively. For machinery the average growth in the indices of Rosstat and NRU HSE is expected at the level of 3.6% and (-5.0%), respectively.

In May–October 2014, the average growth in the Rosstat index of industrial production for utilities (electricity, water, and gas) amounts to 2.0% on the corresponding period of the previous year, while that in the NRU HSE index, to 2.5%.

Retail Sales

This section (Table 2) presents forecasts of monthly retail sales made on the basis of monthly Rosstat data in the January 1999 – February 2014 period.

As seen from *Table 2*, in May–October 2014 the average expected growth in monthly retail sales amounts to about 11.6% on the corresponding period of 2013.

In May–October 2014, the average expected growth in monthly real retail sales amounts to 4.0% on the corresponding period of 2013.

Table 2

THE OUTPUTS OF CALCULATIONS OF FORECAST VALUES OF THE VOLUME OF RETAIL SALES AND THE REAL VOLUME OF RETAIL SALES

	Forecast value according to ARIMA-model	
	Retail sales, billion Rb (in brackets – growth on the respective month of the previous year, %)	Real retail sales (as % of the respective period of the previous year)
May 2014	2097.8 (10.8)	104.1
Jun 2014	2144.9 (10.9)	104.1
Jul 2014	2212.2 (11.1)	103.9
Aug 2014	2275.4 (11.7)	103.9
Sep 2014	2263.1 (12.2)	104.0
Oct 2014	2347.8 (12.6)	104.2
For reference: actual value in the same months of 2013		
May 2013	1893.8	103.0
Jun 2013	1933.9	103.6
Jul 2013	1990.4	104.6
Aug 2013	2036.7	104.2
Sep 2013	2016.6	103.3
Oct 2013	2085.6	103.6

Note: series of retail sales and real retail sales in the January 1999 – February 2014 period.

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1 The indices in question are calculated by E.A. Baranov and V.A. Bessonov.
2 The average growth of industrial production indices is understood here as the average value of the said indices for six forecast months.

INVESTMENTS IN CAPITAL ASSETS

Table 3 presents the outputs of calculations of forecast values of investments in capital assets in May–October 2014. The forecasts were made on the basis of time-series models with utilization of the Rosstat data of the January 1999 – February 2014 period.

The outputs in *Table 3* show that in May–October 2014 the average expected growth in investments in capital assets amounts to about 5.1% on the corresponding period of 2013.

In May–October 2014, the average expected drop in real investments in capital assets amounts to 4.8% on the corresponding period of 2013.

FOREIGN TRADE INDICES

Model calculations of forecast values of the export and export to countries outside the CIS and the import and import from countries outside the CIS were made on the basis of the models of time series and structural models evaluated on the basis of the monthly data in the period from September 1998 till February 2014 on the basis of the data of the Central Bank of Russia[1]. The outputs of the calculations are shown in Table 4.

In May–October 2014, the average expected growth in the export, import, export to countries outside the CIS and import from countries outside the CIS will amount to 8.6%, -2%, 5.6% and -6.0%, respectively, on the corresponding period of 2013. In May–October 2014, the average expected volume of the trade balance with all the countries will amount to $109.8bn which figure is equal to a 31% increase as compared to the same period of 2013.

Table 3

THE OUTPUTS OF CALCULATIONS OF FORECAST VALUES OF THE VOLUME OF INVESTMENTS IN CAPITAL ASSETS AND REAL INVESTMENTS IN CAPITAL ASSETS

Forecast values according to ARIMA-model		
	Investments in capital assets, billion Rb (in brackets – growth on the respective month of the previous year, %)	Real investments in capital assets (as % of the respective period of the previous year)
May 2014	1040.0 (5.2)	96.3
Jun 2014	1177.8 (5.0)	94.8
Jul 2014	1101.4 (4.7)	94.7
Aug 2014	1188.2 (4.7)	95.1
Sep 2014	1258.0 (4.9)	95.0
Oct 2014	1527.9 (5.8)	95.1
For reference: actual values in the same months of 2012–2013		
May 2013	988.2	100.1
Jun 2013	1121.9	97.1
Jul 2013	1052.2	102.4
Aug 2013	1135.0	98.2
Sep 2013	1199.3	98.7
Oct 2013	1443.8	99.9

Note: series of investments in capital assets in the January 1999 – February 2014 period are series of DS type.

Table 4

THE OUTPUTS OF CALCULATIONS OF FORECAST VALUES OF VOLUMES OF FOREIGN TRADE TURNOVER WITH COUNTRIES OUTSIDE THE CIS

Month	Export to all countries				Import from all countries				Export to countries outside the CIS				Import from countries outside the CIS			
	Forecast values (billion USD a month)		Percentage of actual data in the respective month of the previous year		Forecast values (billion USD a month)		Percentage of actual data in the respective month of the previous year		Forecast values (billion USD a month)		Percentage of actual data in the respective month of the previous year		Forecast values (billion USD a month)		Percentage of actual data in the respective month of the previous year	
	ARIMA	SM	ARIMA	SM	ARIMA	SM	ARIMA	SM	ARIMA	SM	ARIMA	SM	ARIMA	SM	ARIMA	SM
May 2014	45.0	46.7	110	114	28.3	28.3	106	106	37.6	39.7	106	112	22.6	23.2	100	102
Jun 2014	48.2	47.3	115	113	26.3	30.5	93	108	36.4	36.2	101	100	23.4	24.4	97	101
Jul 2014	47.3	44.2	108	101	28.1	27.4	92	90	38.5	38.9	104	105	21.9	23.8	83	91
Aug 2014	47.3	47.4	111	111	29.6	28.1	103	98	39.9	40.1	112	113	23.2	24.7	94	100
Sep 2014	46.1	45.2	103	101	28.2	27.6	97	95	38.2	39.1	101	103	21.6	24.3	87	98
Oct 2014	48.1	46.3	111	107	28.9	28.2	95	92	38.7	38.0	107	105	23.1	24.0	87	91

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1 The data on the foreign trade turnover is calculated by the CBR in accordance with the methods for making of the balance of payment in prices of the exporter-country (FOB) in billion USD.

Month	Export to all countries				Import from all countries				Export to countries outside the CIS				Import from countries outside the CIS			
	Forecast values (billion USD a month)		Percentage of actual data in the respective month of the previous year		Forecast values (billion USD a month)		Percentage of actual data in the respective month of the previous year		Forecast values (billion USD a month)		Percentage of actual data in the respective month of the previous year		Forecast values (billion USD a month)		Percentage of actual data in the respective month of the previous year	
	ARIMA	SM	ARIMA	SM	ARIMA	SM	ARIMA	SM	ARIMA	SM	ARIMA	SM	ARIMA	SM	ARIMA	SM
For reference: actual values in respective months of 2013 (billion USD)																
May 2013	41.0				26.6				35.4				22.7			
Jun 2013	41.8				28.2				36.1				24.1			
Jul 2013	43.7				30.6				37.1				26.3			
Aug 2013	42.5				28.7				35.6				24.7			
Sep 2013	44.8				29.0				38.0				24.8			
Oct 2013	43.5				30,5				36.1				26.5			

Note: in the period from January 1999 till February 2014, the series of the export, import, export to the countries outside the CIS and import from the countries outside the CIS were identified as stationary series in the first-order differences. In all the cases, seasonal components were included in the specification of the models.

DYNAMICS OF PRICES

The Consumer Price Index and Producer Price Indices

This section presents calculations of forecast values of the consumer price index and producer price indices (as regards both the industry in general and some types of its activities under the National Industry Classification Standard (NICS)) made on the basis of the time-series models evaluated on the basis of the Rosstat data in the period from January 1999 to February 2014[1]. Table 5 presents the outputs of model calculations of forecast values in May–October 2014 in accordance with ARIMA-models, structural models (SM) and models built with utilization of business surveys (BS).

THE OUTPUTS OF CALCULATIONS OF FORECAST VALUES OF PRICE INDICES

Month	The consumer price index (ARIMA)	The consumer price index (SM)	The consumer price index (FM)	Producer price indices:													
				for industrial goods (ARIMA)	for industrial goods (BS)	for industrial goods (FM)	for mining	for manufacturing	for utilities (electricity, water, and gas)	for food products	for the textile and sewing industry	for wood products	for the pulp and paper industry	for coke and petroleum	for the chemical industry	for primary metals and fabricated metal	for machinery	for transport equipment manufacturing
Forecast values (% of the previous month)																	
May 2014	100.5	100.4	100.7	100.5	98.7	100.1	98.8	99.7	99.9	100.2	100.4	100.1	100.5	102.0	100.5	100.3	100.1	100.2
Jun 2014	100.4	100.5	100.5	100.8	100.9	100.3	99.1	99.6	99.6	100.0	100.4	100.4	100.3	102.1	100.4	100.5	100.2	100.2
Jul 2014	100.4	100.3	100.6	101.1	101.8	100.8	100.2	99.9	100.7	100.5	100.4	100.6	100.5	102.3	100.6	100.7	100.1	100.5
Aug 2014	100.1	100.4	100.4	100.5	102.2	102.4	101.9	100.1	102.0	100.4	100.4	100.4	100.7	103.0	100.9	100.9	100.1	100.5
Sep 2014	100.2	100.2	100.4	100.0	100.9	101.3	97.5	100.5	101.0	100.4	100.4	100.6	100.7	102.1	100.9	100.5	100.0	100.5
Oct 2014	100.4	100.3	100.6	99.9	99.3	99.5	97.2	100.5	99.9	100.4	100.5	101.0	100.2	101.6	100.7	100.5	100.3	100.7
Forecast values (% of December 2013)																	
May 2014	102.7	103.7	103.5	99.8	100.3	100.0	90.9	100.6	100.2	101.3	101.8	102.8	101.2	106.2	104.3	99.5	101.5	102.9
June 2014	103.1	104.2	104.1	100.7	101.2	100.3	90.1	100.3	99.7	101.3	102.2	103.2	101.5	108.5	104.7	100.0	101.7	103.1
Jul 2014	103.5	104.5	104.7	101.8	103.0	101.1	90.2	100.2	100.4	101.8	102.6	103.8	102.1	110.9	105.3	100.7	101.8	103.7
Aug 2014	103.6	104.9	105.1	102.2	105.3	103.5	92.0	100.3	102.4	102.1	103.0	104.3	102.7	114.3	106.3	101.6	101.9	104.1
Sep 2014	103.8	105.1	105.5	102.2	106.2	104.9	89.7	100.8	103.4	102.6	103.4	104.9	103.5	116.7	107.2	102.2	101.9	104.7
Oct 2014	104.3	105.4	106.2	102.2	105.5	104.3	87.1	101.3	103.2	103.0	103.9	106.0	103.7	118.6	107.9	102.7	102.2	105.4

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1   Structural models were evaluated in the period from October 1998.

Table 5, cont'd

Month	The consumer price index (ARIMA)	The consumer price index (SM)	The consumer price index (FM)	Producer price indices:													
				for industrial goods (ARIMA)	for industrial goods (BS)	for industrial goods (FM)	for mining	for manufacturing	for utilities (electricity, water, and gas)	for food products	for the textile and sewing industry	for wood products	for the pulp and paper industry	for coke and petroleum	for the chemical industry	for primary metals and fabricated metal	for machinery	for transport equipment manufacturing
For reference: actual values in the same periods of 2013 (% of December 2012)																	
May 2013	103.1	98.7	95.9	99.5	99.8	100.5	102.0	102.7	101.9	95.4	100.8	98.6	100.7	99.6
Jun 2013	103.5	99.1	98.6	99.4	99.2	101.0	102.2	103.5	101.3	96.1	101.2	97.1	100.4	99.2
Jul 2013	104.4	101.1	103.0	100.1	103.3	101.4	102.5	103.7	101.9	98.0	102.1	96.8	102.5	100.5
Aug 2013	104.5	103.9	107.5	101.8	108.7	101.9	102.5	103.2	103.2	105.6	101.6	97.3	102.1	101.0
Sep 2013	104.7	105.4	112.2	102.5	108.9	102.3	102.9	103.9	104.9	107.7	102.3	98.4	101.9	101.2
Oct 2013	105.3	104.1	107.8	102.3	108.1	102.3	102.6	103.7	103.7	106.3	101.3	99.3	102.1	100.8

Note: in the period from January 1999 till February 2014, the series of the chain producer price index for machinery are identified as a stationary process around the trend with two endogenous structural changes. The series of other chain price indices are stationary at levels.

In May–October 2014, the expected monthly average growth in the consumer price index will amount to 0.4%. In the above period, the producer price index (PPI) is expected to grow on average at the level of 0.5% a month.

As regards producer price indices, in May–October 2014, the following monthly average growth rates are expected: for mining (-0.9%), for manufacturing (0.1%), production and distribution of power, gas and water (0.5%), for utilities (electricity, water, and gas) (0.3%), for the textile and sewing industry (0.4%), for wood products (0.5%), for the pulp and paper industry (0.5%), for coke and petroleum (2.2%), for the chemical industry (0.6%), index for primary metals and fabricated metal products (0.6%), for machinery (0.1%) and for transport equipment manufacturing (0.4).

The dynamics of the cost of the monthly per capita minimum food basket

This section presents the outputs of calculations of forecast values of the cost of the monthly per capita minimum food basket in May–October 2014. The forecasts were made on the basis of time series with use the Rosstat data in the period from January 2000 till February 2014. The outputs of calculations are shown in Table 6.

As seen from *Table 6*, growth in the cost of the monthly per capita minimum food basket as compared to the respective level of the previous year is expected. It is to be noted that the average expected cost of the monthly per capita minimum food basket amounts to about Rb 3,145.7. The expected growth in the cost of the monthly per capita minimum food basket amounts on average to about 9.7% as compared to the level of the same period of the previous year.

Table 6

THE FORECAST OF THE COST OF THE MONTHLY PER CAPITA MINIMUM FOOD BASKET

Forecast values according to ARIMA-model (Rb)	
May 2014	3172.9
June 2014	3176.1
July 2014	3151.0
August 2014	3116.8
September 2014	3112.7
October 2014	3144.8
For reference: actual values in the same months of 2013 (billion Rb)	
May 2013	2878.2
June 2013	2969.8
July 2013	2962.0
August 2013	2838.6
September 2013	2758.2
October 2013	2801.8
Expected growth on the respective month of the previous year (%)	
May 2014	10.2
June 2014	6.9
July 2014	6.4
August 2014	9.8
September 2014	12.9
October 2014	12.2

Note: the series of the cost of the monthly per capita minimum food basket in the period from January 2000 till February 2013 are stationary in the first-order differences.

Indices of Transportation Tariffs

This section presents calculations of forecast values of price indices of transportation tariffs on cargo carriage[1], made on the basis of time-series models evaluated on the basis of the Rosstat data in the period from September 1998 till February 2014. Table 7 shows the outputs of model calculations of forecast values in May–October 2014. It is to be noted that some of the indices under review (for instance, the index of tariffs on pipeline transportation) are adjustable ones and for that reason their behavior is hard to describe by means of the time-series models. As a result, the future values may differ greatly from the real ones in case of the centralized increase of the tariffs in the period of forecasting or in case of absence of such an increase in the forecasting period, but with it taking place shortly before the beginning of that period.

Table 7

THE OUTPUTS OF CALCULATIONS OF FORECAST VALUES OF INDICES OF TRANSPORTATION TARIFFS

Period	The composite index of transportation tariffs	The index of motor freight tariffs	The index of pipeline tariffs
Forecast values according to ARIMA-models (% of the previous month)			
May 2014	100.2	100.2	100.1
June 2014	100.2	100.2	100.2
July 2014	103.5	100.2	106.0
August 2014	100.1	100.1	100.1
September 2014	100.1	100.1	100.0
October 2014	100.1	100.1	97.5
Forecast values according to ARIMA-models (% of December of the previous year)			
May 2014	100.6	104.4	104.1
June 2014	100.8	104.6	104.3
July 2014	104.2	104.8	110.5
August 2014	104.4	104.9	110.6
September 2014	104.5	105.0	110.6
October 2014	104.7	105.1	107.8
For reference: actual values in the same period of 2013 (% of the previous month)			
May 2013	100.3	100.5	100.0
June 2013	100.2	100.5	100.1
July 2013	100.3	100.0	105.9
August 2013	100.2	100.3	100.0
September 2013	99.9	99.9	99.9
October 2013	95.9	100.2	92.0

Note: in the period from September 1998 till February 2014, the series of the index of tariffs on motor cargo carriage were identified as stationary ones; the other series were identified as stationary ones in the period from September 1998 till February 2014, too; fictitious variables for taking into account particularly dramatic fluctuations were used in respect of all the series.

On the basis of the results of the forecast for May–October 2014, within six months under review the composite index of transportation tariffs will grow at the monthly average rate of 0.7%. In July 2014, seasonal index growth of 3.5 p.p. is expected.

The index of motor freight tariffs will grow within six months at the monthly average rate of 0.1%.

Within the next six months, the index of pipeline tariffs will grow at the monthly average rate of 0.6%. In July 2014, seasonal index growth of 6.0 p.p. is expected.

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1 The Bulletin presents a review of the composite index of transportation tariffs on cargo carriage and the index of transportation tariffs on motor cargo carriage, as well as the index of tariffs on pipeline transportation. The composite index of transportation tariffs on cargo carriage is calculated on the basis of the indices of tariffs on cargo carriage by individual types of transport: railway, pipeline, shipping, domestic water-borne, motor and air service (for more detailed information, pls. refer, for instance, to: Prices in Russia. The Official Publication of Goskomstat of RF, 1998).

The dynamics of world prices on natural resources

This section presents calculations of such average monthly values of the Brent oil prices ($ per barrel), the aluminum prices ($ per ton), the gold prices ($ per ounce), the copper prices ($ per ton) and the nickel prices ($ per ton) in May–October 2014 as were received on the basis of nonlinear models of time series evaluated on the basis of the IMF data in the period from January 1980 till March 2014.

Table 8

THE OUTPUTS OF CALCULATIONS OF FORECAST VALUES OF WORLD PRICES ON NATURAL RESOURCES

Month	Brent oil ($ per barrel)	Aluminum ($ per ton)	Gold ($ per ounce)	Copper ($ per ton)	Nickel ($ perton)
Forecast values					
May 2014	111.25	1698	1349	6384	16882
June 2014	112.32	1696	1354	6388	16874
July 2014	113.71	1696	1357	6351	17206
August 2014	114.61	1689	1361	6298	17325
September 2014	115.60	1685	1365	6241	17555
October 2014	116.85	1682	1370	6195	17780
Growth on the respective month of the previous year (%)					
May 2014	8.0	-7.4	-4.5	-11.9	12.9
June 2014	8.9	-6.5	0.9	-8.7	18.2
July 2014	5.6	-4.2	5.5	-8.1	25.1
August 2014	3.3	-7.0	1.0	-12.4	21.1
September 2014	3.6	-4.3	1.2	-12.8	27.2
October 2014	6.7	-7.3	4.1	-14.0	25.9
For reference: actual values in the same period of 2013					
May 2013	103.03	1833	1414	7249	14948
June 2013	103.11	1815	1342	7000	14280
July 2013	107.72	1770	1287	6907	13750
August 2013	110.96	1816	1347	7186	14308
September 2013	111.62	1761	1349	7159	13801
October 2013	109.48	1815	1316	7203	14118

Note: in the period from January 1980 till March 2014, the series of prices on oil, nickel, gold, copper and aluminum are series of DS type.

The average expected level of the Brent oil prices amounts to about $114.1 per barrel which figure is on average 6.0% higher than the respective indices of the previous year. The aluminum prices are expected at the level of about $1,691 per ton, while their average decrease is expected to amount to about 6% against the respective level of the previous year. The gold prices are expected to amount to about $1,360 per ounce. The average copper prices are expected to amount to about $6,309 per ton, while the nickel prices, to about $17,270 per ton. The expected average appreciation of the gold and the nickel prices amounts to about 1% and 21%, respectively, on the respective period of the previous year, while the expected average depreciation of the copper prices, to about 11%.

MONETARY INDICES

The future values of the monetary base (in the narrow definition: cash funds and the Fund of Mandatory Reserves (FMR)) and M_2 monetary aggregate in May–October 2014were received on the basis of models of time-series of respective indices calculated by the CBR[1] in the period from October 1998 till February 2014. Table 9 presents the outputs of calculations of forecast values and actual values of those indices in the same period of the previous year. It is to be noted that due to the fact that the

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1 The data on the specific month is given in accordance with the methods of the CBR as of the beginning of the following month.

monetary base is an instrument of the policy of the CBR the forecasts of the monetary base on the basis of time-series models are to a certain extent notional as the future value of that index is determined to a great extent by decisions of the CBR, rather than the inherent specifics of the series.

Table 9

THE FORECAST OF M_2 AND THE MONETARY BASE

Period	The Monetary base		M_2	
	Billion Rb	Growth on the previous month, %	Billion Rb	Growth on the previous month, %
May 2014	8110	0.1	31517	1.1
June 2014	8271	2.0	31875	1.1
July 2014	8284	0.2	32236	1.1
August 2014	8447	2.0	32600	1.1
September 2014	8462	0.2	32967	1.1
October 2014	8626	1.9	33338	1.1
For reference: actual value in the respective months of 2013 (growth on the previous month, %)				
May 2013	-1.6		0.9	
June 2013	1.9		1.5	
July 2013	0.9		0.8	
August 2013	-0.4		0.2	
September 2013	-0.1		-0.5	
October 2013	0.3		-0.3	

Note: in the period from October 1998 to February 2014, all the time series of monetary indices were attributed to the class of series which are stationary in the first-order differences and have an explicit seasonal component.

In May–October 2014, the monetary base and the M_2 monetary index will grow at the monthly average rate of 1.1%.

INTERNATIONAL RESERVES

This section presents the outputs of the statistical evaluation of such future values of the international reserves of the Russian Federation[1] as were received on the basis of evaluation of the model of time series of the gold and foreign exchange reserves on the basis of the data of the CBR in the period from October 1998 till March 2014. That index is forecasted without taking into account a decrease in the amount of the reserves due to payment of the foreign debt and for that reason the values of the volumes of the international reserves in the months where foreign debt payments are made may happen to be overestimated (or, otherwise, underestimated) as compared to the actual ones.

On the basis of the outputs of the forecast, in May–October 2014 the international reserves will grow at the monthly average rate of 1%.

Table 10

THE FORECAST OF THE INTERNATIONAL RESERVES OF THE RUSSIAN FEDERATION

Period	Forecast values according to ARIMA-models	
	Billion USD	Growth on the previous month, %
May 2014	524.4	1.2
Jun 2014	531.7	1.4
Jul 2014	536.6	0.9
Aug 2014	540.2	0.7
Sep 2014	545.0	0.9
Oct 2014	550.7	1.0
For reference: actual values in the same period of 2013		
May 2013	518.4	-2.7
Jun 2013	513.8	-0.9
Jul 2013	512.8	-0.2
Aug 2013	509.7	-0.6
Sep 2013	522.6	2.5
Oct 2013	524.3	0.3

Note: in the period from October 1998 till March 2014, the series of the gold and foreign exchange reserves of the Russian Federation were identified as stationary series in difference.

FOREIGN EXCHANGE RATES

The model calculations of prospective values of the foreign exchange rates (RUR

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1 The data on the volume of the gold and foreign exchange reserves is presented as of the first day of the following month.

per USD and euro) were made on the basis of assessment of the time series models (ARIMA) and structural models (SM) of the relevant indicators quoted by the RF Central Bank as of the last date of each month over the periods between October 1998 and April 2014 and between January 1999 and April 2014[1], respectively.

In the period under review, the value of the RUR/USD exchange rate is forecasted on the basis of the average of the two models equal to Rb 35.47 per $1. A forecast of the USD/EUR exchange rate will amount on average to $1.39 per one euro.

Table 11

FORECASTS OF THE RUR/USD AND USD/EUR EXCHANGE RATES

Period	The RUR/USD exchange rate (RUR per USD)		The USD/EUR exchange rate (USD per EUR)	
	ARIMA	SM	ARIMA	SM
May 2014	35.41	35.59	1.38	1.38
June 2014	35.24	35.77	1.38	1.38
July 2014	35.09	35.77	1.39	1.38
August 2014	35.01	35.93	1.39	1.38
September 2014	34.94	35.95	1.39	1.39
October 2014	34.89	36.09	1.39	1.39
For reference: actual values in the similar period of 2013				
May 2013	31.08		1.30	
June 2013	32.71		1.31	
July 2013	32.89		1.34	
August 2013	33.25		1.34	
September 2013	32.35		1.34	
October 2013	32.06		1.37	

Note: in the respective periods, the series under review were identified as integrated series of the first order with a seasonal component.

THE STANDARD OF LIVING INDICES

This section (Table 12) presents such outputs of calculations of forecast values of indices of real wages, real disposable income and real income[2] as were received on the basis of the model of time series of respective indices calculated by Rosstat and taken in the period from January 1999 till March 2014. The above indices depend to a certain extent on the centralized decisions on raising of wages and salaries to public sector workers, as well as those on raising of pensions, scholarships and allowances; such a situation introduces some changes in the dynamics of the indices under review. As a result, the future values of the indices of real wages and real disposable income calculated on the basis of the series which last observations are either considerably higher or lower than the previous ones due to such a raising may differ greatly from those which are implemented in reality.

The forecast values shown in *Table 12* point to growth in all the indices of the standard of living of the population. So, average growth of 1.7% in real disposable cash income as compared to the respective period of the previous year is expected; growth in real cash income will amount to 1.9%. Growth of 1.9% on average in real accrued wages on the respective period of the previous year is expected.

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2 The Bulletin applies the IMF's data for the period between January 1999 and February 2014. The data for March and April 2014 was obtained from the foreign exchange rate statistics website: www.oanda.com

1 *Real cash income* is a relative index which is calculated by means of division of the index of the nominal size (which was actually formed in the period under review) of households' cash income by the CPI. *Real disposable cash income* is cash income minus mandatory payments and contributions. (See: Rossiisky Statistichesky Ezhegodnik, Moscow, Rosstat, 2004, p. 212).

Table 12

THE FORECAST OF THE INDICES OF THE STANDARD OF LIVING

Period	Real disposable cash income	Real cash income	Real accrued wages
Forecast values according to ARIMA-models (% of the respective month of 2013)			
May 2014	103.4	103.9	99.6
June 2014	99.5	100.0	100.6
July 2014	101.4	101.0	101.6
August 2014	100.4	100.5	103.5
September 2014	103.5	103.6	104.0
October 2014	102.1	102.4	102.1
For reference: actual values in the respective period of 2013 (% of the same period of 2012)			
May 2013	99.3	99.8	104.7
June 2013	101.6	101.9	105.3
July 2013	104.0	105.2	106.4
August 2013	103.4	103.5	106.8
September 2013	99.8	100.1	106.3
October 2013	105.2	105.2	105.4

Note: for calculating purposes, the series of the disposable income, real income and real wages in the base form were used (March 1999 was adopted as a base period). In the period from January 1999 till March 2014, those series were attributed to the class of processes which are stationary in differences and have an explicit seasonal component.

EMPLOYMENT AND UNEMPLOYMENT

For the purpose of calculation of the future values of the employment (of the number the gainfully employed population) and the unemployment (the total number of the unemployed), models of time series evaluated in the period from October 1998 till February 2014 on the basis of the monthly data of Rosstat[1] were used. The unemployment was calculated on the basis of the models with results of the outputs of business polls[2], too.

It is to be noted that possible logical differences[3] in forecasts of the employment and the unemployment which totals should be equal to the index of the economically active population may arise due to the fact that each series is forecasted individually and not as the difference between the forecast values of the economically active population and another index.

Table 13

THE OUTPUTS OF CALCULATION OF FORECAST VALUES OF THE INDICES THE EMPLOYMENT AND THE UNEMPLOYMENT

Month	Employment (ARIMA)		Unemployment (ARIMA)			Unemployment (BS)		
	Million people	Growth on the respective month of 2012–2013 (%)	Million people	Growth on the respective month of 2012-2013 (%)	% of the index of the number of the gainfully employed population	Million people	Growth on the respective month of 2012–2013 (%)	% of the index of the number of the gainfully employed population
May 2014	72.4	1.0	3.7	-4.0	5.2	3.9	-0.8	5.4
Jun 2014	72.4	1.4	3.7	-9.6	5.1	4.0	-2.9	5.5
Jul 2014	72.5	1.0	3.7	-6.6	5.1	4.0	-0.5	5.5
Aug 2014	72.7	0.4	3.7	-8.6	5.0	3.9	-1.7	5.4
Sep 2014	72.3	0.7	3.7	-7.3	5.1	4.0	1.0	5.5
Oct 2014	72.0	0.7	3.8	-6.7	5.3	4.0	-1.5	5.6

1 The index is calculated in accordance with the methods of the International Labor Organization (ILO) and is given as of the end of the month.
2 The model is evaluated in the period from January 1999 till February 2014.
3 For example, deemed as such a difference may be a simultaneous decrease both in the employment and the unemployment. However, it is to be noted that in principle such a situation is possible provided that there is a simultaneous decrease in the number of the economically active population.

Table 13, cont'd

Month	Employment (ARIMA)		Unemployment (ARIMA)			Unemployment (BS)		
	Million people	Growth on the respective month of 2012–2013 (%)	Million people	Growth on the respective month of 2012-2013 (%)	% of the index of the number of the gainfully employed population	Million people	Growth on the respective month of 2012–2013 (%)	% of the index of the number of the gainfully employed population
For reference: actual values in the same periods of 2013 (million people)								
May 2013	71.7		3.9					
Jun 2013	71.4		4.1					
Jul 2013	71.8		4.0					
Aug 2013	72.4		4.0					
Sep 2013	71.8		4.0					
Oct 2013	71.5		4.1					

Note: in the period from October 1998 till February 2014, the series of the employment is a stochastic process which is stationary around the trend. The series unemployment is a stochastic process with the first order integration. Both the indices include a seasonal component.

According to the forecasts on the basis of ARIMA-models (*Table 13*), in May–October 2014 growth in the employment is expected to amount on average to 0.9% a month on the corresponding period of the previous year.

Average decrease in the unemployment is expected at the level of 4.1% a month as compared to the same period of the previous year. It is to be noted that there is a significant difference between the forecasts of that index received by means of different models. As compared to the respective period of the previous year, a drop in the total number of the unemployed will amount on average to 7.1% as regards the ARIMA-model. As regards KO-model, a drop of 1.1% a month on average is expected.

ANNEX

Diagrams of the Time Series of the Economic Indices of the Russian

Fig. 1a. The Rosstat industrial production index (ARIMA-model)
(% of December 2001)
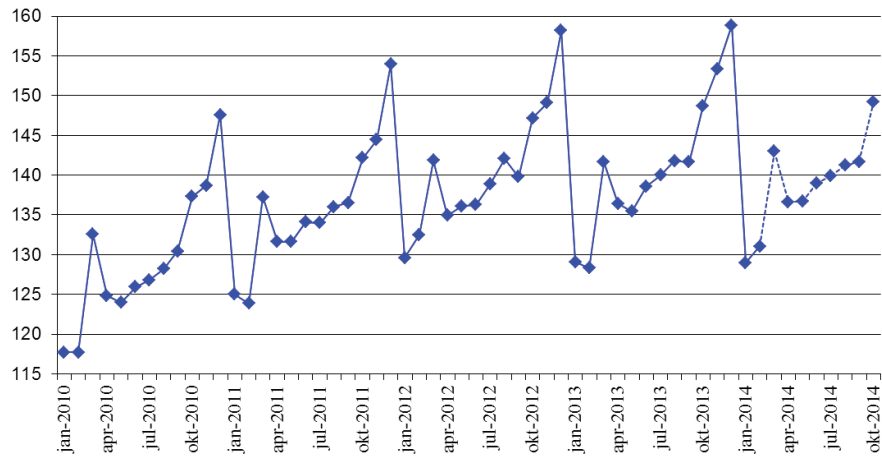
Fig. 1b. The NRU HSE industrial production index (ARIMA-model)
(% of January 1995)
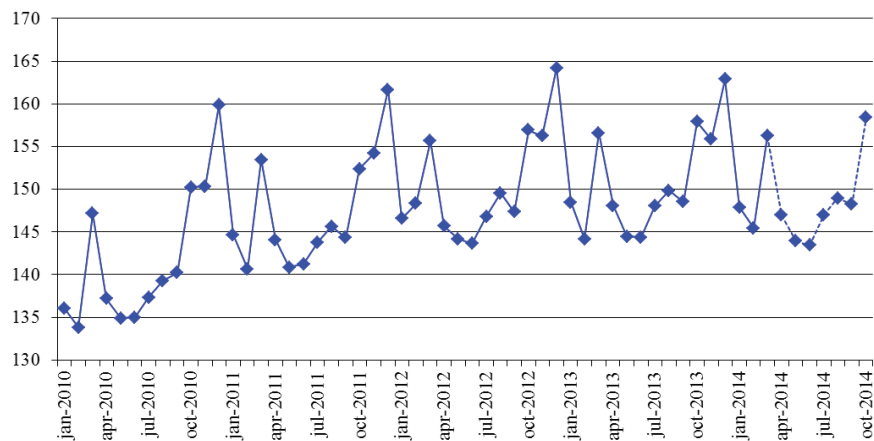
Fig. 2a. The Rosstat industrial production index for mining
(% of December 2001)

15
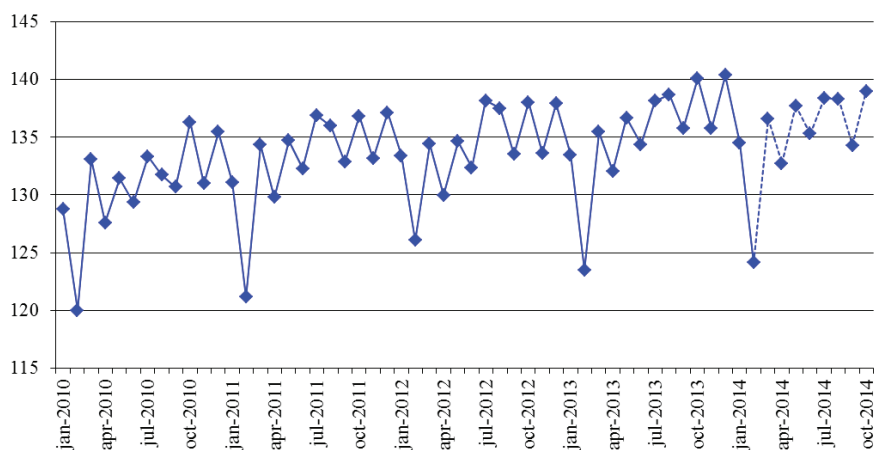
*Fig. 2b. The NRU HSE industrial production index for mining
(% of January 1995)*
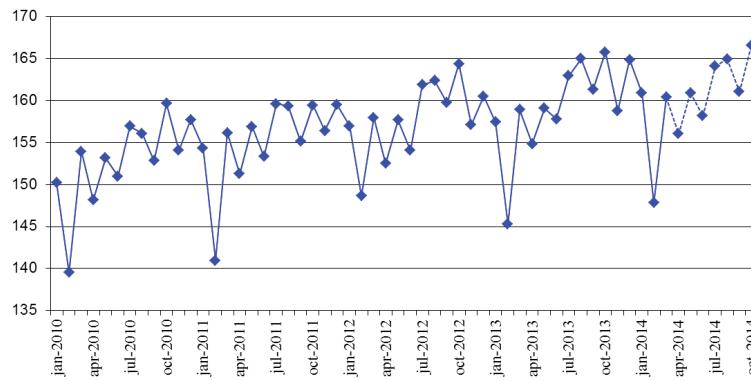
*Fig. 3a. The Rosstat industrial production index for manufacturing
(% of December 2001)*
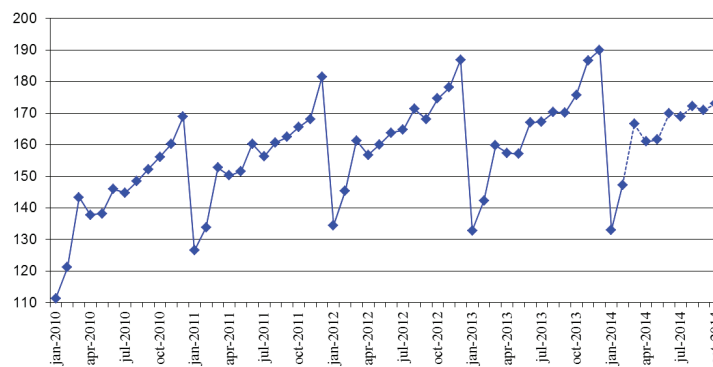
*Fig. 3b. The NRU HSE industrial production index for manufacturing
(% of January 1995)*
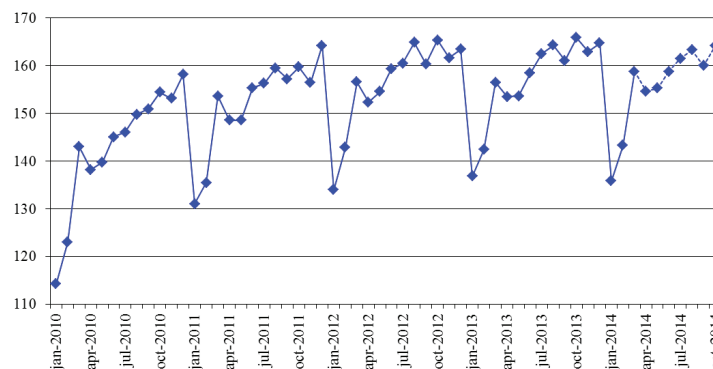
*Fig. 4a. The Rosstat industrial production index for utilities (electricity, water, and gas)
(as a percentage of that in December 1998)*
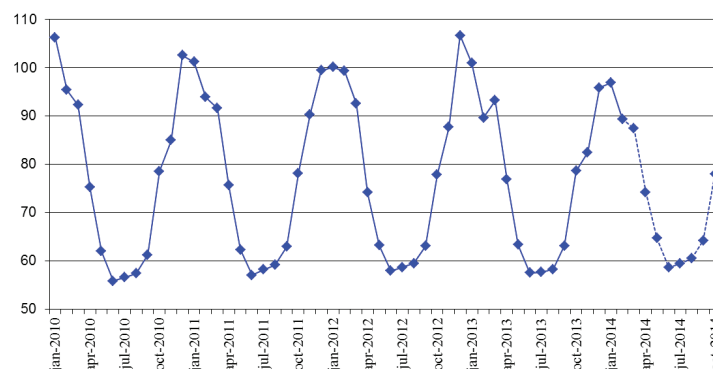
Fig. 4b. The NRU HSE industrial production index for utilities (electricity, water, and gas)
(as a percentage of that in January 1995)
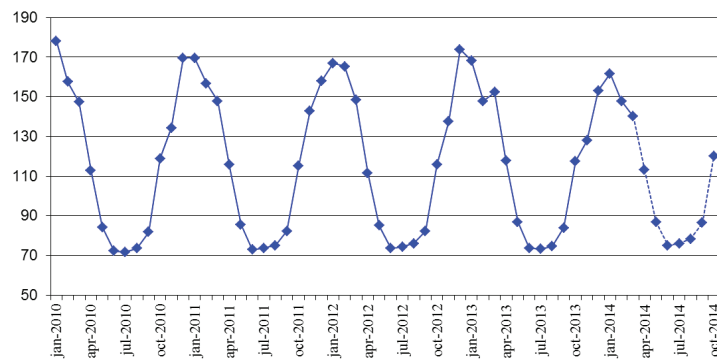
Fig. 5a. The Rosstat industrial production index for food products
(as a percentage of that in December 2001)
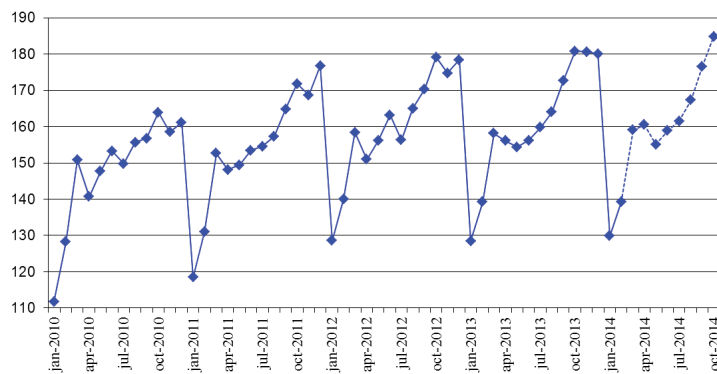
Fig. 5b. The NRU HSE industrial production index for food products
(as a percentage of that in January 1995)
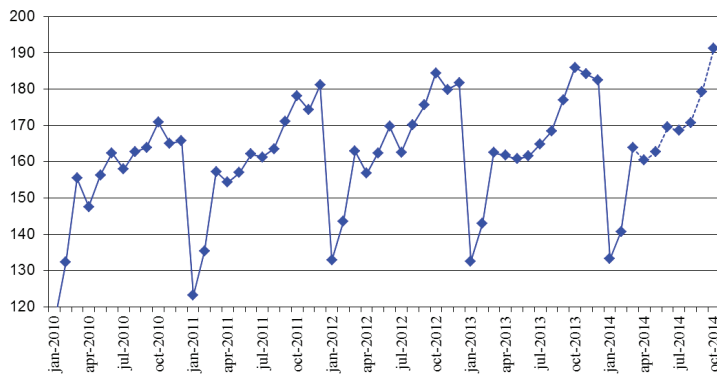
Fig. 6a. The Rosstat industrial production index for coke and petroleum
(as a percentage of that in December 2001)
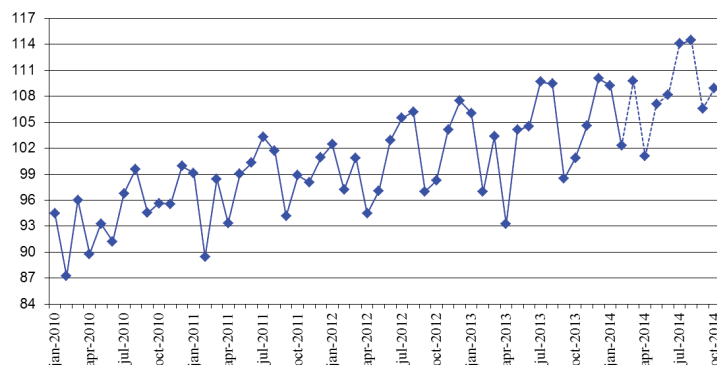
*Fig. 6b. The NRU HSE industrial production index for petroleum and coke
(as a percentage of that in January 1995)*
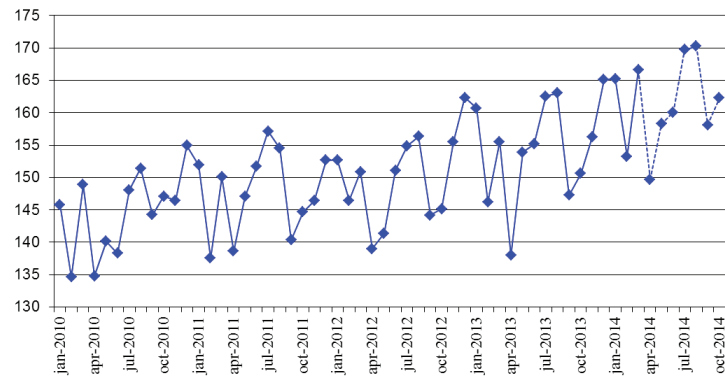
*Fig.7a. The Rosstat industrial production index for primary metals and fabricated metal products
(as a percentage of that in December 1998)*
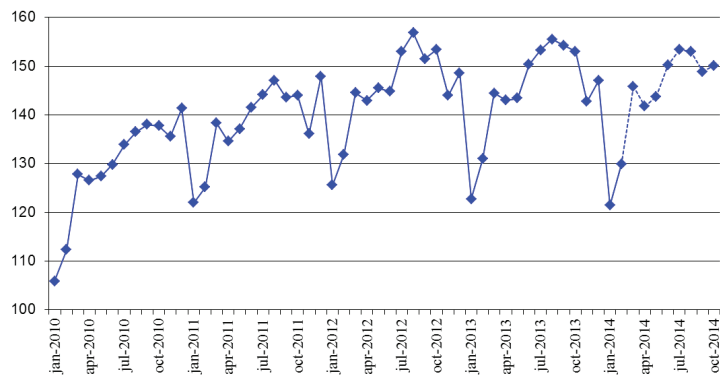
*Fig. 7b. The NRU HSE industrial production index for primary metals and fabricated metal products
(as a percentage of that in January 1995)*
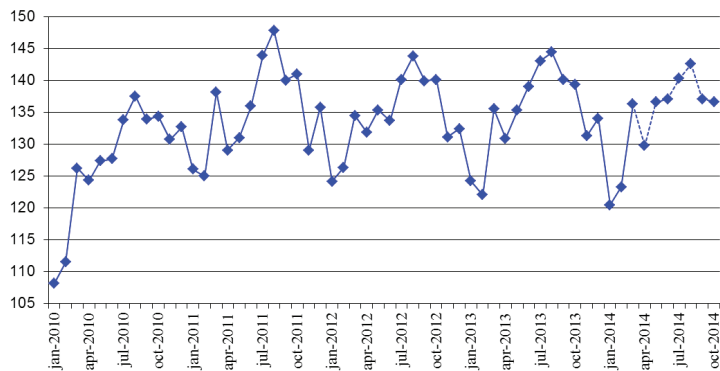
*Fig. 8a. The Rosstat industrial production index for machinery
(as a percentage of that in December 1998)*
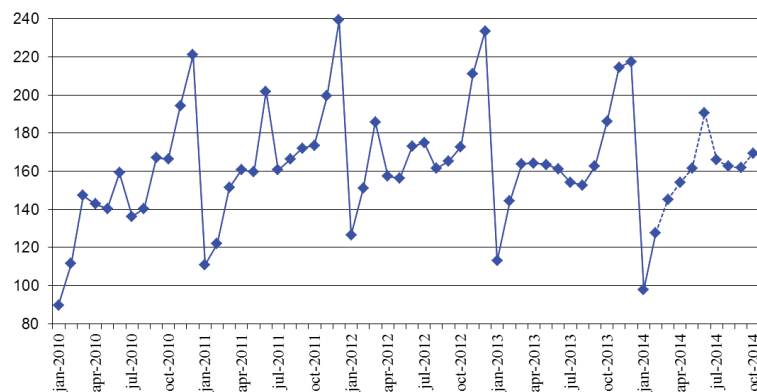
Fig. 8b. The NRU HSE industrial production index for machinery (as a percentage of that in January 1995)
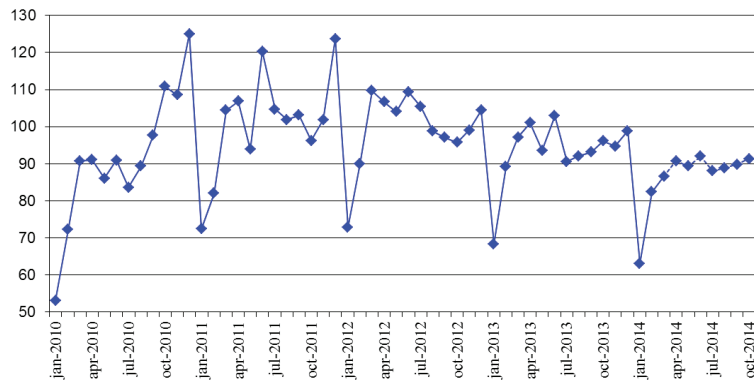
Fig. 9. The volume of retail sales (billion Rb)
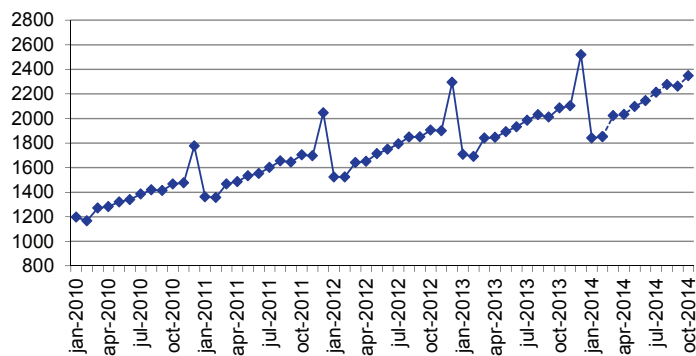
Fig. 9a. The real volume of retail sales (as a percentage of that in the same period of the previous year)
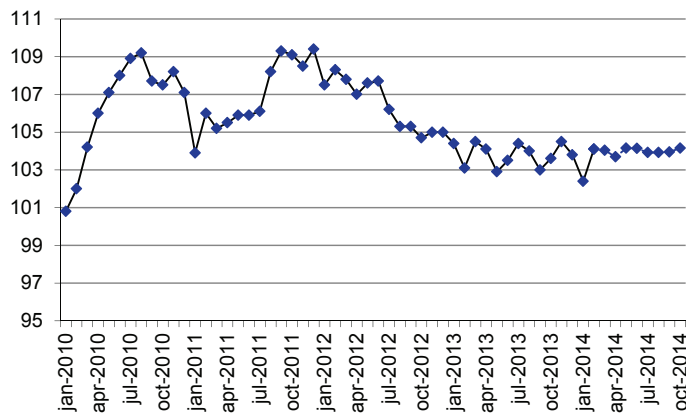
Fig. 10. Investments in capital assets (billion Rb)
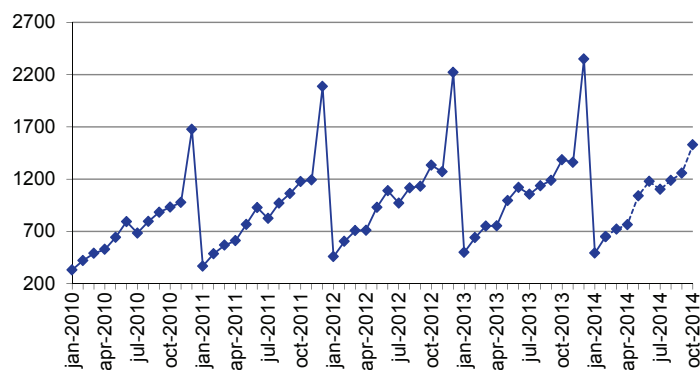
Fig. 10a. Real investments in capital assets
(as a percentage of those in the same period of the previous year)
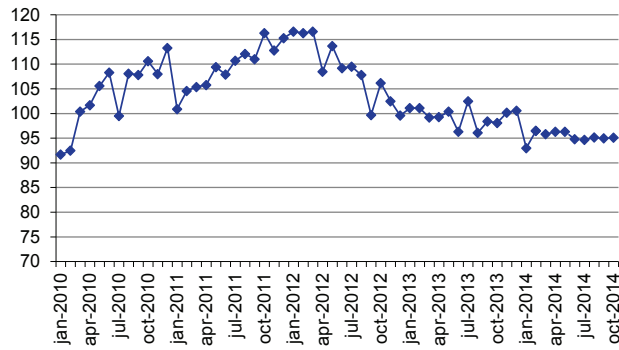
Fig.11. Export to all countries (billion USD)
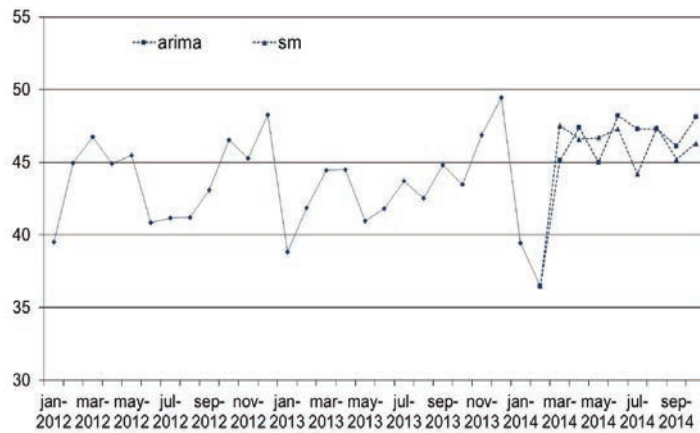
Fig. 12. Export to countries outside the CIS (billion USD)
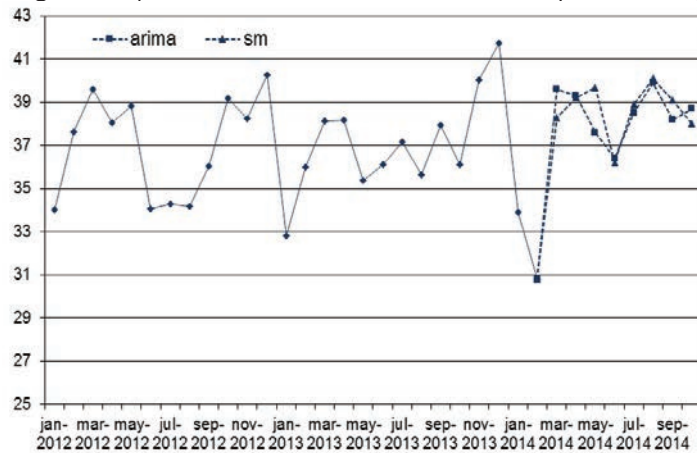
Fig. 13. Import from all countries (billion USD)
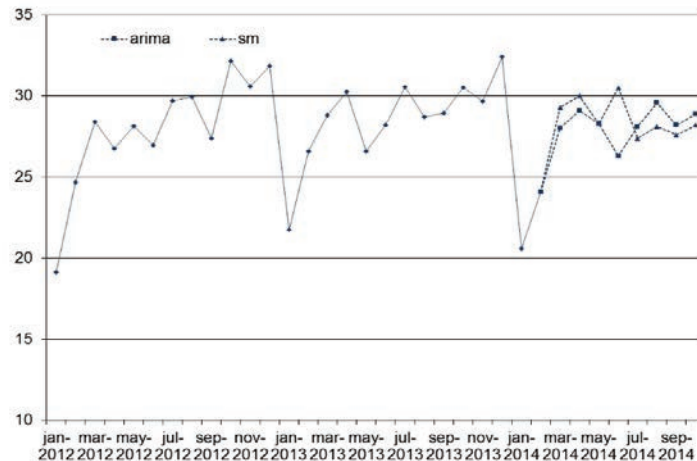
Fig. 14. Import from countries outside the CIS (billion USD)
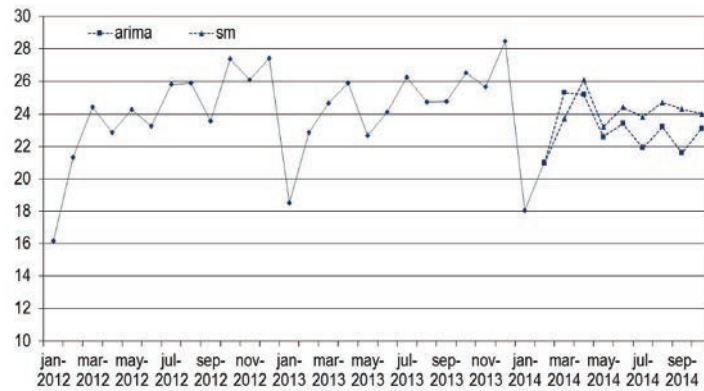
Fig. 15. The consumer price index
(as a percentage of that in December of the previous year)
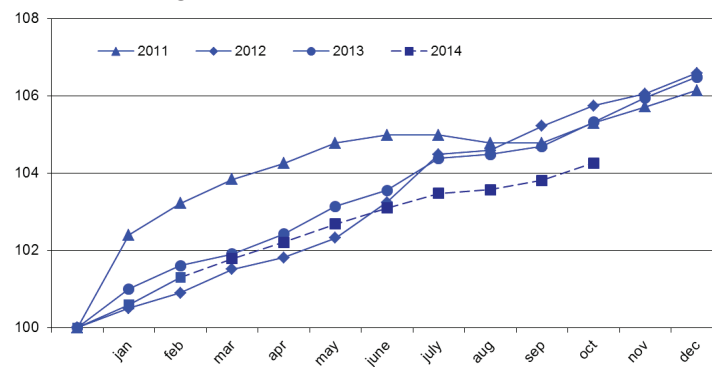
Fig. 15a. The consumer price index
(as a percentage of that in December of the previous year) (SM)
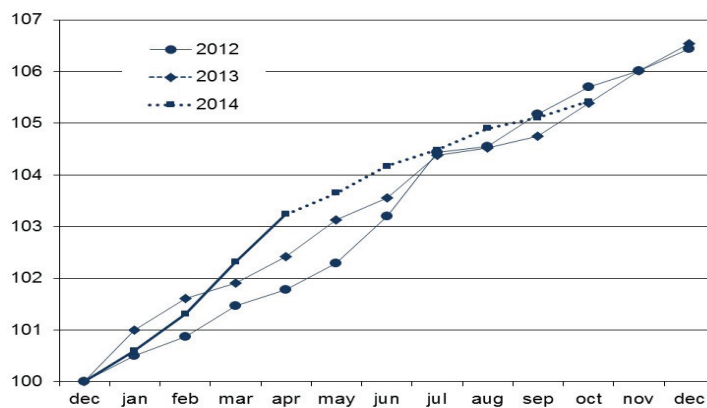
Fig.16. The producer price index for industrial goods
(as a percentage of that in December of the previous year)
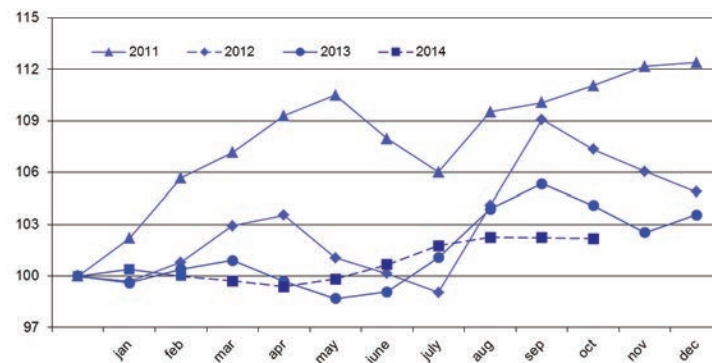
Fig. 17. The price index for mining
(as a percentage of that in December of the previous year)
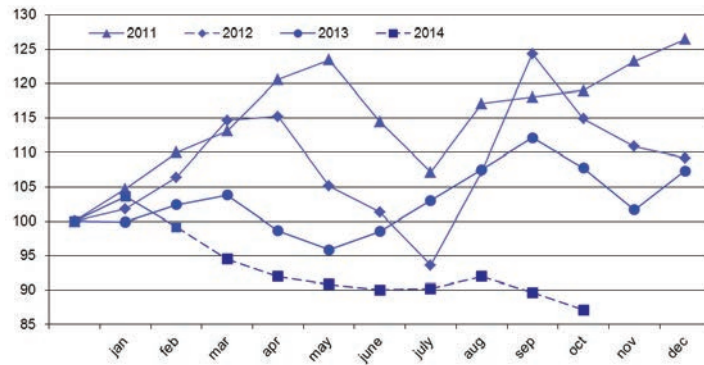
Fig. 18. The price index for manufacturing
(as a percentage of that in December of the previous year)
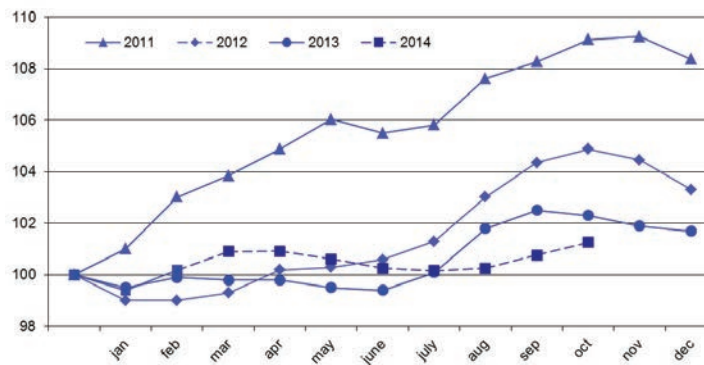
Fig. 19. The price index for utilities (electricity, water, and gas)
(as a percentage of that in December of the previous year)
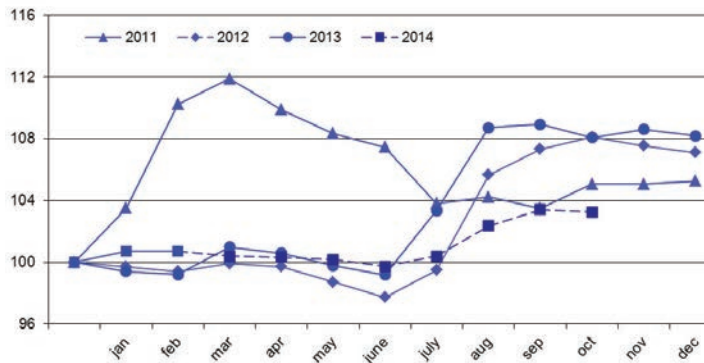
Fig. 20. The price index for food products
(as a percentage of that in December of the previous year)
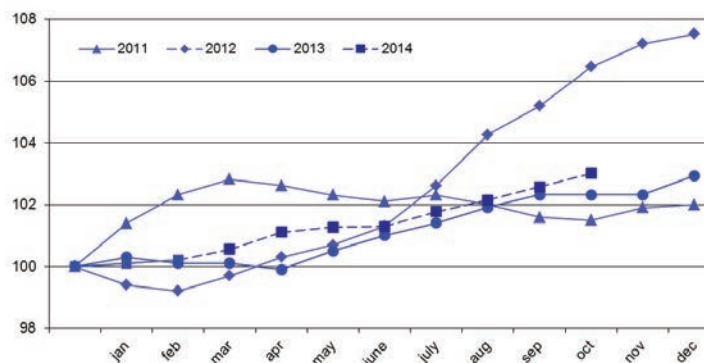
Fig. 21. The price index for the textile and sewing industry
(as a percentage of that in December of the previous year)
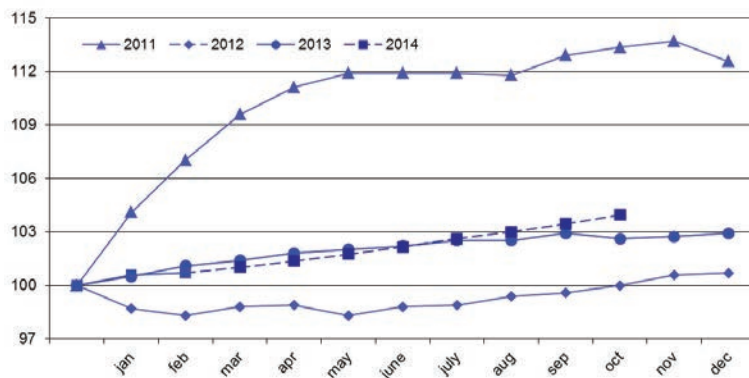
Fig. 22. The price index for wood products
(as a percentage of that in December of the previous year)
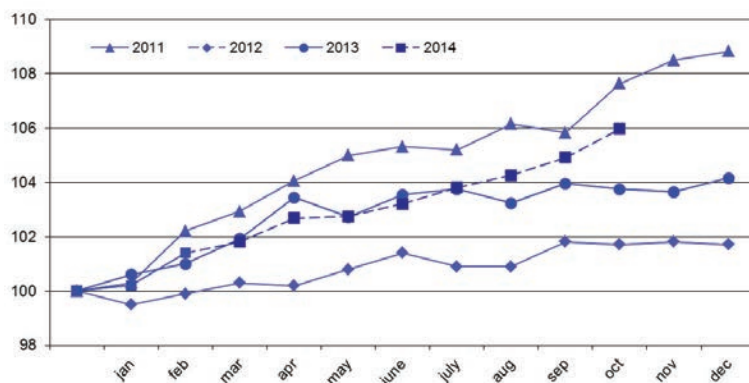
Fig. 23. The price index for the pulp and paper industry
(as a percentage of that in December of the previous year)
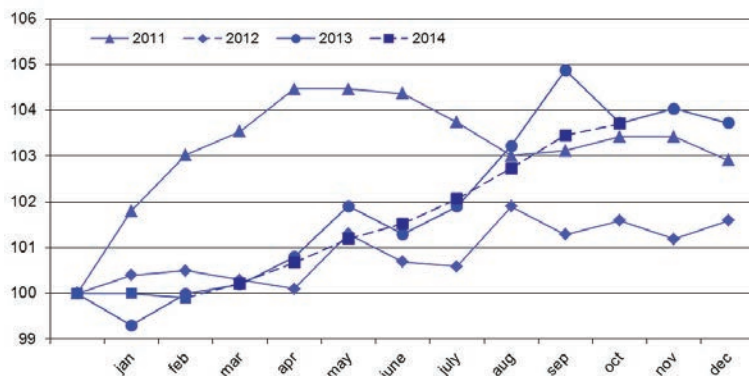
Fig. 24. The price index for coke and petroleum
(as a percentage of that in December of the previous year)
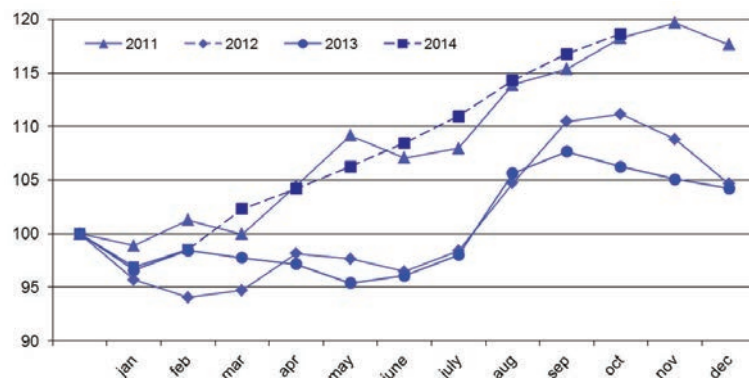
Fig. 25. The price index for the chemical industry
(as a percentage of that in December of the previous year)
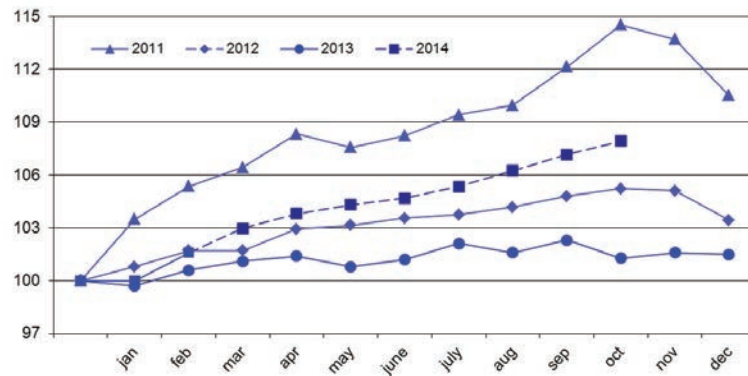
Fig. 26. The price index for primary metals and fabricated metal products
(as a percentage of that in December of the previous year)
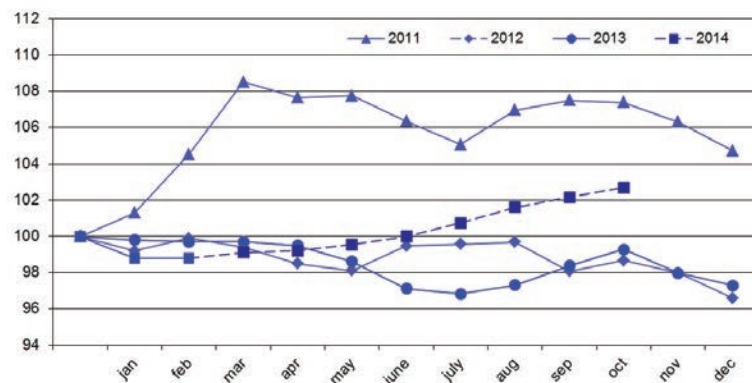
Fig. 27. The price index for machinery
(as a percentage of that in December of the previous year)
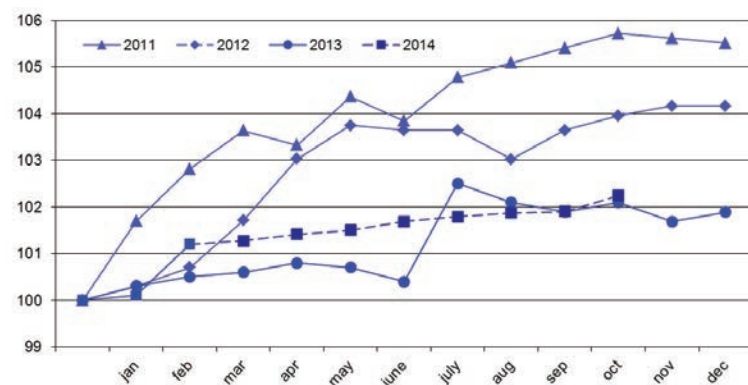
Fig. 28. The price index for transport equipment manufacturing
(as a percentage of that in December of the previous year)
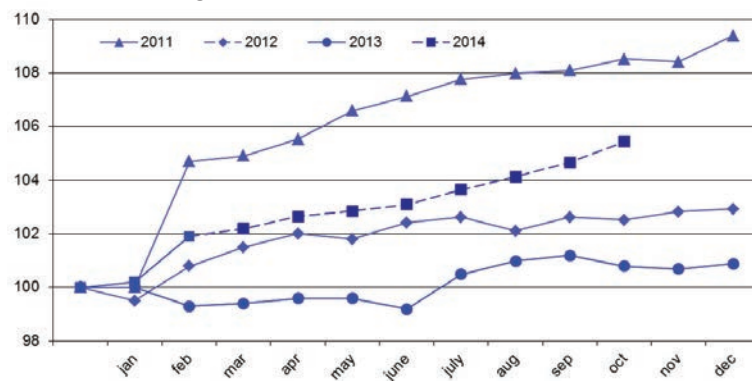
Fig. 29. The cost of the monthly per capita minimum food basket (Rb)
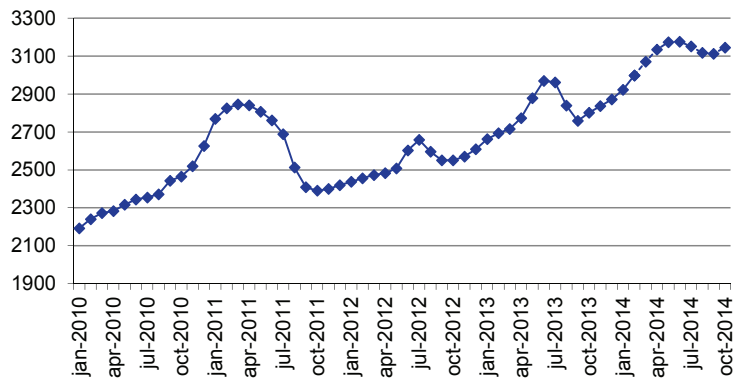
Fig. 30. The composite index of transportation tariffs (for each year, as a percentage of that in the previous month)

— 2012   — •— 2013
— ■ — 2014
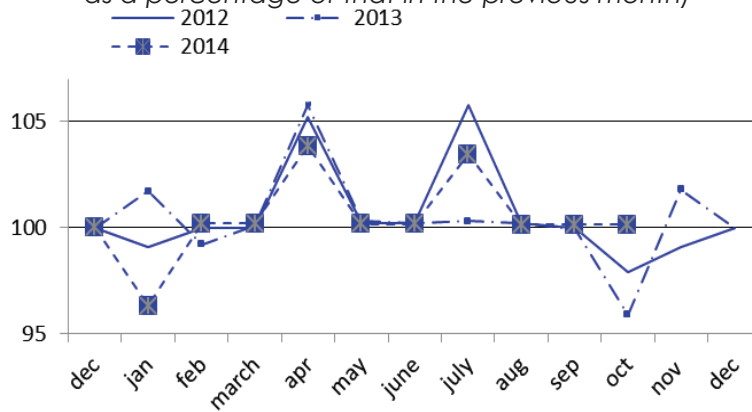
Fig. 31. The index of motor freight tariffs (for each year, as a percentage of that in the previous month)

— 2012   — •— 2013
— ■ — 2014
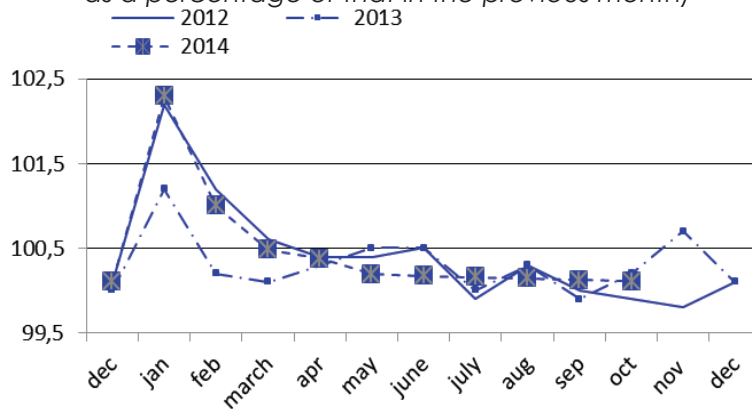
Fig. 32. The index of pipeline tariffs (for each year, as a percentage of that in the previous month)

— 2012   — •— 2013
— ■ — 2014
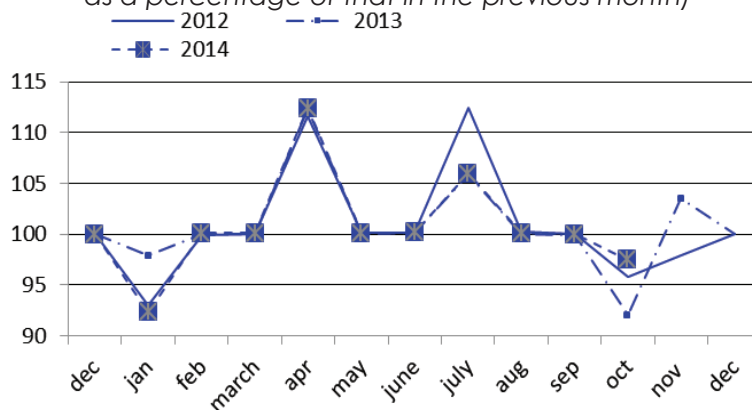
Fig. 33. The Brent oil price ($ per barrel)
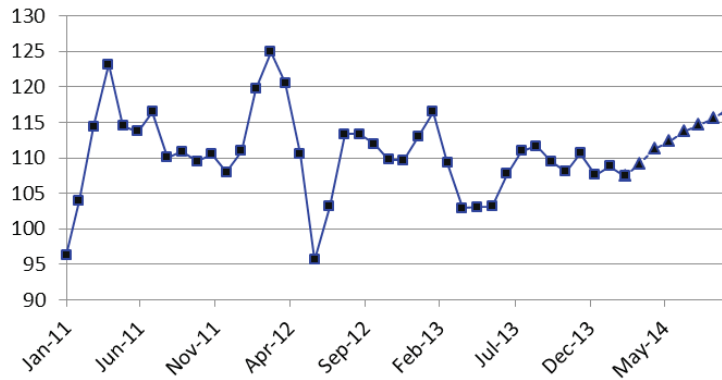
Fig. 34. The aluminum price ($ per ton)
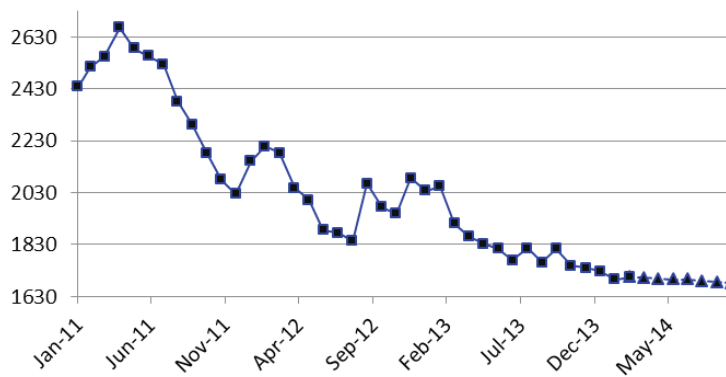
Fig. 35. The gold price ($ per ounce)
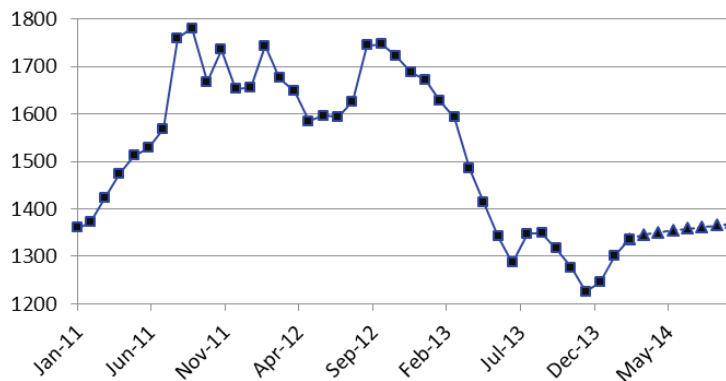
Fig. 36. The nickel price ($ per ton)
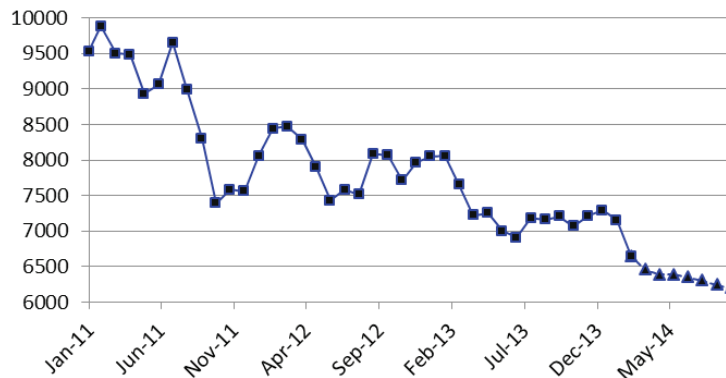
Fig. 37. The copper price ($ per ton)
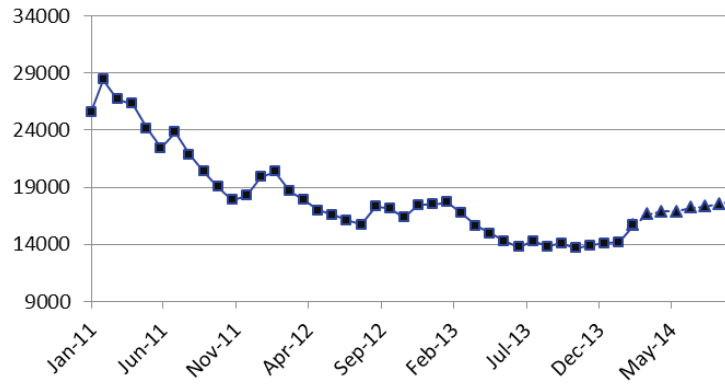
Fig. 38. The monetary base, million Rb
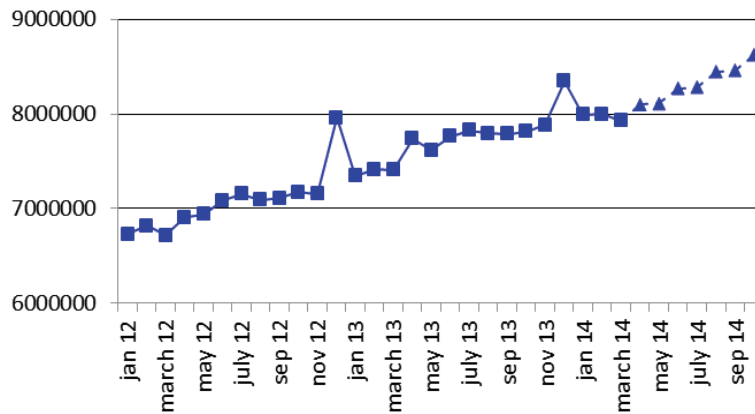
Fig. 39. M₂, billion Rb
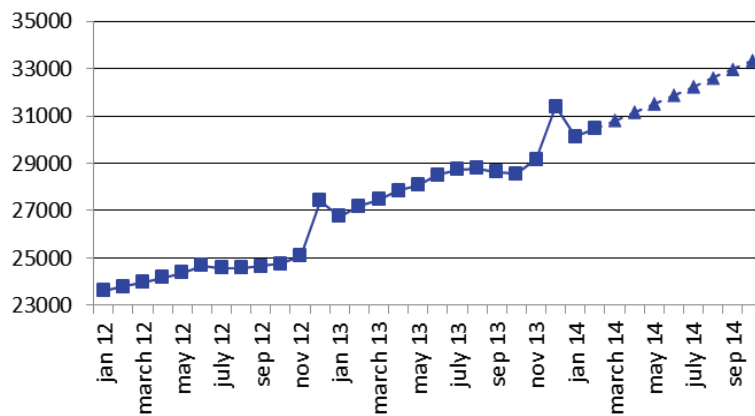
Fig. 40. The international reserves of the Russian Federation, million USD
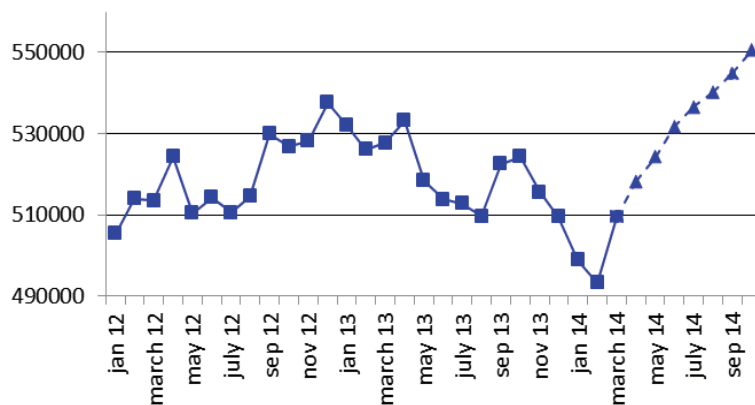
Fig. 41. The RUR/USD exchange rate
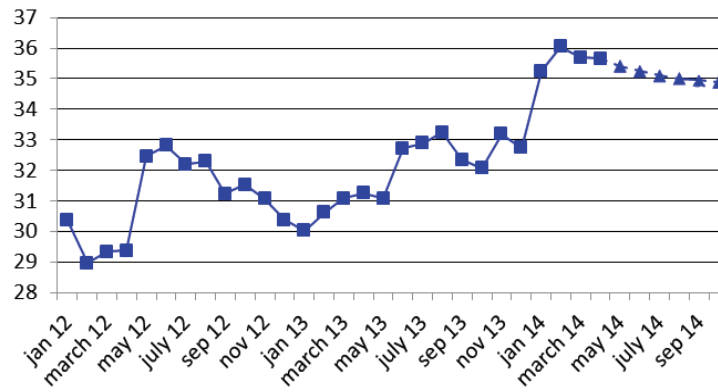
Fig. 41a. The RUR/USD exchange rate (SM)
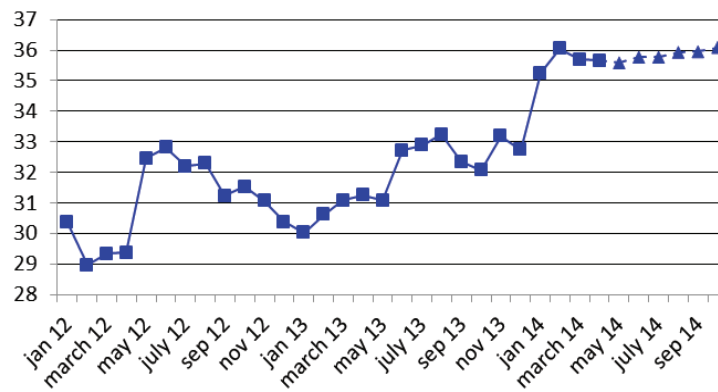
Fig. 42. The USD/EUR exchange rate
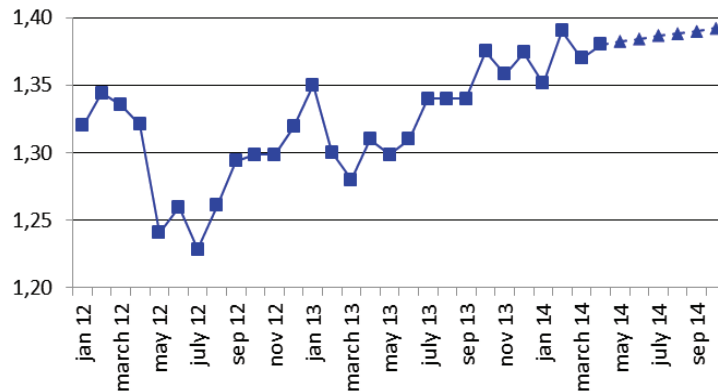
Fig. 42a. The USD/EUR exchange rate (SM)
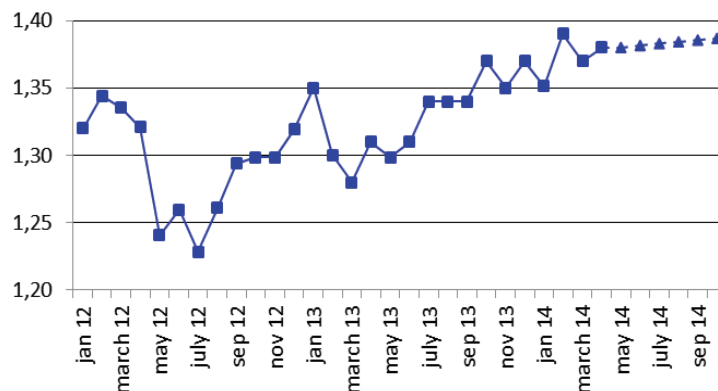
Fig. 43. Real disposable cash income
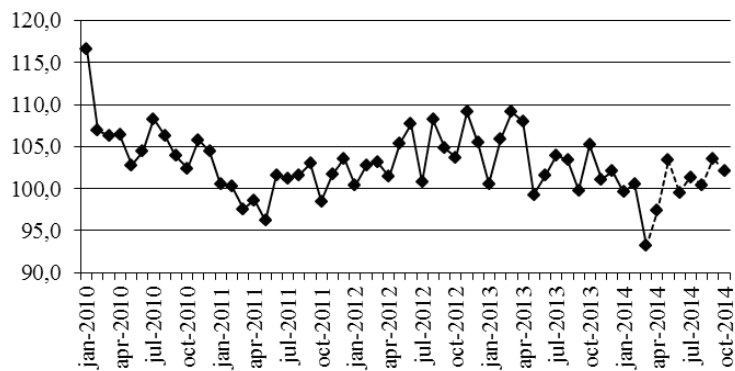*(as a percentage of that in the same period of the previous year)*

Fig. 44. Real cash income
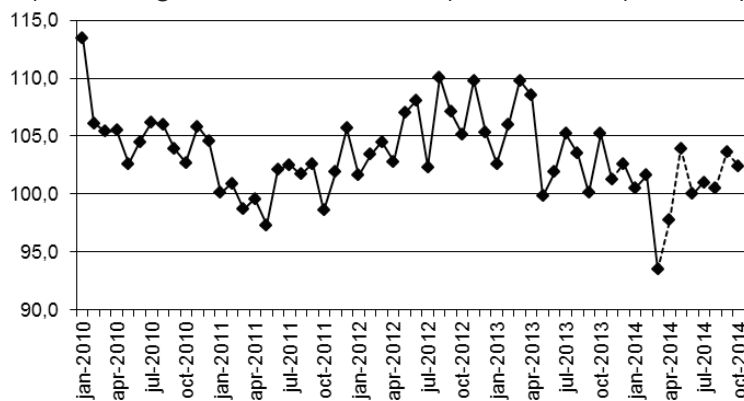*(as a percentage of that in the same period of the previous year)*

Fig. 45. Real accrued wages
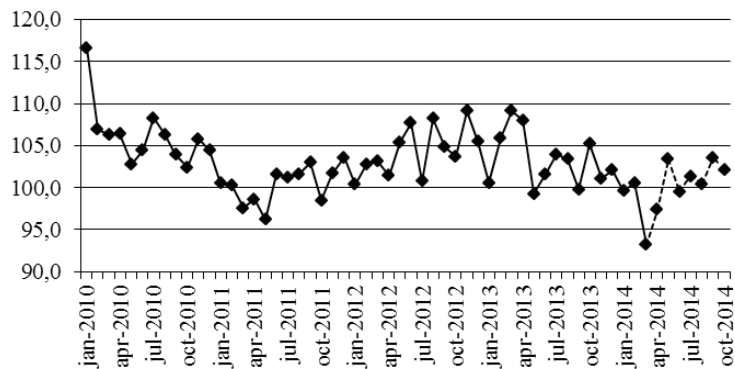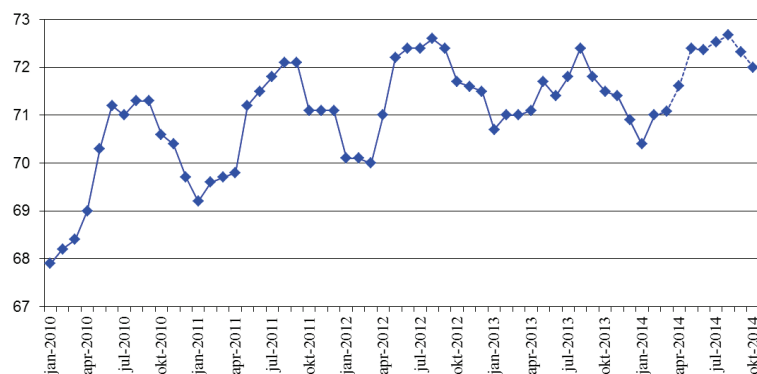*(as a percentage of those in the same period of the previous year)*

Fig. 46. Employment (million people)

Fig. 47. Unemployment (million people)