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

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INTRODUCTION TO ALL THE ISSUES

This Bulletin presents calculations of values of different economic indices of the Russian Federation in November 2014 – April 2015 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 used 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.●

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																		
Nov 2014	-2.4	-0.3	0.3	-0.9	1.1	0.0	-5.2	0.0	3.8	5.6	2.5	2.4	6.4	7.5	0.6	7.1	-12.1	-7.8
Dec 2014	-0.8	1.5	1.3	1.3	1.3	-0.5	-3.0	0.7	0.3	7.0	3.9	3.4	4.7	5.6	2.4	5.5	-4.1	-11.8
Jan 2015	0.9	0.1	-0.3	-0.5	2.2	-0.6	0.4	2.8	-0.3	2.8	3.9	4.4	3.6	2.1	1.9	9.7	17.7	-11.2
Feb 2015	0.1	0.3	0.1	-0.4	3.1	0.3	-1.3	1.0	-0.3	3.6	4.7	5.4	2.7	3.4	3.4	6.8	13.4	-9.6
Mar 2015	-0.8	1.9	0.8	1.5	2.9	1.0	0.8	1.9	0.1	3.9	4.2	3.8	1.3	2.3	3.9	3.9	18.8	-10.6
Apr 2015	-0.2	1.3	-1.7	0.7	2.1	0.8	-0.7	0.1	-0.9	0.8	3.6	3.2	1.3	3.6	0.0	4.9	14.2	-13.0
For reference: actual growth in 2013-2014 on the respective month of 2012-2013																		
Nov 2013		2.8		-0.3	1.8	1.0	4.8	0.8	-5.9	-7.0	3.4	2.4	0.4	0.4	-0.9	0.1	1.8	-4.4
Dec 2013		0.4		-0.8	2.0	2.7	1.7	0.8	-10.1	-12.0	1.0	0.4	2.3	1.7	-1.0	1.2	-6.7	-5.3
Jan 2014		-0.2		0.4	0.9	3.7	0.0	-0.2	-3.9	-4.0	1.1	1.9	2.9	3.9	-1.0	-2.8	-13.3	-6.9
Feb 2014		2.1		0.9	0.8	1.9	3.4	0.6	-0.3	0.0	-0.1	-1.8	5.4	5.0	-0.9	1.0	-11.4	-9.1
Mar 2014		1.4		-0.2	0.6	0.8	3.5	1.6	-6.6	-8.1	1.8	0.8	8.6	7.3	1.4	0.1	-15.4	-12.1
Apr 2014		2.4		1.2	1.1	0.9	3.9	2.1	-1.9	-1.7	1.8	1.5	11.2	9.1	4.1	0.3	-10.9	-3.3

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.

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1 It 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 November 2014 – April 2015, the series of monthly data of the indices of industrial production of the Federal State Statistics Service (Rosstat) from January 2002 till August 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 September 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 growth[2] in the NRU HSE industrial production index in November 2014 – April 2015 on the corresponding period of the previous year for industry in general amounts to 0.2%. As regards the Rosstat industrial production index, it amounts to 0.1%. On the basis of the results of 2014, the forecasted annual growth in the Rosstat industrial production index and the NRU HSE industrial production index will amount to 0.4% and 1.3%, respectively.

In November 2014 – April 2015, the monthly average values of the Rosstat and NRU HSE industrial production indices for mining amount to 2.1% and 0.2%, respectively. As for production of coke and petroleum, the average growth in the indices of Rosstat and NRU HSE is expected at the level of 3.3% and 4.1%, respectively.

In November 2014 – April 2015, the average growth in the NRU HSE industrial production index for manufacturing amounts to 1.1% on the corresponding period of the previous year, while that in the Rosstat index, to (-1.5%). The monthly average values of the Rosstat and NRU HSE industrial production indices for food products amount to 3.8% and 3.8%, respectively. In November 2014 – April 2015, the monthly average values of the Rosstat and NRU HSE industrial production indices for primary metals and fabricated metal products amount to 2.1% and 6.3%, respectively. As for machinery, the average growth in the indices of Rosstat and NRU HSE is expected at the level of 8.0% and (-10.7%), respectively.

In November 2014 – April 2015, the average growth in the Rosstat industrial production index for utilities (electricity, water and gas) amounts to 0.5% on the corresponding period of the previous year, while that in the NRU HSE index, to 4.0%.

In 2014, growth in the Rosstat and NRU HSE industrial production indices will amount on average (by the type of economic activities) to 0.5% and 0.3%, respectively.

Retail Sales

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

Table 2

THE OUTPUTS OF CALCULATIONS OF FORECAST VALUES OF THE RETAIL SALES AND THE REAL 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)
Nov 2014	2298.9 (9.5)	101.5
Dec 2014	2794.2 (11.0)	101.4
Jan 2015	2026.5 (9.4)	101.5
Feb 2015	2022.1 (9.1)	101.1
Mar 2015	2225.0 (9.4)	101.1
Apr 2015	2223.5 (9.7)	101.4
For reference: actual value in the same months of 2013–2014		
Nov 2013	2099.5	104.1
Dec 2013	2517.2	103.5
Jan 2014	1851.8	102.7
Feb 2014	1853.3	104.0
Mar 2014	2033.7	104.1
Apr 2014	2027.3	102.8

Note: series of retail sales and real retail sales in the January 1999 – August 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.

As seen from *Table 2*, in November 2014 – April 2015 the average expected growth in monthly sales volumes amounts to about 9.7% on the corresponding period of 2013–2014.

In November 2014 – April 2015, the average expected growth in monthly real sales amounts to 1.3% on the corresponding period of 2013–2014.

On the basis of the results of 2014, year-on-year growth in retail sales in nominal terms and real terms will amount to 11.0% and 2.2%, respectively.

INVESTMENTS IN CAPITAL ASSETS

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

The outputs in *Table 3* show that in November 2014 – April 2015 the average expected growth in investments amounts to about 1.3% on the corresponding period of 2013–2014.

In November 2014 – April 2015, the average expected drop in real investments amounts to 1.9% on the corresponding period of 2013–2014.

On the basis of the results of 2014, year-on-year growth in index of investments in capital assets in nominal terms will amount to 7.5%. As regards the index of real investments in capital assets, a drop of 2.7% is expected on the basis of the results of 2014.

Table 3

THE OUTPUTS OF CALCULATIONS OF FORECAST VALUES 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)
Nov 2014	1422.2 (4.1)	98.4
Dec 2014	2524.1 (7.5)	98.3
Jan 2015	480.9 (-2.3)	97.8
Feb 2015	646.9 (-0.5)	97.9
Mar 2015	699.7 (-0.1)	97.9
Apr 2015	749.8 (-1.1)	98.1
For reference: actual values in the same months of 2012–2013		
Nov 2013	1366.7	100.4
Dec 2013	2349.0	100.6
Jan 2014	492.2	93.0
Feb 2014	650.2	96.5
Mar 2014	700.4	95.7
Apr 2014	758.2	97.3

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

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 August 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 October 2014 – March 2015, the average expected growth in the export, import, export to countries outside the CIS and import from countries outside the CIS will amount to -0.42%, -9.5%, -3.9% and -6.4%, respectively, on the corresponding period of 2013. In November 2014 – April 2015, the average expected volume of the trade balance with all the countries will amount to $212.4bn which figure is equal to a 13.7% increase as compared to the same period of 2013–2014. Generally, in 2014 the average expected trade balance surplus with all the countries will amount to $212.4bn which is equal to a 16.7% increase as compared to 2013.

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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.

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
Nov 2014	46.6	44.8	100	96	28.2	28.6	95	96	38.6	39.3	97	98	24.5	24.4	95	95
Dec 2014	48.7	48.4	98	98	28.7	30.0	88	92	40.4	38.8	97	93	26.6	26.4	93	93
Jan 2015	39.3	37.2	99	94	19.2	17.5	92	83	32.5	30.5	95	89	16.6	16.9	90	92
Feb 2015	42.1	40.9	115	112	22.1	21.2	92	88	33.7	32.8	110	107	19.1	19.7	90	93
Mar 2015	46.5	45.8	99	97	24.5	24.7	89	90	38.1	37.9	93	93	22.1	23.6	92	98
Apr 2015	46.2	45.6	97	96	24.7	24.5	89	88	38.4	38.1	94	93	23.2	23.1	95	95
For reference: actual values in respective months of 2013–2014 (billion USD)																
Nov 2013	46.8				29.8				40.0				25.7			
Dec 2013	49.5				32.5				41.8				28.5			
Jan 2014	39.7				21.0				34.2				18.4			
Feb 2014	36.5				24.0				30.7				21.2			
Mar 2014	47.1				27.4				40.8				24.0			
Apr 2014	47.7				27.7				41.0				24.3			

Note: in the period from January 1999 till August 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 August 2014[1]. Table 5 presents the outputs of model calculations of forecast values in November 2014 – April 2015 in accordance with ARIMA-models, structural models (SM) and models built with utilization of business surveys (BS).

In November 2014 – April 2015, the expected monthly average growth in the consumer price index will amount to 0.7%. In the above period, the producer price index (PPI) is expected to grow on average at the level of 0.3% a month. On the basis of three models, on average, annual growth in the consumer price index is expected at the level of 8.1%, while that as regards the producer price index, at the level of 5.5%.

As regards producer price indices, in November 2014 – April 2015 the following monthly average growth rates are expected: mining (1.8%), manufacturing (0.7%), utilities (electricity, water and gas) (1.0%), food products (0.8%), the textile and sewing industry (0.4%), wood products (0.5%),

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

Table 5

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)	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
										Producer price indices:								
Forecast values (% of the previous month)																		
Nov 2014	100.5	100.6	100.5	99.8	99.4	100.2	102.8	100.7	100.1	100.7	100.5	100.3	99.9	101.9	100.8	100.8	100.5	100.8
Dec 2014	100.5	100.7	100.7	100.9	100.4	100.3	102.0	100.2	99.9	100.5	100.0	100.0	100.4	101.5	100.6	99.4	100.6	100.3
Jan 2015	101.0	100.6	101.4	99.8	100.3	99.8	100.6	100.6	101.7	100.6	100.5	100.6	100.4	101.2	100.9	100.7	100.9	101.4
Feb 2015	100.6	100.6	100.6	99.8	100.3	100.8	102.0	101.1	103.9	101.0	100.5	100.8	100.4	102.1	101.2	100.6	101.1	100.0
Mar 2015	100.5	100.5	100.7	100.9	101.4	100.0	102.3	100.7	100.3	100.9	100.4	100.3	100.4	102.1	100.9	100.5	100.4	100.6
Apr 2015	100.5	100.7	100.8	100.3	100.4	100.9	101.4	100.9	100.9	101.3	100.6	100.7	100.5	101.8	100.4	101.1	100.5	100.2
Forecast values (% of December 2013/2014)																		
Nov 2013	107.0	107.8	107.4	106.0	104.5	104.2	109.4	108.2	103.0	111.3	104.0	103.3	102.7	117.0	109.9	109.4	107.6	104.7
Dec 2013	107.6	108.5	108.2	107.0	104.9	104.5	111.6	108.5	103.0	111.9	104.0	103.3	103.1	118.7	110.5	108.8	108.2	105.0
Jan 2014	101.0	100.6	101.4	99.8	100.3	99.8	100.6	100.6	101.7	100.6	100.5	100.6	100.4	101.2	100.9	100.7	100.9	101.4
Feb 2014	101.6	101.2	102.0	99.6	100.6	100.6	102.6	101.8	105.7	101.6	101.0	101.4	100.8	103.2	102.1	101.3	102.0	101.3
Mar 2014	102.2	101.7	102.7	100.5	102.0	100.6	105.0	102.4	106.0	102.6	101.4	101.7	101.3	105.4	102.9	101.8	102.5	101.9
Apr 2014	102.7	102.4	103.5	100.7	102.4	101.5	106.4	103.3	106.0	103.9	102.0	102.4	101.8	107.3	103.4	102.9	103.0	102.2
For reference: actual values in the same periods of 2013–2014 (% of December 2012/2013)																		
Nov 2013		106.0			102.5		101.6	101.9	108.6	102.3	102.7	103.6	104.0	105.1	101.6	98.0	101.7	100.7
Dec 2013		106.5			103.6		107.3	101.7	108.2	102.9	102.9	104.2	103.7	104.2	101.5	97.3	101.9	100.9
Jan 2014		100.6			100.4		103.6	99.4	100.7	100.1	100.6	100.2	100.0	96.9	100.0	98.8	100.1	100.2
Feb 2014		101.3			100.0		99.1	100.2	100.7	100.2	100.7	101.4	99.9	98.5	101.6	98.8	101.3	101.9
Mar 2014		102.3			102.3		105.8	101.6	100.3	101.8	101.4	100.8	100.0	101.9	102.9	100.8	102.2	102.4
Apr 2014		103.2			103.0		106.0	102.6	100.4	103.4	102.1	100.2	100.3	103.3	104.8	102.2	102.9	102.9

Note: in the period from January 1999 till August 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.

the pulp and paper industry (0.3%), coke and petroleum production (1.8%), the chemical industry (0.8%), primary metals and fabricated metal products (0.5%), machinery (0.7%) and transport equipment manufacturing (0.5%).

Annual growth in producer price indices by the type of economic activities will amount on average to 8.0%. On the basis of the results of 2014, the maximum growth is expected in coke and petroleum production (18.7%), while the minimum one, in utilities (electricity, water and gas) (3.0%).

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 November 2014 – April 2015. The forecasts were made on the basis of time series with use the Rosstat data in the period from January 2000 till August 2014. The outputs of calculations are shown in Table 6.

As seen from *Table 6*, growth in the cost of the minimum package of food products as compared to the respective level of the previous year is expected. It is to be noted that the average expected cost of the minimum package of food products amounts to about Rb 3,043.5 The expected growth in the cost of the minimum package of food products amounts on average to about 2.4% as compared to the level of the same period of the previous year. On the basis of the results of 2014, annual growth in the cost of the minimum package of food products amounts to 4.3%.

Indices of Transportation Tariffs

This section presents calculations of forecast values of 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 August 2014. Table 7 shows the outputs of model calculations of forecast values in November 2014 – April 2015. 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.

On the basis of the results of the forecast for November 2014 – April 2015, within six months under review the composite index of transportation tariffs on cargo carriage will grow at the monthly average rate of 1.0%. As a result, in 2014 its annual drop will amount to 6.1%.

Table 6

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

Forecast values according to ARIMA-model (Rb)	
November 2014	2971.9
December 2014	2995.7
January 2015	3012.3
February 2015	3046.5
March 2015	3097.2
April 2015	3137.6
For reference: actual values in the same months of 2013–2014 (billion Rb)	
November 2013	2836.3
December 2013	2871.5
January 2014	2922.9
February 2014	2998.3
March 2014	3080.4
April 2014	3137.5
Expected growth on the respective month of the previous year (%)	
November 2014	4.8
December 2014	4.3
January 2015	3.1
February 2015	1.6
March 2015	0.5
April 2015	0.0

Note: the series of the cost of the monthly per capita minimum food basket in the period from January 2000 till August 2014 are stationary in the first-order differences.

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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 index of tariffs on motor cargo carriage will grow at the average monthly rate of 0.2% within six months. In 2014, annual growth in that index will amount to 3.7%.

Within the next six months, the index of tariffs on pipeline transportation will grow at the monthly average rate of 1.5%. As a result, in 2014 annual growth in the index will amount to 10%.

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)			
November 2014	100.4	100.0	101.6
December 2014	100.4	100.0	102.1
January 2015	100.4	101.7	99.8
February 2015	100.4	100.0	100.0
March 2015	100.4	99.9	102.1
April 2015	103.8	99.9	103.7
Forecast values according to ARIMA-models (% of December of the previous year)			
November 2014	105.7	103.7	107.7
December 2014	106.1	103.7	110.0
January 2015	100.4	101.7	99.8
February 2015	100.8	101.6	99.8
March 2015	101.2	101.6	101.8
April 2015	105.0	101.5	105.5
For reference: actual values in the same period of 2013–2014 (% of the previous month)			
November 2013	101.8	100.7	103.5
December 2013	100.0	100.1	100.0
January 2014	96.3	102.3	92.3
February 2014	100.2	101.0	100.1
March 2014	100.1	100.5	100.0
April 2014	102.3	99.7	104.8

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

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 November 2014 – April 2015 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 September 2014.

The average expected level of prices on oil amounts to about $96.1 per barrel which figure is on average 11.3% lower than the respective indices of the previous year. Prices on aluminum are expected at the level of about $2,000 per ton, while their average growth is expected to amount to about 15% against the respective level of the previous year. Prices on gold are expected to amount to about $1,253 per ounce. Average prices on copper are expected to amount to about $6,923 per ton, while those on nickel, to about $18,165 per ton. The expected average depreciation of prices on gold and copper amounts to about 2% and 1%, respectively, on the respective period of the previous year, while prices on nickel are expected to appreciate on average by 23%.

As of the end of 2014, Brent oil prices are expected at the level of $95.8 a barrel (annual drop of 11.0%), while prices on aluminum, gold, copper and nickel, at the level of $1,993 per ton (growth of

15.4%), \$1,253 per ounce (growth of 0.6%), \$6,884 per ton (drop of 5.6%) and \$18,135 a ton (growth of 28.6%), respectively.

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 ($ per ton)
Forecast values					
November 2014	95.21	2033	1239	6862	17983
December 2014	95.28	1998	1260	6861	17953
January 2015	95.77	1993	1253	6884	18135
February 2015	96.12	2002	1239	6924	18208
March 2015	96.85	1985	1256	6976	18312
April 2015	97.45	1989	1274	7032	18401
Growth on the respective month of the previous year (%)					
November 2014	-11.9	16.3	-2.9	-3.0	31.4
December 2014	-13.9	14.8	2.8	-4.9	28.9
January 2015	-11.0	15.4	0.6	-5.6	28.6
February 2015	-11.7	18.1	-4.8	-3.2	28.2
March 2015	-9.8	16.4	-6.0	4.9	16.8
April 2015	-9.7	9.8	-1.9	5.4	5.9
For reference: actual values in the same period of 2013–2014					
November 2013	108.08	1748	1276	7071	13684
December 2013	110.63	1740	1225	7215	13925
January 2014	107.57	1727	1245	7291	14101
February 2014	108.81	1695	1301	7149	14204
March 2014	107.41	1705	1336	6650	15678
April 2014	107.88	1811	1299	6674	17374

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

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 November 2014 – April 2015 were received on the basis of models of time-series of respective indices calculated by the CBR[1] in the period from October 1998 till August 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 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.

In November 2014 – April 2015, the monetary base and the M_2 monetary index will grow at the monthly average rate of 1.1% and 1.0%, respectively. In 2014, annual growth in the M2 index is expected at the level of 3.8%.

In January 2015, seasonal growth of 5.5% in the monetary base is expected. In 2014, annual growth in the monetary base is expected to amount to 6.8%.

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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.

THE FORECAST OF M2 AND THE MONETARY BASE

Period	The Monetary base		M$_2$	
	Billion Rb	Growth on the previous month, %	Billion Rb	Growth on the previous month, %
November 2014	8426	2.2	31558	0.9
December 2014	8418	-0.1	32606	3.3
January 2015	8880	5.5	32337	-0.8
February 2015	8591	-3.3	32634	0.9
March 2015	8774	2.1	32933	0.9
April 2015	8768	-0.1	33234	0.9
For reference: actual value in the respective months of 2013–2014 (growth on the previous month, %)				
November 2013	0.4		2.2	
December 2013	1.7		7.7	
January 2014	9.1		-4.0	
February 2014	-7.4		1.1	
March 2014	0.4		-2.2	
April 2014	-1.0		1.2	

Note: In the period from October 1998 to August 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.

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 August 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 November 2014 – April 2015 the international reserves will grow at the monthly average rate of 0.7%. In 2014, according to forecasts annual drop in international reserves will amount to 9.6%.

THE FORECAST OF THE INTERNATIONAL RESERVES OF THE RUSSIAN FEDERATION

Period	Forecast values according to ARIMA-models	
	Billion USD	Growth on the previous month, %
Nov 2014	455.8	-1.3
Dec 2014	460.8	1.1
Jan 2015	467.4	1.4
Feb 2015	472.1	1.0
Mar 2015	471.7	-0.1
Apr 2015	473.9	0.5
For reference: actual values in the same period of 2013–2014		
Nov 2013	515.6	-1.7
Dec 2013	509.6	-1.2
Jan 2014	498.9	-2.1
Feb 2014	493.3	-1.1
Mar 2014	509.6	3.3
Apr 2014	486.1	-4.6

Note: in the period from October 1998 till August 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 per USD and USD per 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

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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.

each month over the periods between October 1998 and October 2014 and between January 1999 and October 2014[1], respectively.

In November 2014 – April 2015, the value of the USD/RUR exchange rate is forecasted on the basis of the average of the two models equal to Rb 43.39 per $1. As of the end of the year, the forecasted value of the USD/RUR exchange rate on the basis of the two models will amount to Rb 43.32 per $1. A forecast of the EUR/USD exchange rate will amount on average to $1.27 per one euro. As of the end of 2014, the value of the index is forecasted at the level of $1.27 per on euro.

It is to be noted that for both the exchange rates the differences in forecasts made on the basis of different models are rather substantial.

Table 11

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

Period	The USD/RUR exchange rate (RUR per USD)		The EUR/USD exchange rate (USD per EUR)	
	ARIMA	SM	ARIMA	SM
November 2014	43.20	43.73	1.27	1.26
December 2014	42.81	43.98	1.28	1.26
January 2015	42.54	44.10	1.28	1.26
February 2015	42.38	44.33	1.29	1.26
March 2015	42.27	44.47	1.29	1.26
April 2015	42.22	44.68	1.30	1.26
For reference: actual values in the similar period of 2013–2014				
November 2013	33.19		1.35	
December 2013	32.73		1.37	
January 2014	35.24		1.35	
February 2014	36.05		1.39	
March 2014	35.69		1.37	
April 2014	35.70		1.41	

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 September 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 such indices of the standard of living of the population as real disposable cash income and real cash income and a drop in the index of real wages. So, average growth of about 5.2% and 5.1% in real disposable cash income and real cash

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1 The Bulletin applies the IMF's data for the period between January 1999 and August 2014. The data for September and October 2014 was obtained from the foreign exchange rate statistics website: www.oanda.com

2 *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).

income is expected, respectively, as compared to the same period of the previous year. A drop of 3.3% in real wages on the respective period of the previous year is expected.

On the basis of the results of 2014, for 12 months growth in real disposable cash income, real cash income and real accrued wages will amount to 1%, 1.3% and 0.8%, respectively.

Table 12

THE FORECAST OF THE STANDARD OF LIVING INDICES

Period	Real disposable cash income	Real cash income	Real accrued wages
Forecast values according to ARIMA-models (% of the respective month of 2013/2014)			
November 2014	103.1	103.5	97.7
December 2014	102.2	101.9	94.5
January 2015	107.3	106.8	96.9
February 2015	105.3	105.0	98.1
March 2015	108.7	108.7	99.0
April 2015	104.8	104.9	94.1
For reference: actual values in the respective period of 2013–2014 (% of the same period of 2012/2013)			
November 2013	101.0	101.2	104.1
December 2013	102.1	102.6	102.7
January 2014	99.5	100.4	105.2
February 2014	100.5	101.6	104.6
March 2014	93.1	93.4	103.8
April 2014	102.0	101.7	103.2

Note: for calculating purposes, the series of the real disposable cash income, real cash income and real accrued wages in the base form were used (March 1999 was adopted as a base period). In the period from January 1999 till September 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 August 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.

According to the forecasts on the basis of ARIMA-models (*Table 13*), in October 2014 – March 2015 growth in the number of gainfully employed population is expected to amount on average to 0.4% a month on the corresponding period of the previous year. As of the end of 2014, the number of the gainfully employed population is expected to amount to 71.4m people.

An average decrease in the index of the total number of the unemployed is expected at the level of 0.6% a month as compared to the same period of the previous year. At the end of 2014, the average number of the unemployed is expected at the level of 4.1m people.

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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 August 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

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 previous year (%)	Million people	Growth on the respective month of previous year (%)	% of the index of the number of the gainfully employed population	Million people	Growth on the respective month of previous year (%)	% of the index of the number of the gainfully employed population
November 2014	71.6	0.2	3.9	-3.9	5.5	3.9	-3.8	5.4
December 2014	71.3	0.6	4.1	-3.3	5.7	4.0	-3.6	5.6
January 2015	70.8	0.6	4.3	2.3	6.1	4.1	-2.2	5.8
February 2015	71.1	0.1	4.4	3.8	6.1	4.1	-2.2	5.8
March 2015	71.1	0.0	4.2	5.5	5.9	4.0	-0.5	5.6
April 2015	71.5	0.7	4.0	1.1	5.7	3.9	-0.8	5.5
For reference: actual values in the same periods of 2013–2014 (million people)								
November 2013	71.4		4.1					
December 2013	70.9		4.2					
January 2014	70.4		4.2					
February 2014	71.0		4.2					
March 2014	71.1		4.0					
April 2014	71.0		4.0					

Note: in the period from October 1998 till August 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.●

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)
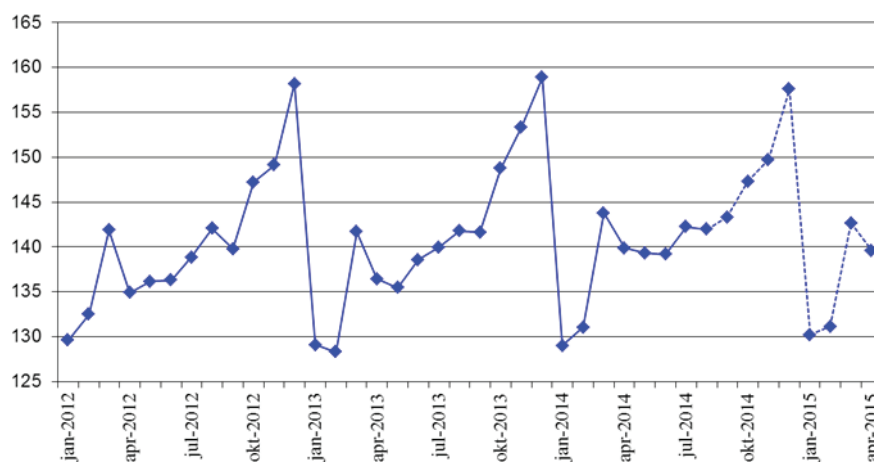
Fig. 1b. The NRU HSE industrial production index (ARIMA-model) (% of January 1995)
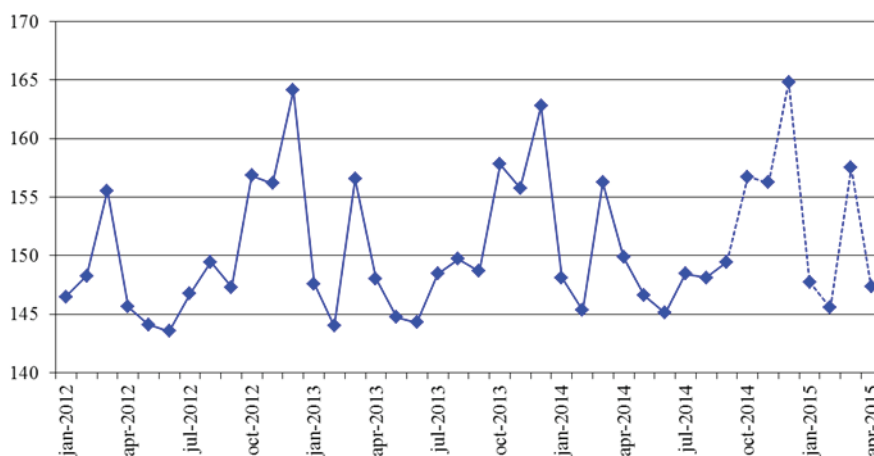
Fig. 2a. The Rosstat industrial production index for mining (% of December 2001)
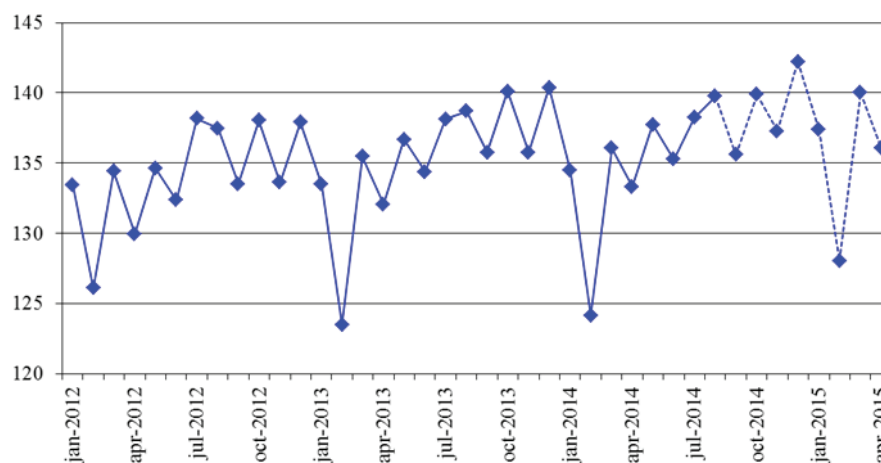
Fig. 2b. The NRU HSE industrial production index for mining
(% of January 1995)
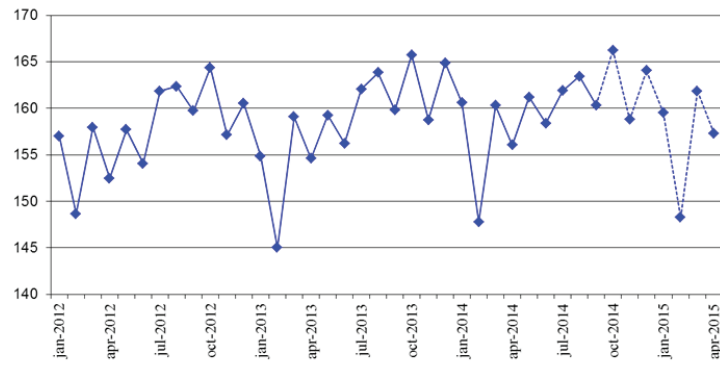
Fig. 3a. The Rosstat industrial production index for manufacturing
(% of December 2001)
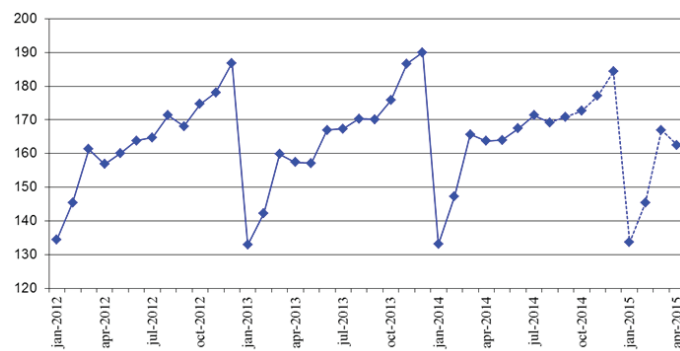
Fig. 3b. The NRU HSE industrial production index for manufacturing
(% of January 1995)
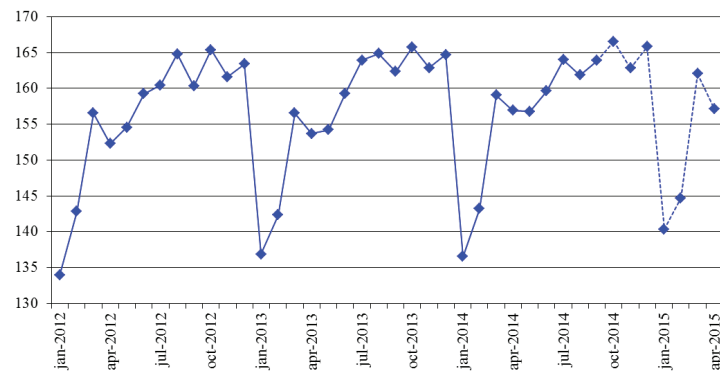
Fig. 4a. The Rosstat industrial production index for utilities (electricity, water, and gas)
(as a percentage of that in December 1998)
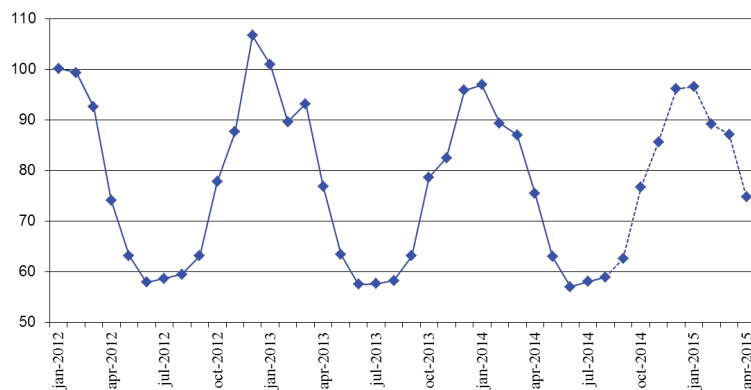
*Fig. 4b. The NRU HSE industrial production index for utilities (electricity, water, and gas)
(as a percentage of that in January 1995)*
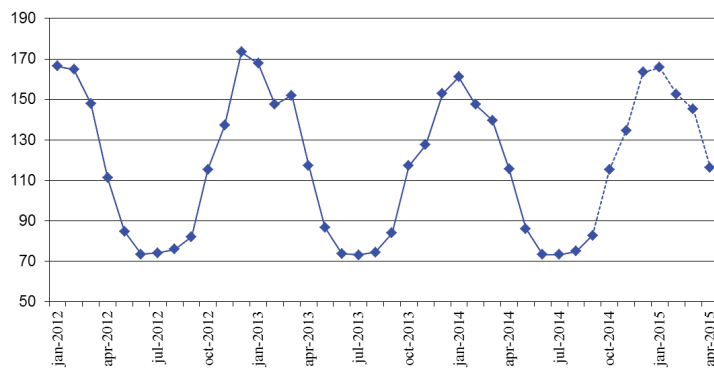
*Fig. 5a. The Rosstat industrial production index for food products
(as a percentage of that in December 2001)*
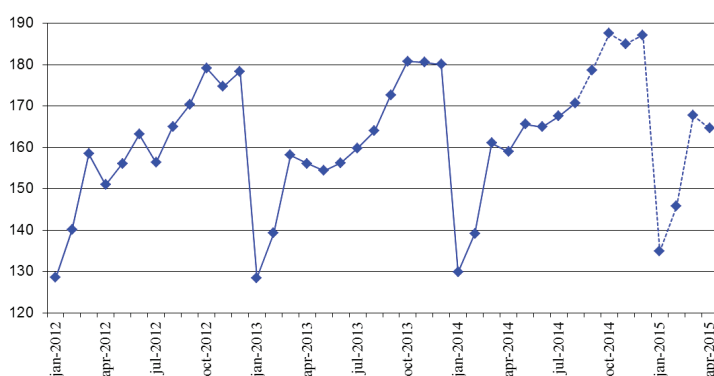
*Fig. 5b. The NRU HSE industrial production index for food products
(as a percentage of that in January 1995)*
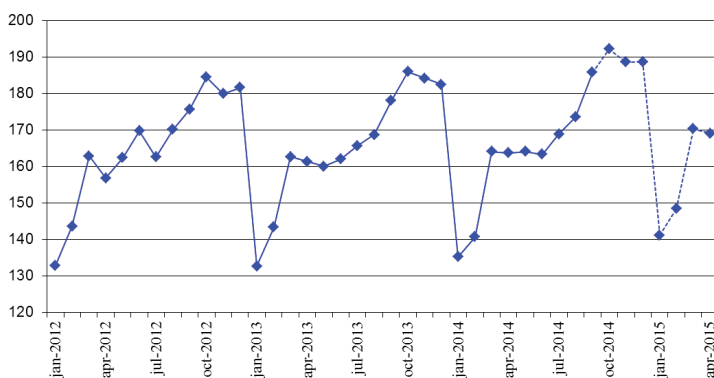
*Fig. 6a. The Rosstat industrial production index for coke and petroleum
(as a percentage of that in December 2001)*
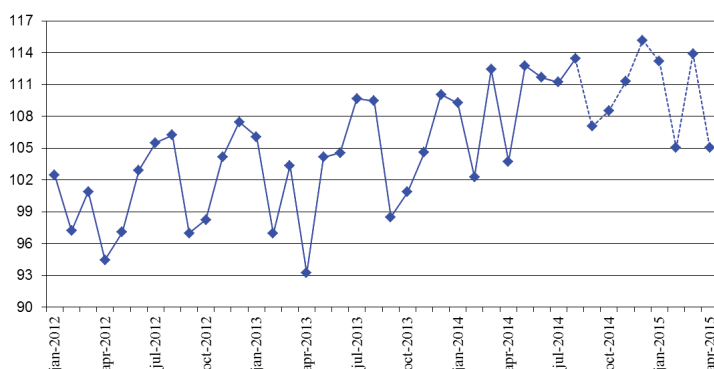
*Fig. 6b. The NRU HSE industrial production index for petroleum and coke
(as a percentage of that in January 1995)*
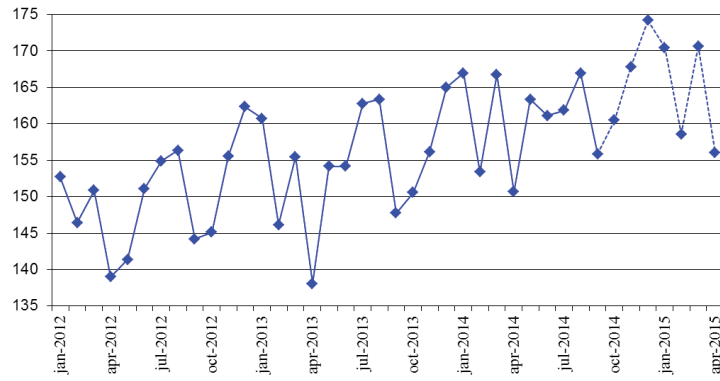
*Fig.7a. The Rosstat industrial production index for primary metals and fabricated metal products
(as a percentage of that in December 1998)*
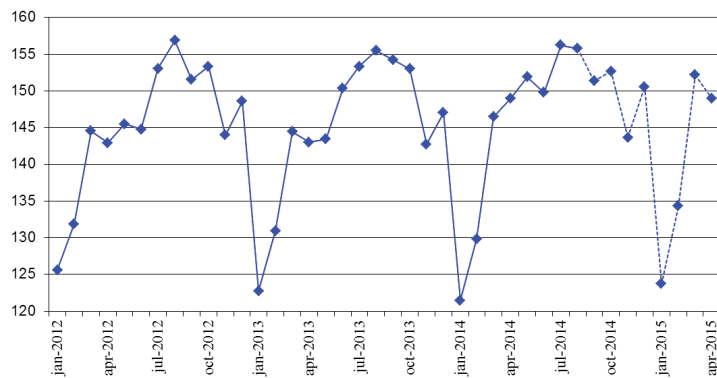
*Fig. 7b. The NRU HSE industrial production index for primary metals and fabricated metal products
(as a percentage of that in January 1995)*
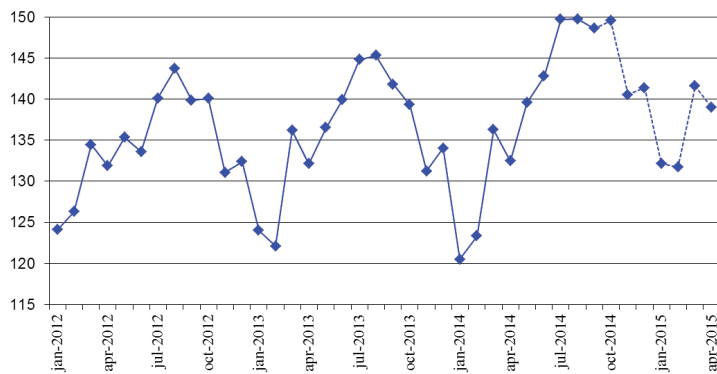
*Fig. 8a. The Rosstat industrial production index for machinery
(as a percentage of that in December 1998)*
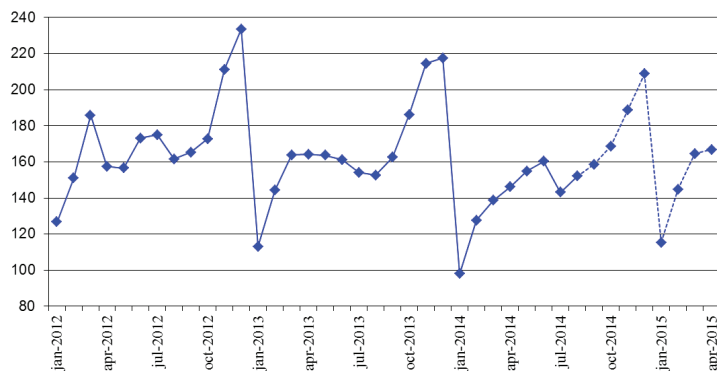
*Fig. 8b. The NRU HSE industrial production index for machinery
(as a percentage of that in January 1995)*
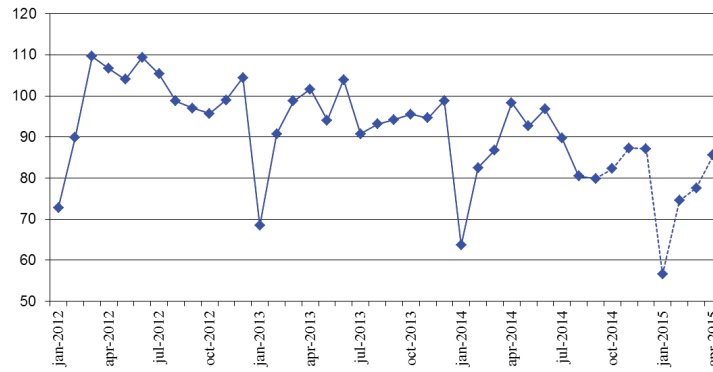
Fig. 9. The volume of retail sales (billion Rb)
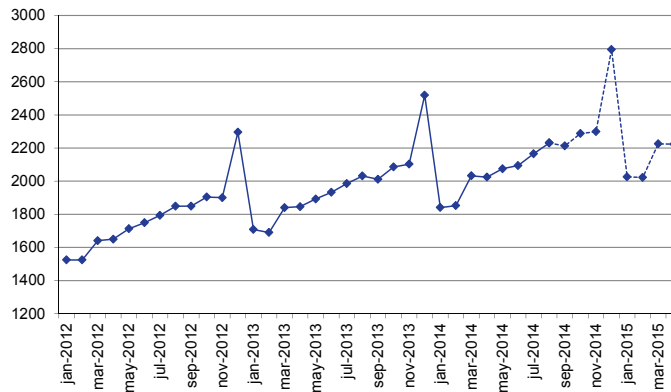
*Fig. 9a. The real volume of retail sales
(as a percentage of that in the same period of the previous year)*
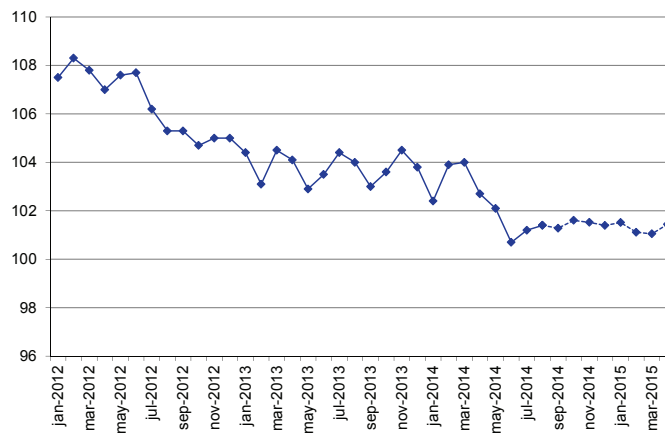
Fig. 10. Investments in capital assets (billion Rb)
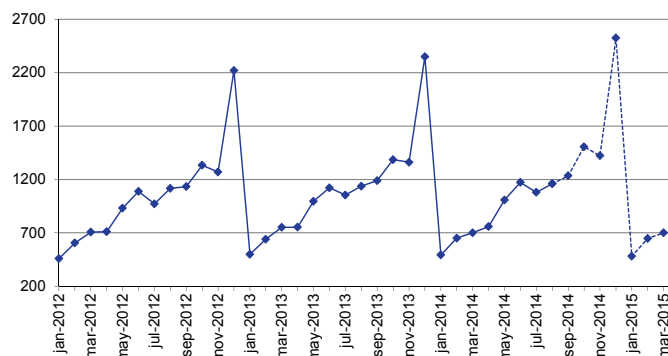
*Fig. 10a. Real investments in capital assets
(as a percentage of those in the same period of the previous year)*
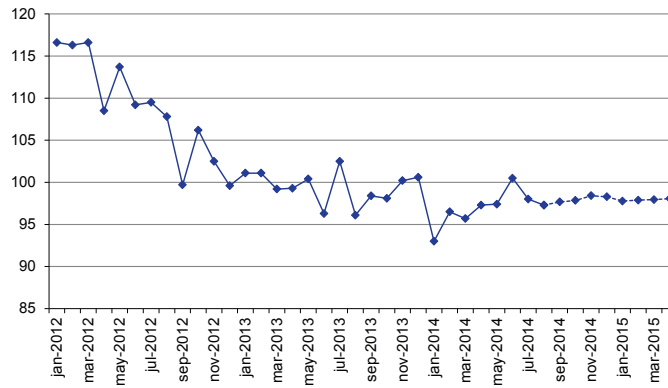
Fig.11. Export to all countries (billion USD)
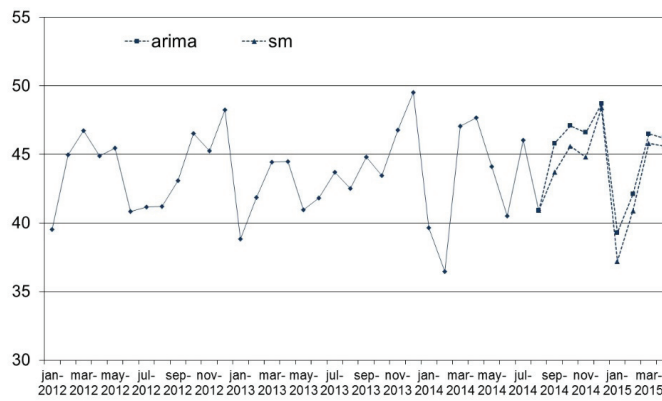
Fig. 12. Export to countries outside the CIS (billion USD)
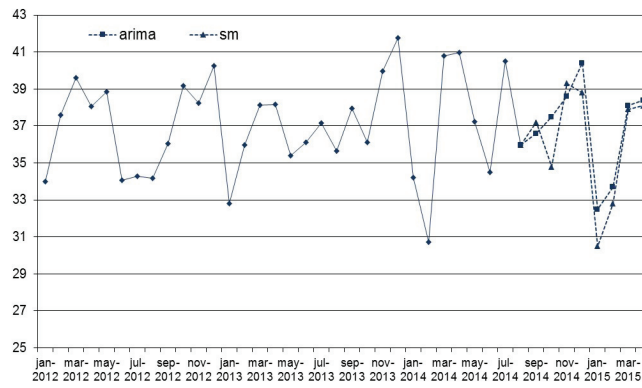
Fig. 13. Import from all countries (billion USD)
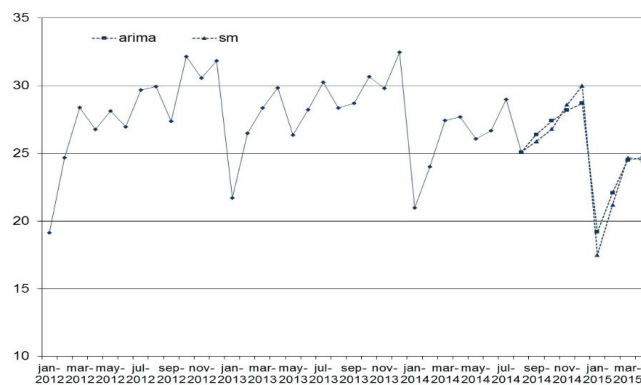
Fig. 14. Import from countries outside the CIS (billion USD)
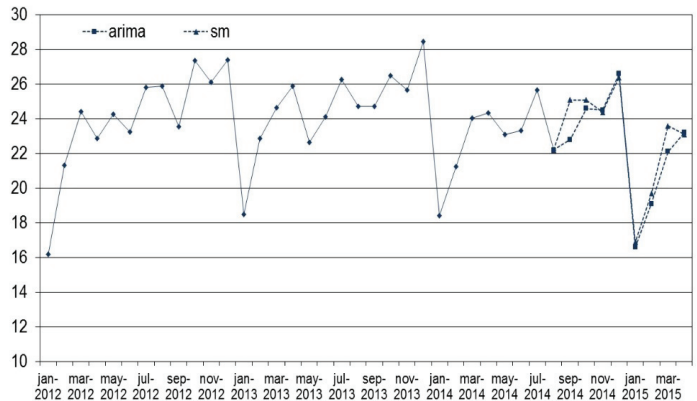
Fig. 15. The consumer price index
(as a percentage of that in December of the previous year)
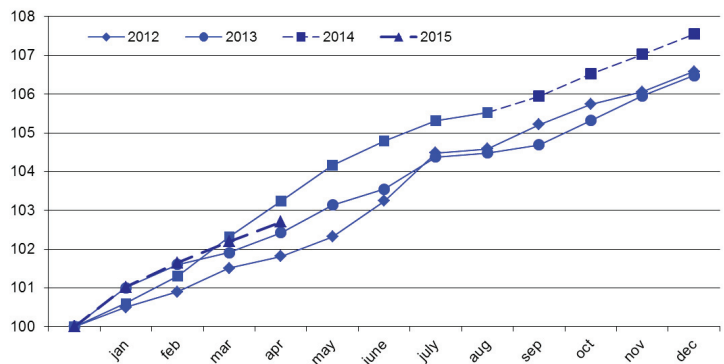
Fig. 15a. The consumer price index
(as a percentage of that in December of the previous year) (SM)
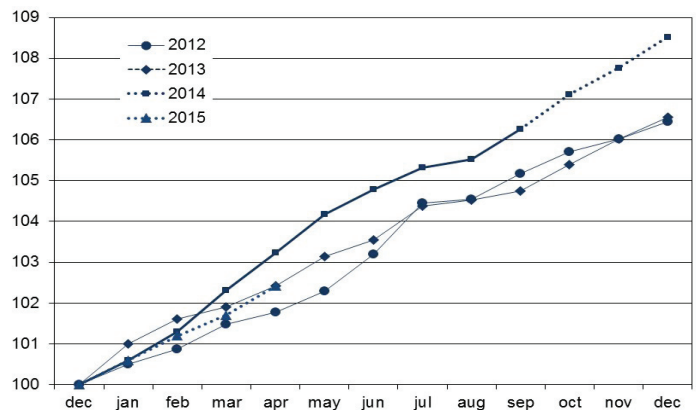
Fig.16. The producer price index for industrial goods
(as a percentage of that in December of the previous year)
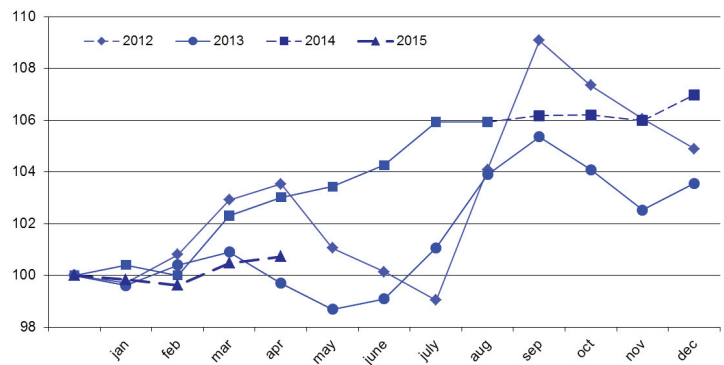
Fig. 17. The price index for mining
(as a percentage of that in December of the previous year)
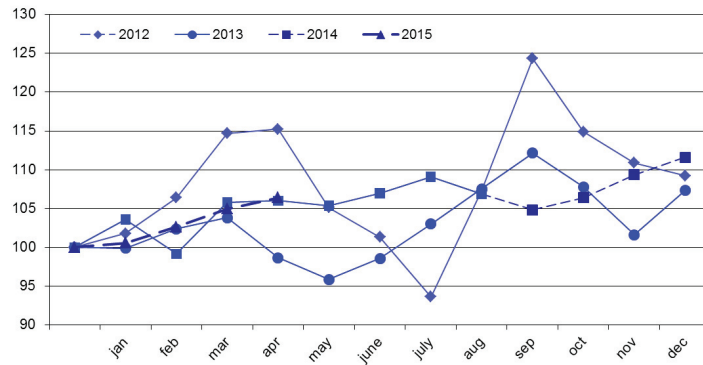
Fig. 18. The price index for manufacturing
(as a percentage of that in December of the previous year)
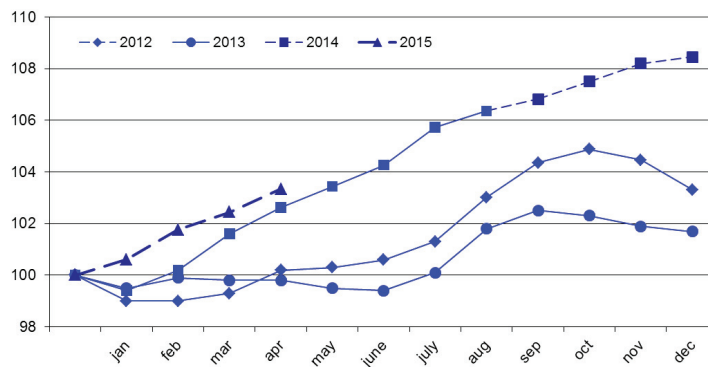
Fig. 19. The price index for utilities (electricity, water, and gas)
(as a percentage of that in December of the previous year)
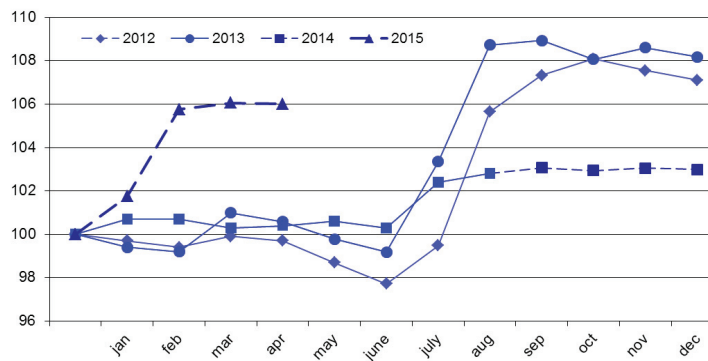
Fig. 20. The price index for food products
(as a percentage of that in December of the previous year)
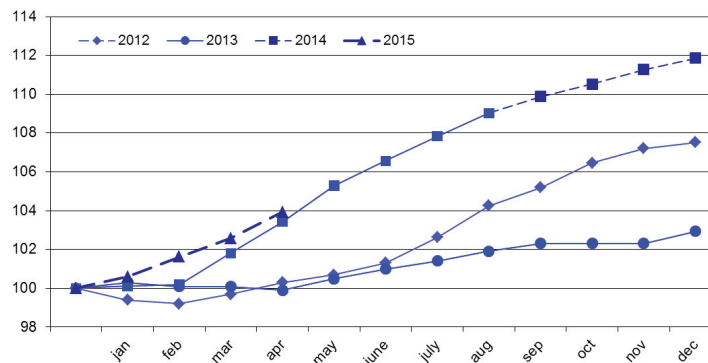
Fig. 21. The price index for the textile and sewing industry
(as a percentage of that in December of the previous year)
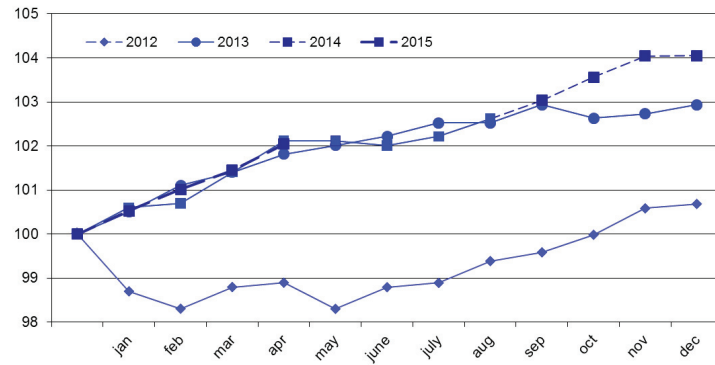
Fig. 22. The price index for wood products
(as a percentage of that in December of the previous year)
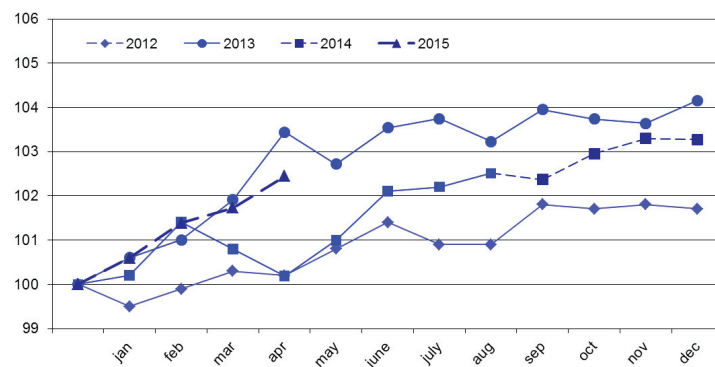
Fig. 23. The price index for the pulp and paper industry
(as a percentage of that in December of the previous year)
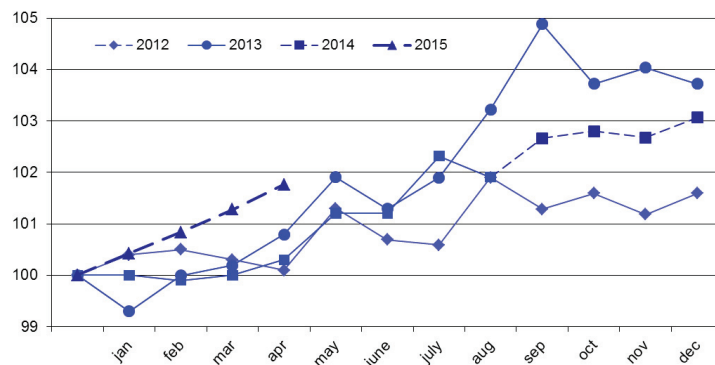
Fig. 24. The price index for coke and petroleum
(as a percentage of that in December of the previous year)
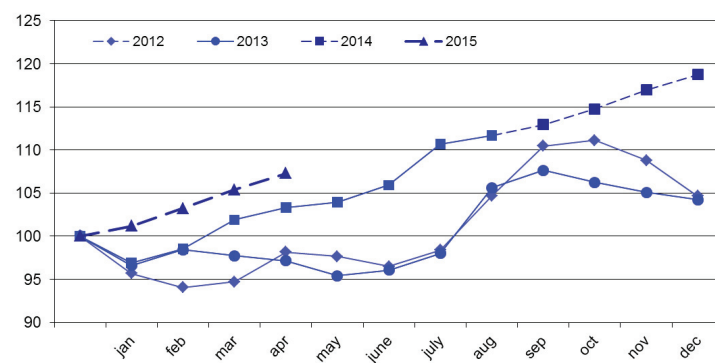
Fig. 25. The price index for the chemical industry
(as a percentage of that in December of the previous year)
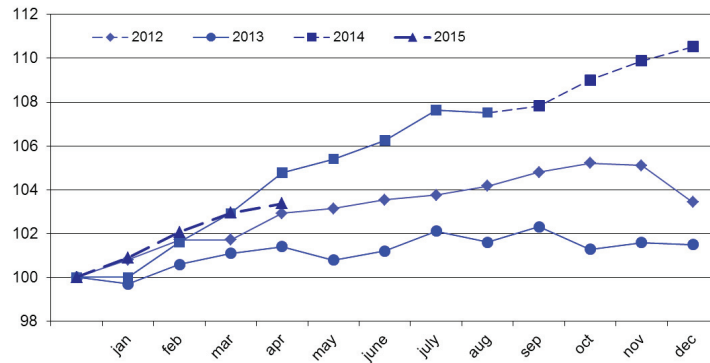
Fig.26. The price index for primary metals and fabricated metal products
(as a percentage of that in December of the previous year)
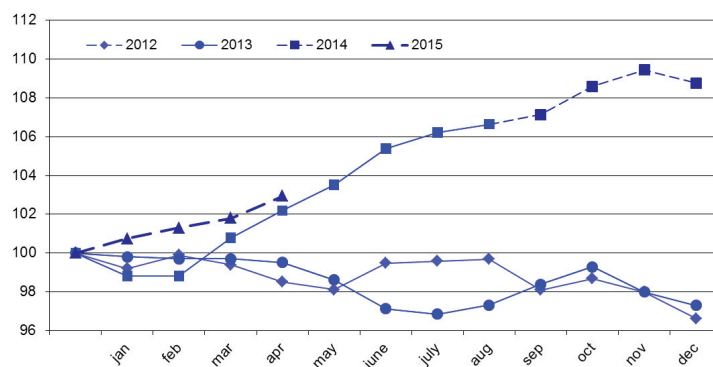
Fig.27. The price index for machinery
(as a percentage of that in December of the previous year)
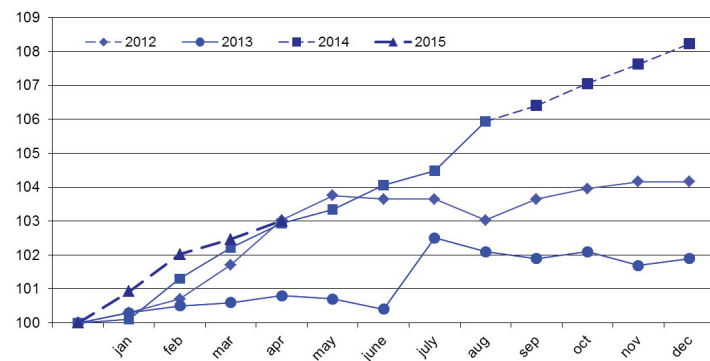
Fig.28. The price index for transport equipment manufacturing
(as a percentage of that in December of the previous year)
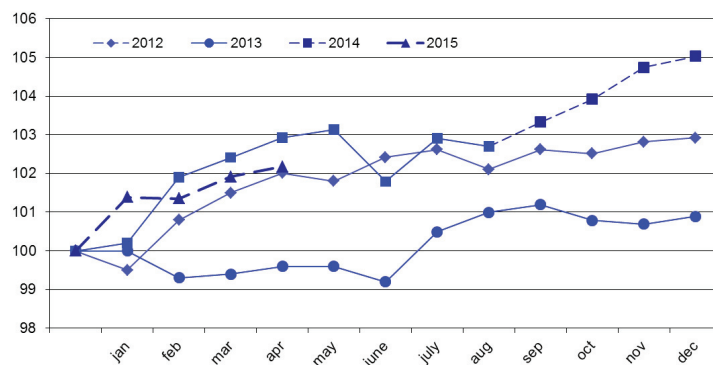
Fig. 29. The cost of the monthly per capita minimum food basket (Rb)
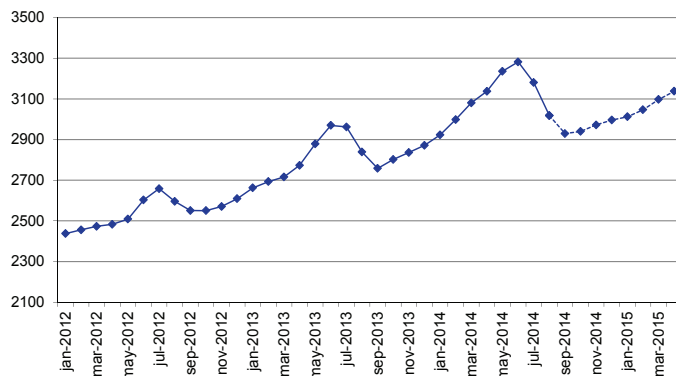
Fig. 30. The composite index of transportation tariffs
(for each year, as a percentage of that in the previous month)
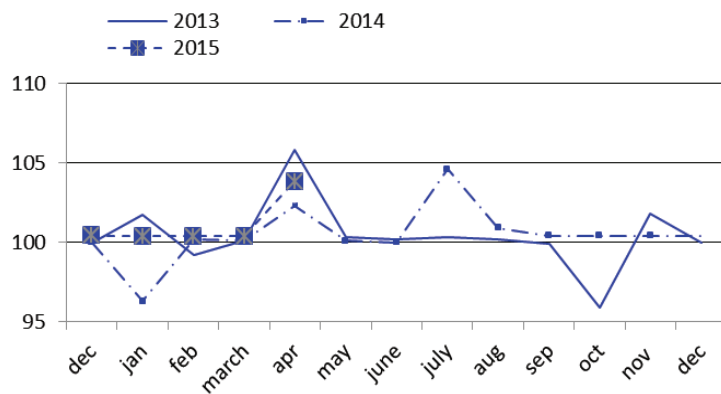
Fig. 31. The index of motor freight tariffs
(for each year, as a percentage of that in the previous month)
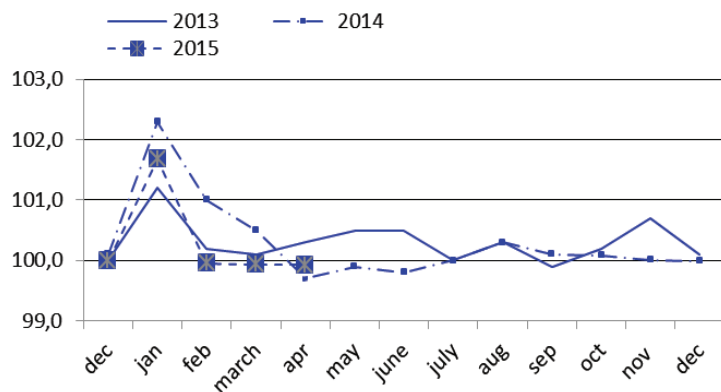
Fig. 32. The index of pipeline tariffs
(for each year, as a percentage of that in the previous month)
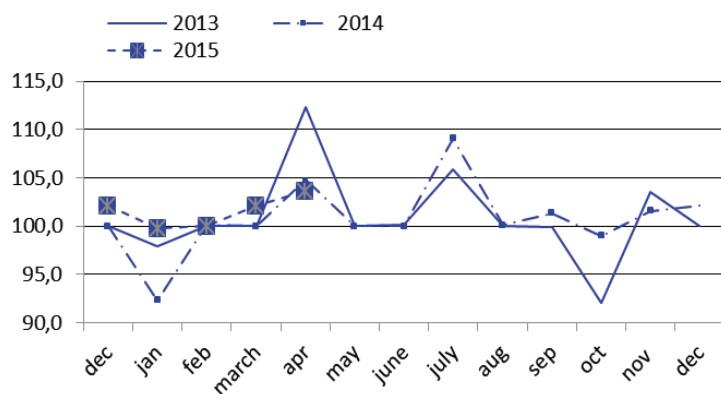
Fig. 33. The Brent oil price ($ per barrel)
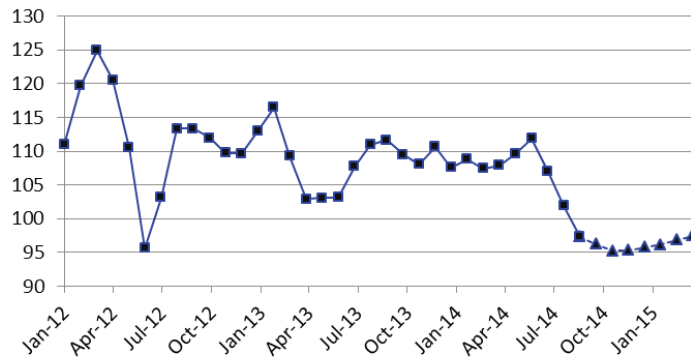
Fig. 34. The aluminum price ($ per ton)
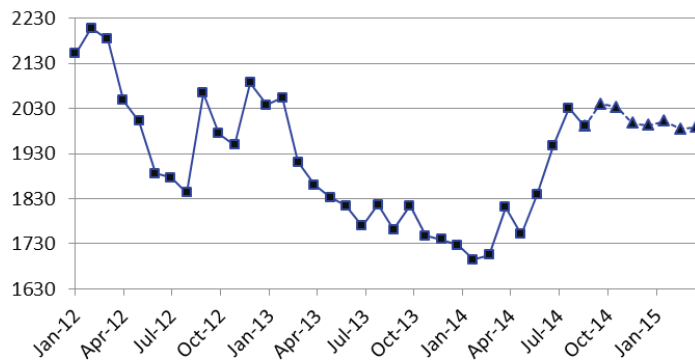
Fig. 35. The gold price ($ per ounce)
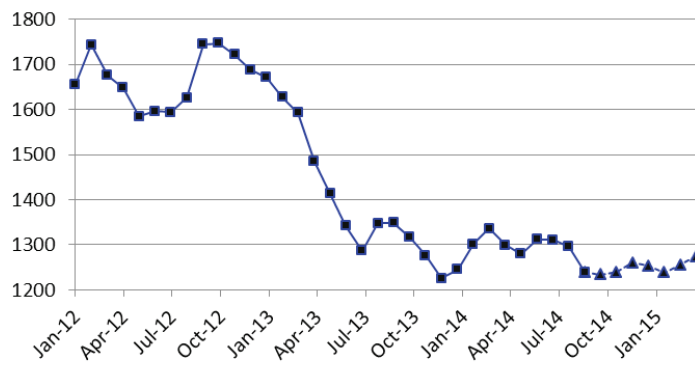
Fig. 36. The nickel price ($ per ton)
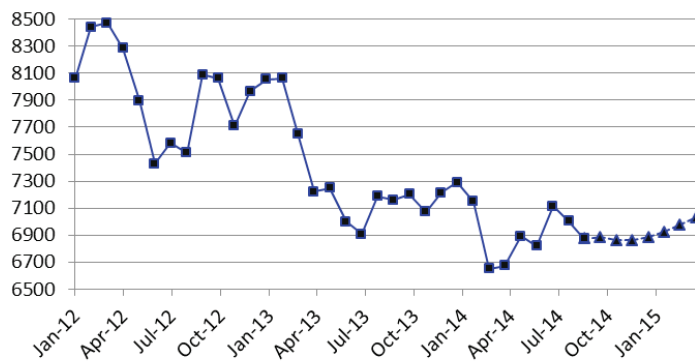
Fig. 37. The copper price ($ per ton)
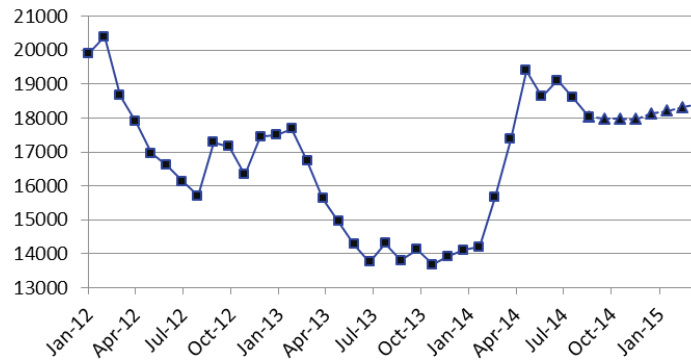
Fig. 38. The monetary base, billion Rb
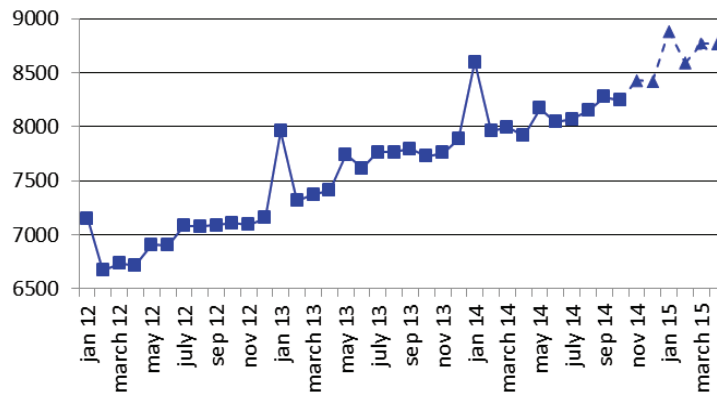
Fig. 39. M₂, billion Rb
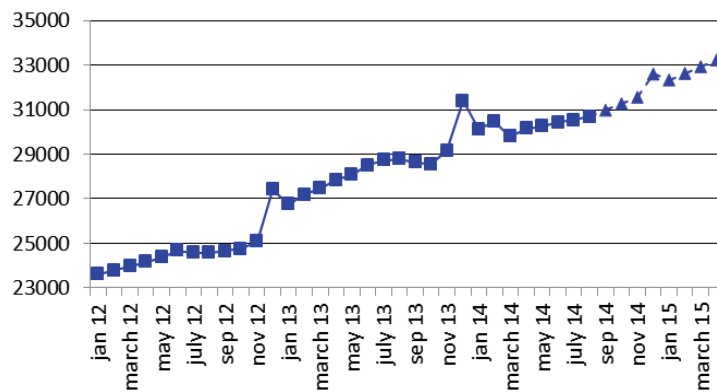
Fig. 40. The international reserves of the Russian Federation, million USD
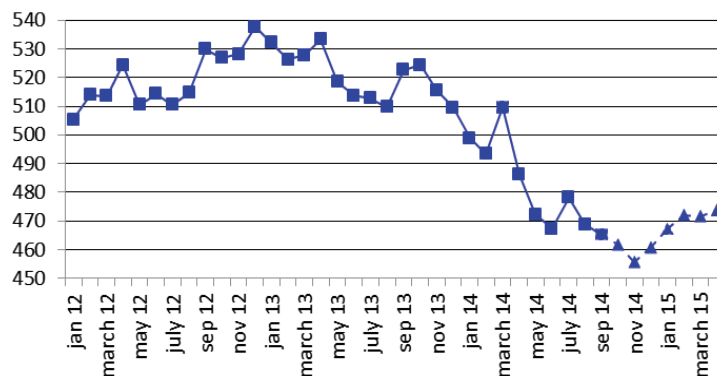
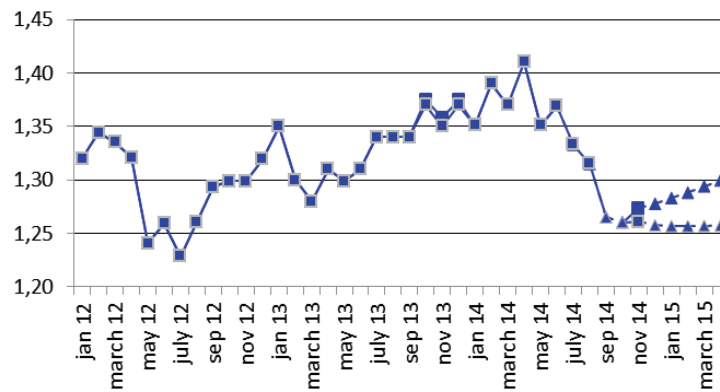*Fig. 41. The RUR/USD exchange rate*
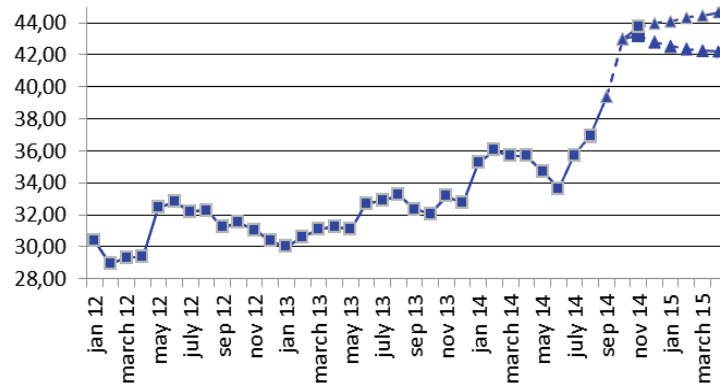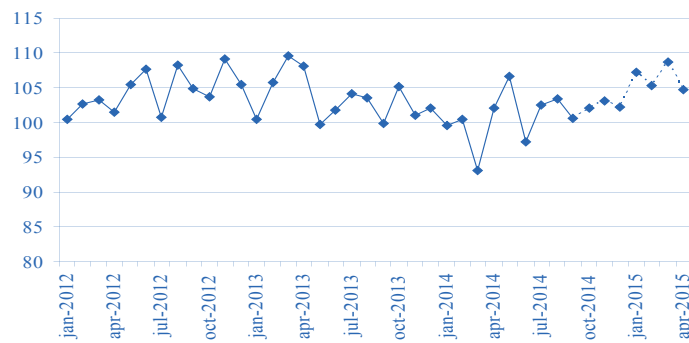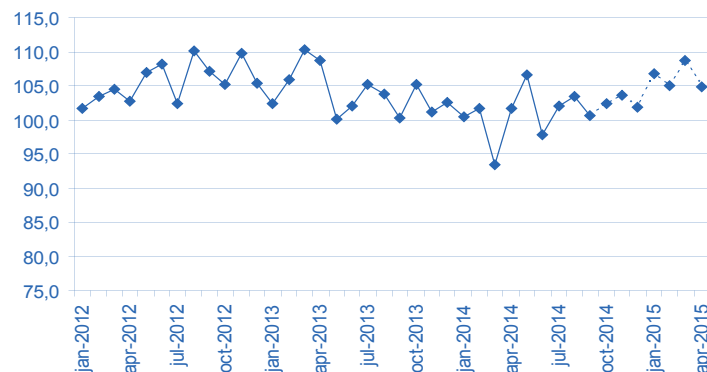

Fig. 42. The USD/EUR exchange rate

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
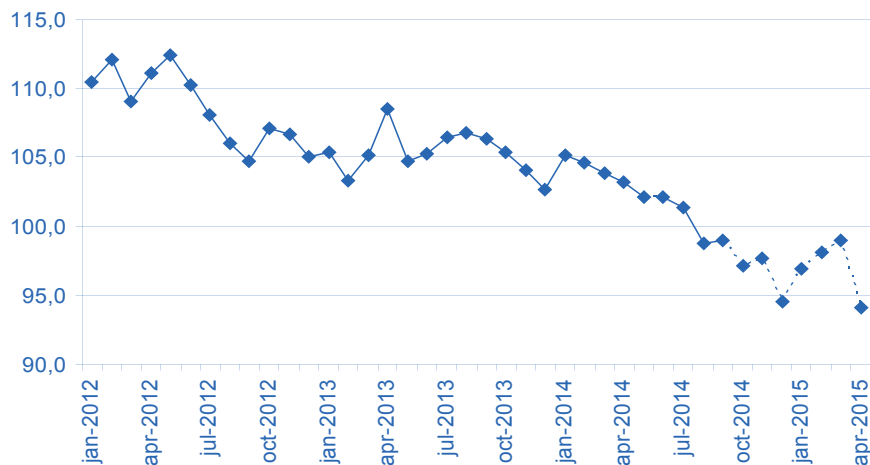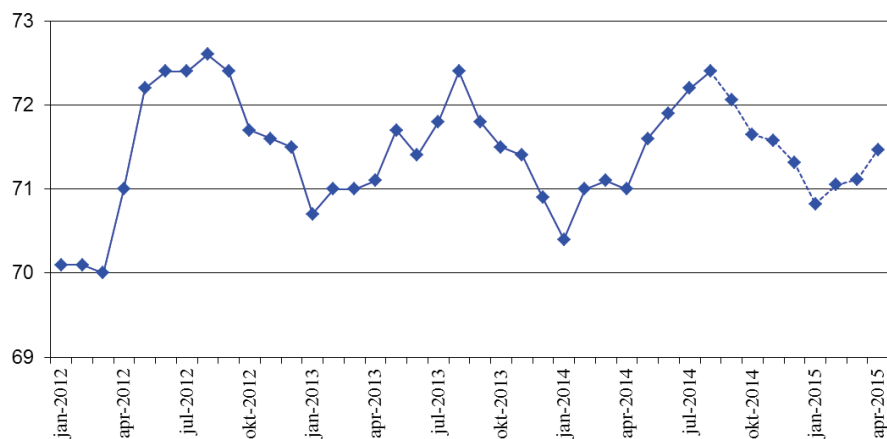*(as a percentage of those in the same period of the previous year)*

Fig. 46. Employment (million people)

Fig. 47. Unemployment (million people)