



GAIDAR INSTITUTE FOR ECONOMIC POLICY

125009, Russia, Moscow, Gazetny Pereulok 5

Tel./Fax +7(495)629-6596

www.iep.ru

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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.Kibliitskaya, Yu.Ponomarev and A.Skrobotov

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INTRODUCTION TO ALL THE ISSUES

This Bulletin presents calculations of values of different economic indices of the Russian Federation in May–October of 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 years¹. 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 ARIMA formal models (p, d, q) for forecasting a 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 findings of the previous research² 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 changes³ 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 the countries and the export to all the countries on the basis of structural models (SM). The forecast

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. Kiblitckaya, *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.

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 show¹ that utilization of the series of the business polls as explanatory variables² 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 PRODUCTION¹, (%)

	Index of industrial production		IIP for mining		IIP for manufacturing (electricity, water, and gas)		IIP for food products		IIP for coke and petroleum		IIP or primary metals and fabricated metal products		IIP for machinery					
	Rosstat	NRU HSE	Rosstat	NRU HSE	Rosstat	NRU HSE	Rosstat	NRU HSE	Rosstat	NRU HSE	Rosstat	NRU HSE	Rosstat	NRU HSE				
															ARIMA	BS	ARIMA	BS
May 15	-0.3	-1.1	-1.9	-1.1	0.5	0.0	-2.6	-1.5	1.8	1.3	1.1	2.3	-1.8	-0.7	-3.1	-2.0	-6.9	-12.0
Jun 15	1.3	1.2	-1.2	1.1	0.5	0.2	1.0	-1.1	2.5	3.2	2.3	5.5	-0.3	1.2	-1.3	-2.0	-4.0	-9.5
Jul 15	0.4	-0.3	-0.8	-0.7	0.6	1.5	-0.9	-1.3	2.1	3.7	1.7	3.7	4.8	5.5	-1.8	-2.0	1.5	-7.6
Aug 15	1.3	-0.1	0.4	-1.1	-0.5	1.0	1.4	0.5	2.4	4.0	2.2	2.0	3.4	3.3	-1.8	-0.7	-5.3	0.6
Sep 15	-0.6	-0.3	-0.9	-0.8	-2.4	0.4	-2.1	-1.8	2.2	4.2	1.2	-1.0	3.9	2.8	-3.9	-2.1	-7.0	0.1
Oct 15	-1.2	-1.1	-1.3	-1.3	-2.0	0.3	-3.3	-2.0	-3.4	-1.7	2.0	0.0	3.6	3.8	-4.6	-2.1	-16.8	-5.8
Expected growth on the respective month of the previous year																		
For reference: actual growth in 2014 on the respective month of 2013																		
May 14	2.8	1.2	0.9	1.4	4.4	1.4	-0.5	-0.8	7.2	2.9	8.2	5.1	5.9	2.7	5.3	-1.6	-7.0	
Jun 14	0.4	0.5	0.8	1.5	0.3	0.0	-0.8	-0.3	5.5	0.1	6.7	3.8	-0.4	2.5	-0.6	-7.0		
Jul 14	1.5	-0.1	-0.1	0.2	0.0	2.4	2.4	0.8	4.7	1.2	1.3	-1.1	1.9	3.9	-7.2	-1.1		
Aug 14	0.0	-1.0	0.8	0.0	0.0	-0.6	-1.9	1.2	4.1	2.7	3.5	1.4	-0.6	3.6	-0.3	-13.8		
Sep 14	2.8	0.8	2.4	0.7	3.6	1.2	-0.8	-1.4	5.1	4.6	6.5	4.6	0.5	5.1	-4.9	-12.8		
Oct 14	2.9	0.9	1.9	0.1	3.6	0.8	2.8	3.3	3.5	2.7	6.7	3.8	0.3	5.6	-9.6	-7.0		

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 2015, the series of monthly data of the indices of industrial production of the Federal State Statistics Service (Rosstat) from January 2002 till January 2015, 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 HSE¹) in the period from January 1999 till February 2015 were used (the value of January 2005 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 average² decline of the industrial production index computed by the NSU HSE in May–October 2015 compared with the same period the previous year on industrial production constitutes -0.8%, on the whole. For the Rosstat industrial production index this indicator constitutes -0.1%. Herewith, the industrial production index projection computed by Rosstat along ARIMA and KO models differ significantly. According to ARIME model, average monthly growth is forecasted at 0.2%, meanwhile according to KO model the fall is forecasted at 0.3% monthly.

Average monthly values of the industrial production index regarding mineral extraction computed by Rosstat and the NSU HSE in May–October constitute (-0.6%) and 0.6% respectively. In coke and petroleum products, production average growth is forecasted at the level of 2.3% and 2.6% for Rosstat and the NSU HSE indices, respectively.

Reduction of the industrial production index in the manufacturing sector computed by the NSU HSE in May–October 2015 against the same period of the previous year averages 1.2%, and Rosstat index – down 1.1%. Increase of the industrial production index in foodstuffs production computed by Rosstat and the NSU HSE averages 1.7% and 2.1%, respectively. Monthly values for industrial production index computed by Rosstat and NSU HSE for metallurgy and finished metal products in May–October 2015 average (-2.8%) and (-1.8%), respectively. In machine building and equipment production average reduction is projected at 6.4% and 5.7% for Rosstat and the NSU HSE indices, respectively.

Growth of the industrial production index in generation and distribution of electricity, gas and water computed by Rosstat in May–October 2015 compared with the same period the previous year averages 1.3%, the same indicator for the NSU HSE index constitutes 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 – January 2015 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)
May 15	2,266.7 (9.1)	89.9
Jun 15	2,296.7 (9.5)	90.0
Jul 15	2,371.3 (9.5)	89.9
Aug 15	2,443.7 (9.5)	90.3
Sep 15	2,422.2 (9.0)	88.7
Oct 15	2,504.0 (9.4)	88.2
For reference: actual values in the same months of 2014		
May 14	2,077.7	102.2
Jun 14	2,097.1	100.8
Jul 14	2,166.3	101.3
Aug 14	2,231.7	101.4
Sep 14	2,222.0	101.7
Oct 14	2,289.7	101.6

Note: series of retail sales and real retail sales in the January 1999 – January 2015 period.

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*, average projected increment of the monthly trade turnover for May–October 2015 against corresponding period of 2014 amounts to about 9.3%.

Projected decline of monthly real commodities turnover for the period under review against the same period of 2014 averages 10.5%.

INVESTMENTS IN CAPITAL ASSETS

Table 3 presents the outputs of calculations of forecast values of investments in capital assets in April–September 2015. The forecasts were made on the basis of time-series models with utilization of the Rosstat data of the January 1999 – January 2015 period.

The outputs in *Table 3* demonstrate that the projected growth in capital assets (in nominal terms) in May–October 2015 against corresponding period the previous year averages about 4.6%.

Forecasted fall of real investment for this period against the same period of 2014 averages 7.3%.

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 January 2015 on the basis of the data of the Central Bank of Russia¹. The outputs of the calculations are shown in Table 4.

Average projected fall of indices for export, import, export outside the CIS and import from countries outside the CIS for May–October 2015 against the same period of 2014 will constitute 18.2%, 29.6%, 23.6% and 30.3% respectively. Average projected surplus volume of the trade balance with all countries for May–October 2015 will constitute \$ 93.6bn which corresponds to an increase of 1.8% from the same period the previous year.

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 15	34.1	34.1	77	77	18.5	17.3	71	66	25.5	27.4	69	74	15.0	14.7	65	64
Jun 15	33.1	30.9	81	76	16.7	18.4	62	69	24.6	28.4	71	82	16.5	14.8	71	64

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, cont'd

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
Jul 15	34.1	32.3	74	70	19.7	19.7	67	67	28.0	30.6	68	74	16.0	17.5	62	68
Aug 15	35.0	35.4	84	85	18.6	18.5	74	73	28.0	30.1	77	83	18.1	15.2	82	68
Sep 15	33.5	33.9	88	89	19.0	18.9	73	73	24.8	29.0	75	88	17.5	16.4	77	72
Oct 15	38.5	37.6	93	91	20.8	19.4	77	72	25.2	32.4	70	89	18.9	16.1	79	67
For reference: actual values in respective months of 2014 (billion USD)																
May 14	44.0				26.1				37.2				23.1			
Jun 14	40.7				26.7				34.7				23.3			
Jul 14	46.2				29.2				41.0				25.8			
Aug 14	41.5				25.3				36.4				22.3			
Sep 14	38.1				26.0				33.0				22.8			
Oct 14	41.5				26.8				36.2				24.0			

Note: in the period from January 1999 till January 2015, 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 January 2015¹. Table 5 presents the outputs of model calculations of forecast values in April–September 2015 in accordance with ARIMA-models, structural models (SM) and models computed with the help of business surveys (BS).

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)	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 15	101.0	100.3	101.2	100.8	100.2	101.1	101.0	101.0	100.0	102.1	101.8	101.5	100.8	102.1	101.6	101.7	101.1	100.4
Jun 15	101.0	100.4	101.0	101.2	100.3	101.7	101.6	101.1	99.8	101.6	101.3	101.4	100.4	101.8	101.1	101.2	101.3	100.9
Jul 15	100.8	100.6	100.7	100.4	100.5	101.9	101.0	100.9	100.9	101.7	101.2	100.9	100.6	101.8	101.8	100.9	101.1	100.6
Aug 15	100.3	100.5	100.7	100.4	100.0	103.3	102.3	101.4	101.5	101.0	101.0	100.7	100.4	101.7	102.4	100.8	101.1	100.5
Sep 15	100.6	100.7	100.5	99.9	99.1	100.7	101.0	101.5	100.2	101.1	100.9	100.6	100.5	101.6	102.8	100.9	101.2	100.6
Oct 15	100.9	100.5	100.6	100.1	100.3	98.5	100.9	101.1	100.1	101.2	100.9	101.1	100.4	101.5	102.0	101.4	101.0	100.5
Forecast values (% of December 2014)																		
May 15	108.9	109.0	109.1	103.3	105.1	104.0	92.0	107.8	105.2	116.0	109.8	107.7	106.5	105.3	110.1	118.9	108.7	103.9
Jun 15	110.1	109.5	110.3	103.9	106.4	104.8	91.1	108.9	105.1	118.8	111.5	109.0	106.8	108.4	111.4	121.2	109.9	104.3

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 and petroleum	for the chemical industry	for primary metals and fabricated metal	for machinery	for transport equipment manufacturing
Jul 15	111.0	110.1	111.3	105.0	107.2	106.5	90.3	110.0	105.4	120.9	112.7	110.3	106.8	110.6	112.4	122.3	111.4	105.1
Aug 15	112.0	111.4	112.0	105.3	107.8	108.3	88.8	111.0	104.9	123.1	113.9	111.1	107.5	112.9	114.4	123.0	112.7	105.7
Sep 15	112.3	112.3	112.8	105.5	108.3	111.0	87.4	112.6	105.5	124.4	114.9	111.7	108.3	114.6	116.8	122.6	114.1	106.1
Oct 15	113.0	113.2	113.4	105.4	107.6	112.3	84.3	114.2	105.8	125.6	115.8	112.3	108.8	116.2	119.6	120.9	115.6	106.7
For reference: actual values in the same periods of 2014 (% of December 2013)																		
May 14		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	102.9
Jun 14		104.2		103.4		105.4	103.4	100.6	105.3	102.1	101.0	101.2	103.9	105.4	103.5	103.3	103.1	103.1
Jul 14		104.8		104.3		106.9	104.3	100.3	106.6	102.0	102.1	101.2	105.9	106.2	105.4	104.1	101.8	101.8
Aug 14		105.3		105.9		109.1	105.7	102.4	107.8	102.2	102.2	102.3	110.7	107.6	106.2	104.5	102.9	102.9
Sep 14		105.5		105.9		106.9	106.4	102.8	109.0	102.6	102.5	101.9	111.7	107.5	106.6	105.9	102.7	102.7
Oct 14		106.3		105.1		100.7	107.0	103.4	109.6	102.8	102.5	102.3	112.8	108.7	107.4	106.2	103.0	103.0

Note: in the period from January 1999 till January 2015, 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.

Projected average monthly growth of the consumer price index in May–October 2015 will come to 0.7%. Price growth of industrial goods production for this period is predicted on average at 0.6% monthly. It is worth noting that the producer price index along factor model is more pessimistic than along other two models.

For producer price index from April to September 2015, the following average monthly growth rates are forecasted: in mineral production 1.3%, manufacturing sector 1.2%, electricity, gas and water production and distribution 0.4%, foodstuffs production 1.5%, textile and garment manufacture 1.2%, timber and timber products 1.0%, pulp and paper production 0.5%, coke and petroleum products 1.8%, chemical industry 2.0%, metallurgy and finished metal products 1.1%, machine and equipment production 1.2%, and in means of transport and transport equipment 0.6%.

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

As seen from Table 6, price growth of the minimum set of foodstuffs is forecasted compared with the same period previous year. Herewith, predicted price of a minimum set of

Table 6
THE FORECAST OF THE COST OF THE MONTHLY PER CAPITA MINIMUM FOOD BASKET

Forecast values according to ARIMA-model (Rb)	
May 2015	3,786.2
June 2015	3,702.8
July 2015	3,592.1
August 2015	3,520.0
September 2015	3,541.6
October 2015	3,620.2
For reference: actual values in the same months of 2014 (billion Rb)	
May 2014	3,235.7
June 2014	3,281.9
July 2014	3,180.1
August 2014	3,017.5
September 2014	2,996.1
October 2014	3,043.7
Expected growth on the respective month of the previous year (%)	
May 2015	17.0
June 2015	12.8
July 2015	13.0
August 2015	16.7
September 2015	18.2
October 2015	18.9

Note: the series of the cost of the monthly per capita minimum food basket in the period from January 2000 till January 2015 are stationary in the first-order differences.

foodstuffs averages Rb 3,627.1. Thus, projected increment of the price of a minimum set of foodstuffs averages 16.1% against the corresponding period the previous year.

Indices of Freight Rates

This section presents calculations of forecast values of freight rate indices on cargo carriage¹, made on the basis of time-series models evaluated on the basis of the Rosstat data in the period from September 1998 till January 2015. Table 7 shows the outputs of model calculations of forecast values in April–September 2015. It should be noted that some of the indices under review (for instance, the pipeline rate index) 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 rates 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 FREIGHT RATES

Period	The composite freight rate index	The index of trucking freight rate	The index of pipeline rate
Forecast values according to ARIMA-models (% of the previous month)			
May 2015	100.4	100.6	103.0
June 2015	100.4	100.6	102.1
July 2015	104.0	100.5	102.5
August 2015	100.4	100.5	103.0
September 2015	100.4	100.5	102.8
October 2015	100.4	100.5	102.4
Forecast values according to ARIMA-models (% of December of the previous year)			
May 2015	110.4	106.8	109.8
June 2015	110.9	107.4	112.1
July 2015	115.3	107.9	114.8
August 2015	115.8	108.5	118.2
September 2015	116.3	109.1	121.5
October 2015	116.8	109.6	124.5
For reference: actual values in the same period of 2014 (% of the previous month)			
May 2014	100.1	99.9	100.0
June 2014	100.0	99.8	100.0
July 2014	104.6	100.0	109.1
August 2014	100.9	100.3	100.1
September 2014	100.3	100.2	100.3
October 2014	94.9	100.2	89.9

Note: in the period from September 1998 through January 2015, the series of the freight rates index were identified as stationary ones; the other series were identified as stationary ones in the period from September 1998 through January 2014, too; fictitious variables for taking into account particularly dramatic fluctuations were used in respect of all the series.

According to the forecast findings for May–October 2015, the composite freight rate index will be growing at average monthly rate of 1.5%. In July 2015, a seasonal index's pickup is projected by 4 p.p.

Trucking freight rate will be growing by the average rate of 0.5% over given six months.

Pipeline rate will also be growing over the coming six months. The average growth rate will stand at 2.6%.

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

World Prices of Natural Resources

This section presents calculations of such average monthly values of Brent crude prices (US\$ per barrel), the aluminum prices (US\$ per ton), the gold prices (\$ per ounce), the copper prices (US\$ per ton) and the nickel prices (US\$ per ton) in April–September 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 through February 2015.

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					
May 2015	65.10	1,750	1,192	5,987	13,216
June 2015	69.50	1,747	1,207	5,966	13,138
July 2015	63.80	1,727	1,193	5,936	13,026
August 2015	65.40	1,726	1,182	5,926	13,096
September 2015	67.50	1,723	1,204	5,938	13,094
October 2015	71.00	1,708	1,223	5,964	13,165
Expected growth on the respective month of the previous year (%)					
May 2015	-40.6	0.0	-7.4	-13.1	-31.9
June 2015	-37.9	-5.0	-5.6	-12.5	-29.5
July 2015	-40.4	-11.3	-9.0	-16.5	-31.9
August 2015	-35.8	-15.0	-8.8	-15.4	-29.6
September 2015	-30.7	-13.4	-2.8	-13.6	-27.4
October 2015	-18.6	-12.2	0.1	-11.5	-16.7
For reference: actual values in the same period of 2014					
May 2014	109.68	1,751	1,288	6,891	19,401
June 2014	111.87	1,839	1,279	6,821	18,629
July 2014	106.98	1,948	1,311	7,113	19,118
August 2014	101.92	2,030	1,296	7,002	18,600
September 2014	97.34	1,990	1,239	6,872	18,035
October 2014	87.27	1,946	1,222	6,737	15,812

Note: from January 1980 through February 2015, the series of prices on oil, nickel, gold, copper and aluminum are series of DS type.

The average projected crude price amounts to about \$67.0 per barrel which is below corresponding indicators last year on average by 34.0%. Aluminum prices are projected at about \$1,730.0 per ton and their average forecasted reduction constitutes about 10% compared with the same level last year. Projected gold prices constitutes about \$1,200.0 per ounce; copper prices – \$5,953.0 per ton; nickel prices – about \$13,123 per ton. Average projected price fall on gold constitutes about 6%, average reduction of copper prices – about 14%, average reduction of nickel prices – 28% compared with the corresponding level last year.

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 April–September 2015 were received on the basis of models of time-series of respective indices calculated by the CBR¹ in the period from October 1998 through February 2015. 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 mon-

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.

etary 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 M₂ AND THE MONETARY BASE

Period	The Monetary base		M2	
	Billion Rb	Growth on the previous month, %	Billion Rb	Growth on the previous month, %
May 2015	8,068	3.2	32,712	0.6
June 2015	7,974	-1.2	32,923	0.6
July 2015	8,204	2.9	33,133	0.6
August 2015	8,105	-1.2	33,343	0.6
September 2015	8,338	2.9	33,554	0.6
October 2015	8,238	-1.2	33,764	0.6
For reference: actual value in the respective months of 2014 (growth on the previous month, %)				
May 2014		3.2		0.3
June 2014		-1.6		0.6
July 2014		0.4		0.3
August 2014		1.0		0.5
September 2014		1.6		-0.1
October 2014		-0.4		-1.2

Note: in the period from October 1998 to February 2015, 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 2015, the monetary base and money indicator M2 will be going up at the average monthly rate 0.9% and 0.6%, respectively.

INTERNATIONAL RESERVES

This section presents the outputs of the statistical estimation of such future values of the international reserves of the Russian Federation¹ 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 released by the CBR from October 1998 through February 2015. 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.

Subsequent to the forecast findings for May–October 2015 international reserves will be falling by average rate of 3.7%.

Table 10

THE FORECAST OF THE INTERNATIONAL RESERVES OF THE RUSSIAN FEDERATION

Period	Forecast values according to ARIMA-model	
	Billion USD	Growth on the previous month, %
May 2015	352.4	-1.1
June 2015	343.6	-2.5
July 2015	328.1	-4.5
August 2015	310.8	-5.3
September 2015	296.9	-4.5
October 2015	283.9	-4.4
For reference: actual values in the same period of 2014		
	Billion USD	Growth on the previous month, %
May 2014	472.3	-2.8
June 2014	467.2	-1.1
July 2014	478.3	2.4
August 2014	468.8	-2.0
September 2014	465.2	-0.8
October 2014	454.2	-2.3

Note: in the period from October 1998 through February 2015, the series of the gold and foreign exchange reserves of the Russian Federation were identified as stationary series in difference.

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

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 each month over the periods between October 1998 and March 2015 and between January 1999 and March 2015¹, respectively.

USD/RUR exchange rate during the reviewed period is forecasted along two models in the amount of Rb49.36 77 kopecks for USD. Euro/USD exchange rate is projected at 1.12 euros per 1 dollar. It should be noted that differences in the projections of euro-dollar exchange rate along two models are rather significant.

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
May 2015	49.78	49.65	1.13	1.10
June 2015	48.75	48.92	1.14	1.10
July 2015	49.69	49.00	1.13	1.10
August 2015	49.69	49.11	1.14	1.10
September 2015	49.67	49.22	1.14	1.10
October 2015	49.49	49.34	1.15	1.10
For reference: actual values in the similar period of 2014				
May 2014	34.74		1.35	
June 2014	33.63		1.37	
July 2014	35.72		1.33	
August 2014	36.93		1.32	
September 2014	39.39		1.25	
October 2014	43.49		1.25	

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

THE LIVING STANDARD INDICES

This section (Table 12) presents such outputs of calculations of forecast values of indices of real wages, real disposable income and real income² as were received on the basis of the model of time series of respective indices computed by Rosstat and taken in the period from January 1999 through February 2015. 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.

1 The Bulletin applies the IMF's data for the period between January 1999 and January 2015. The data for February and March 2015 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 Statisticheskyy Ezhegodnik, Moscow, Rosstat, 2004, p. 212).

According to the results presented in *Table 12*, real disposable income will be on average falling by 1.2% a month (against the same period the previous year) on the reviewed period. Real money income will be declining on average by 2.2%. Predicted fall of real wages will be more significant and will average 6.8% against the same period the previous year.

Table 12

THE FORECAST OF THE LIVING STANDARD INDICES

Period	Real disposable money income	Real money income	Real accrued wages
Forecast values according to ARIMA-models (% of the respective month of 2014)			
May 2015	96.7	95.8	90.2
June 2015	100.3	99.5	91.2
July 2015	98.2	97.5	92.6
August 2015	96.9	95.7	96.1
September 2015	101.0	99.8	94.8
October 2015	99.5	98.5	94.6
For reference: actual values in the respective period of 2014 (% of the same period of 2013)			
May 2014	106.0	105.9	102.1
June 2014	96.5	96.7	102.1
July 2014	102.4	101.3	101.4
August 2014	103.8	104.6	98.8
September 2014	100.1	101.0	101.5
October 2014	101.9	101.7	100.6

Note: for calculating purposes, the series of the real disposable money income, real money income and real accrued wages in the base form were used (March 1999 was adopted as a base period). From January 1999 through February 2015, 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 January 2015 on the basis of the monthly data of Rosstat¹ were used. The unemployment was calculated on the basis of the models with results of the outputs of business polls², too.

It is to be noted that possible logical differences³ 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 ARIMA model forecasting (*Table 13*), in May–October 2015, the number of employed in the economy will grow on average by 0.3% monthly against the corresponding period the previous year.

Projections of the number of unemployed along two models differ rather significantly. ARIMA-model forecasts the indicator growth compared with the same period last year. Forecasts computed with the help of a model using business surveys' findings demonstrate a sharper growth on the number of unemployed in the period under review on average by 13.8% against the same period last year.

1 The index is computed in accordance with the methods of the International Labor Organization (ILO) and is given as of the month-end.

2 The model is evaluated in the period from January 1999 till January 2015.

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
May 2015	72.1	0.7	3.9	4.5	5.4	4.2	14.1	5.8
June 2015	72.2	0.4	3.8	3.5	5.3	4.3	16.1	6.0
July 2015	72.3	0.1	3.9	4.1	5.3	4.2	13.9	5.8
August 2015	72.5	0.2	3.8	2.9	5.3	4.2	14.3	5.8
September 2015	72.2	0.4	3.8	4.0	5.3	4.2	14.3	5.8
October 2015	72.0	0.0	4.0	1.9	5.5	4.3	10.3	6.0
For reference: actual values in the same periods of 2014 (million people)								
May 2014	71.0					4.0		
June 2014	71.6					3.7		
July 2014	71.9					3.7		
August 2014	72.2					3.7		
September 2014	72.4					3.7		
October 2014	71.9					3.7		

Note: in the period from October 1998 till January 2015, 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 Federation

Fig. 1a. The Rosstat industrial production index (ARIMA-model) (% of December 2001)

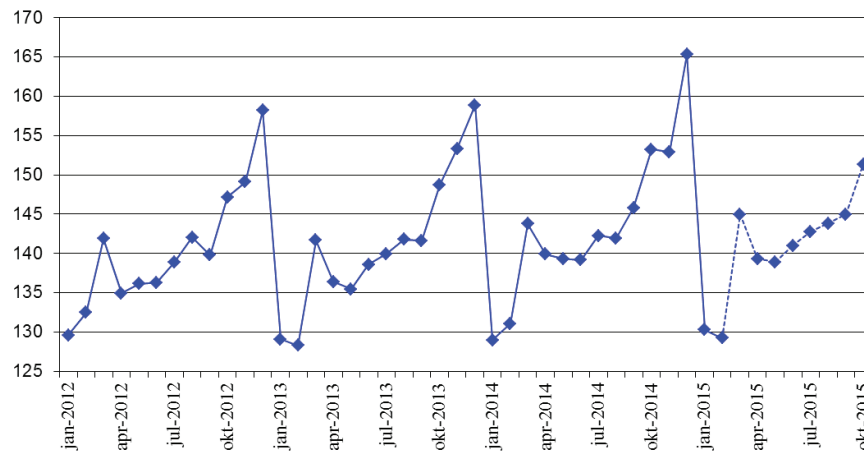


Fig. 1b. The NRU HSE industrial production index (ARIMA-model) (% of January 2005)

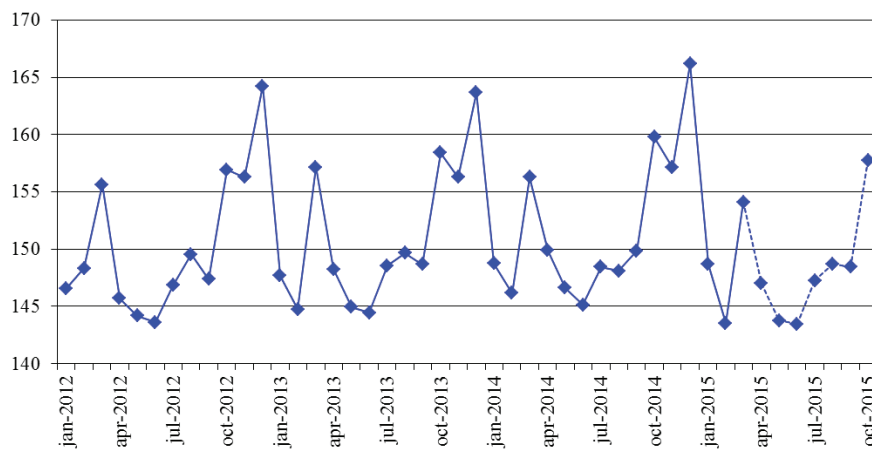


Fig. 2a. The Rosstat industrial production index for mining (% of December 2001)

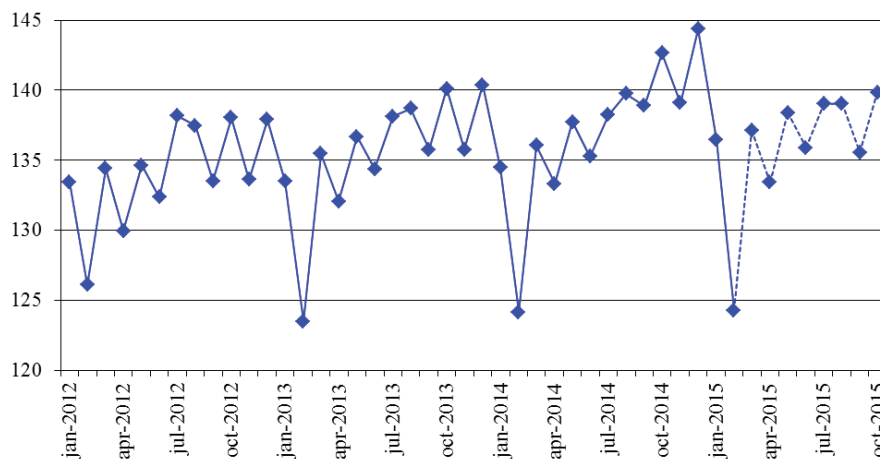


Fig. 2b. The NRU HSE industrial production index for mining (% of January 2005)

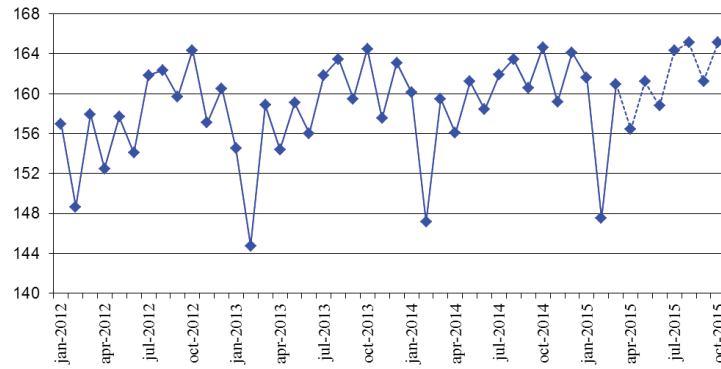


Fig. 3a. The Rosstat industrial production index for manufacturing (% of December 2001)

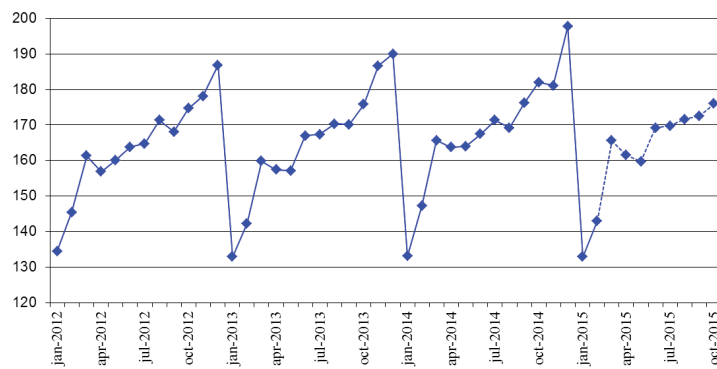


Fig. 3b. The NRU HSE industrial production index for manufacturing (% of January 2005)

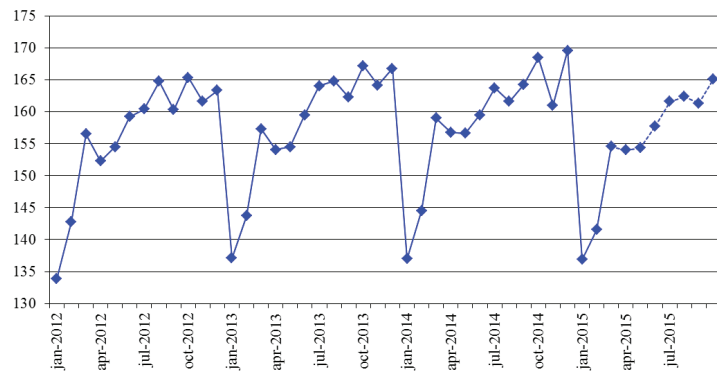


Fig. 4a. The Rosstat industrial production index for utilities (electricity, water, and gas) (as a percentage of that in December 2001)

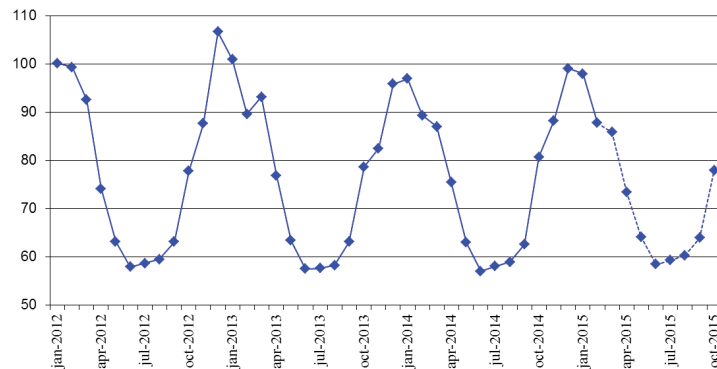


Fig. 4b. The NRU HSE industrial production index for utilities (electricity, water, and gas) (as a percentage of that in January 2005)

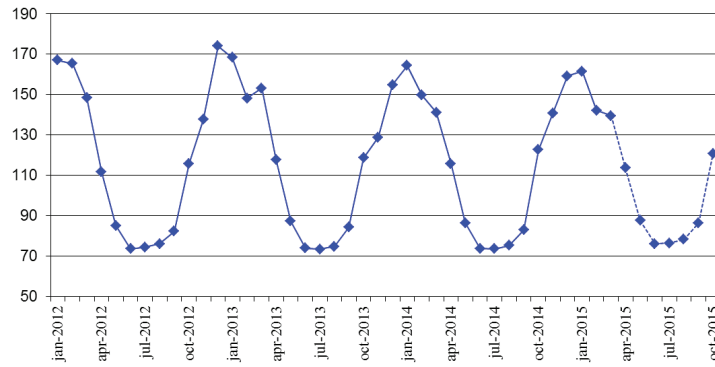


Fig. 5a. The Rosstat industrial production index for food products (as a percentage of that in December 2001)

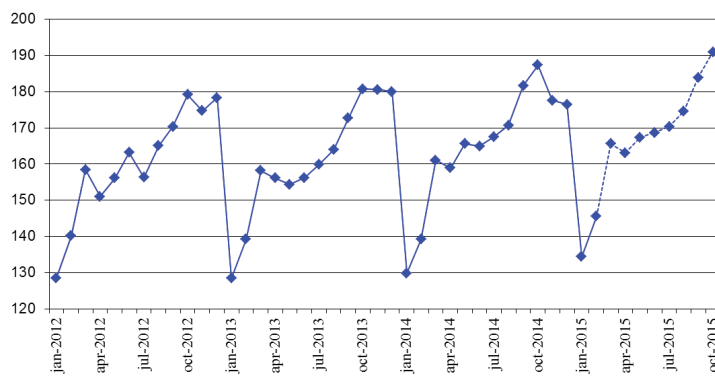


Fig. 5b. The NRU HSE industrial production index for food products (as a percentage of that in January 2005)

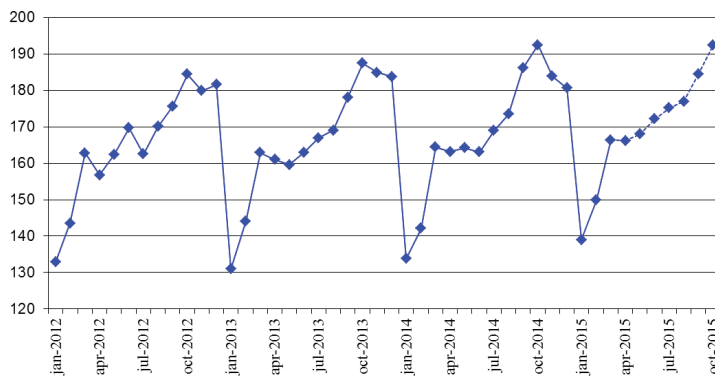


Fig. 6a. The Rosstat industrial production index for coke and petroleum (as a percentage of that in December 2001)

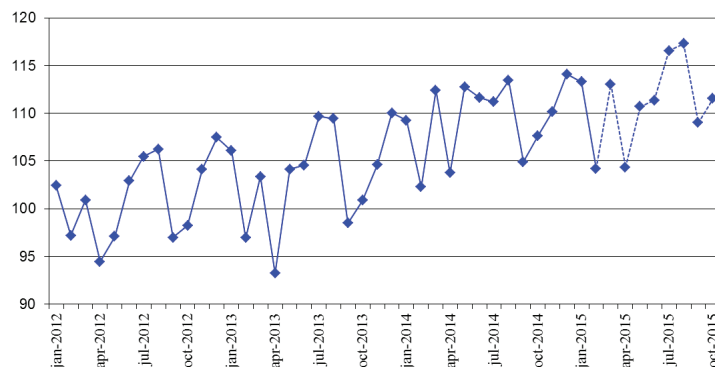


Fig. 6b. The NRU HSE industrial production index for petroleum and coke (as a percentage of that in January 2005)

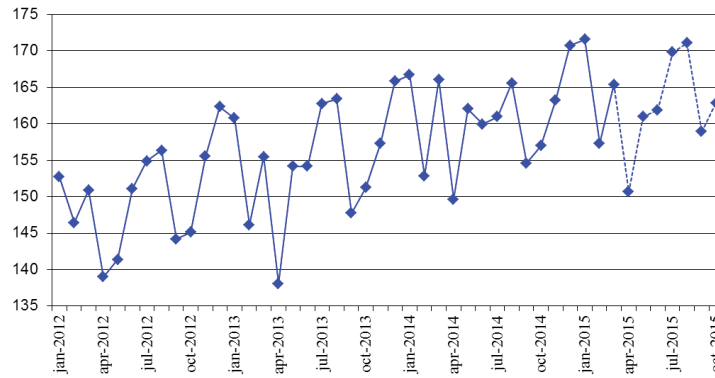


Fig. 7a. The Rosstat industrial production index for primary metals and fabricated metal products (as a percentage of that in December 2001)

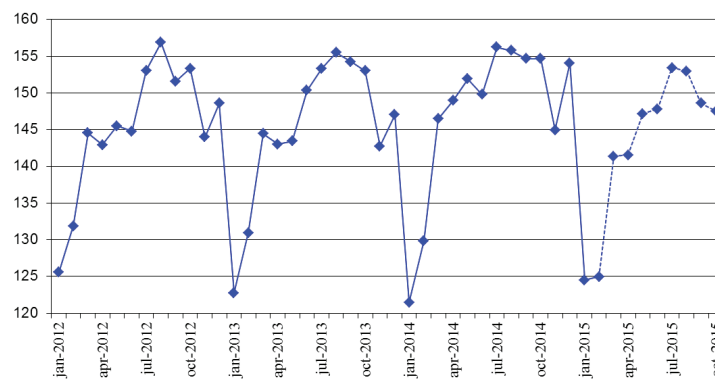


Fig. 7b. The NRU HSE industrial production index for primary metals and fabricated metal products (as a percentage of that in January 2005)

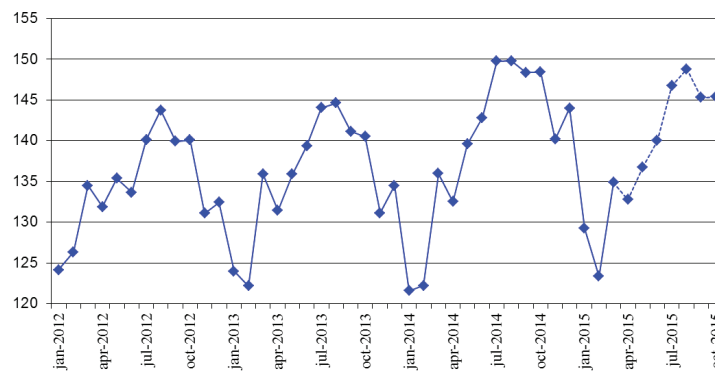


Fig. 8a. The Rosstat industrial production index for machinery (as a percentage of that in December 2001)

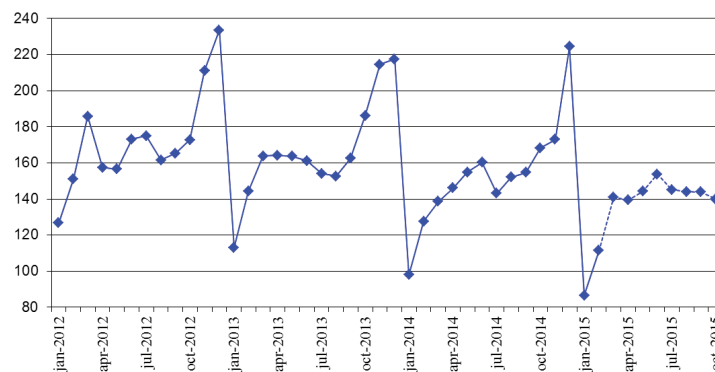


Fig. 8b. The NRU HSE industrial production index for machinery (as a percentage of that in January 2005)

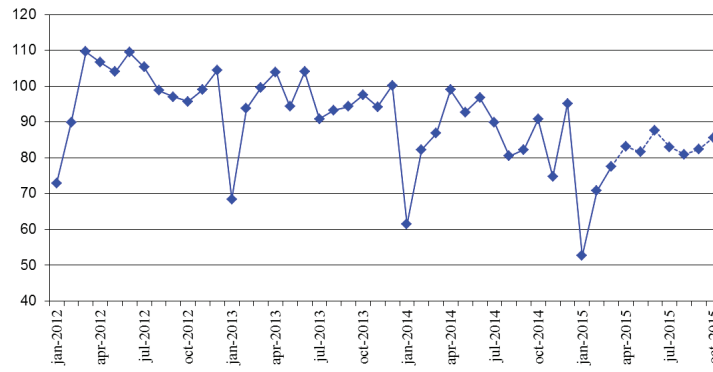


Fig. 9. The volume of retail sales (billion Rb)

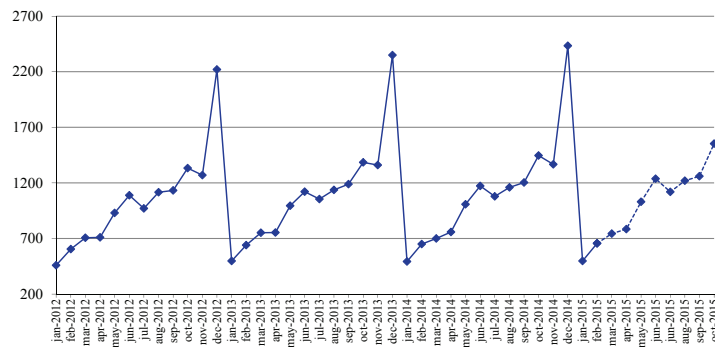


Fig. 9a. The real volume of retail sales (as a percentage of that in the same period of the previous year)

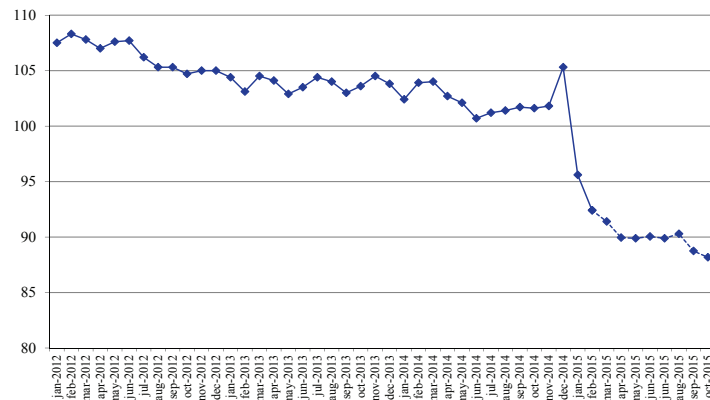


Fig. 10. Investments in capital assets (billion Rb)

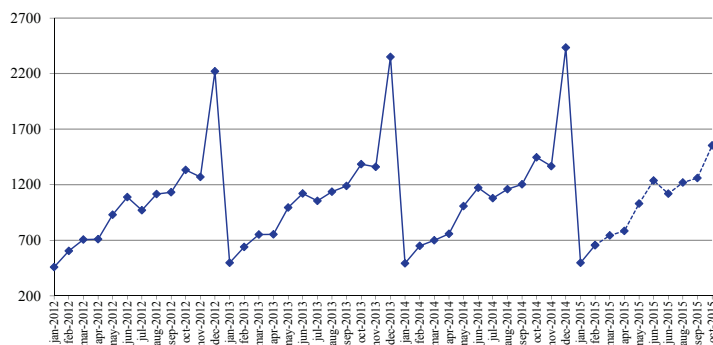


Fig. 10a. Real investments in capital assets
(as a percentage of those in the same period of the previous year)

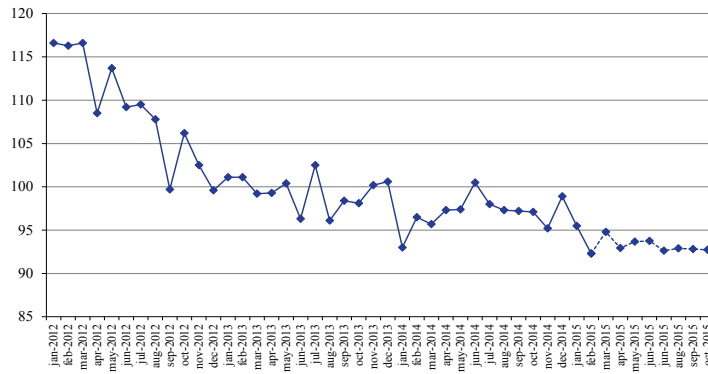


Fig. 11. Export to all countries (billion USD)

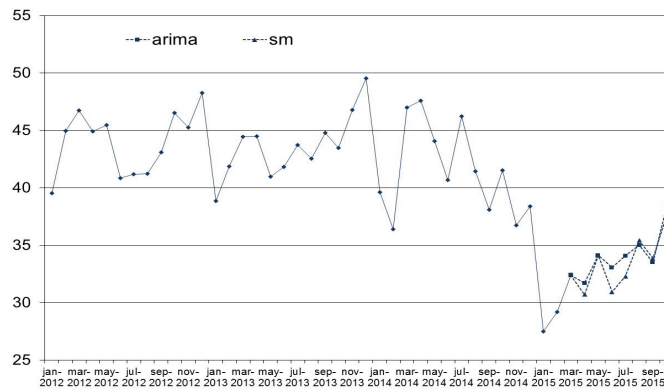


Fig. 12. Export to countries outside the CIS (billion USD)

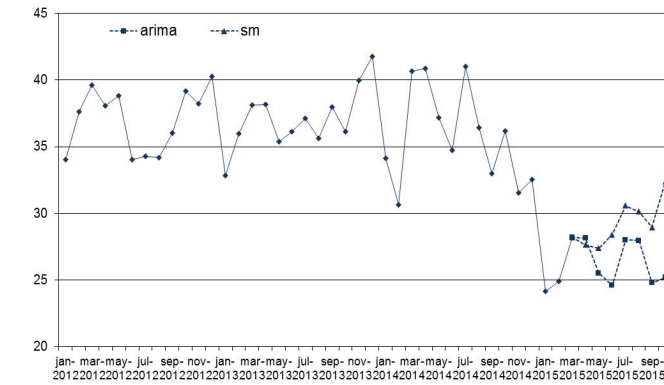


Fig. 13. Import from all countries (billion USD)

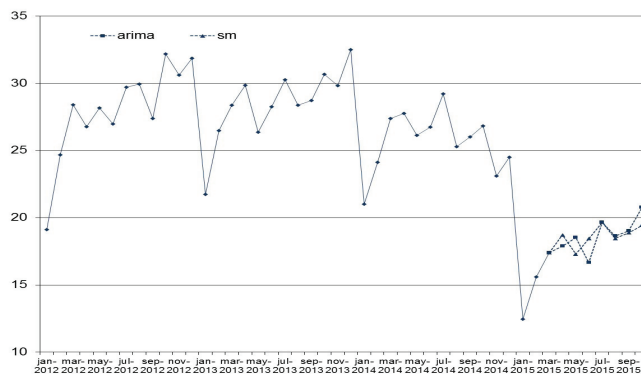


Fig. 14. Import from countries outside the CIS (billion USD)

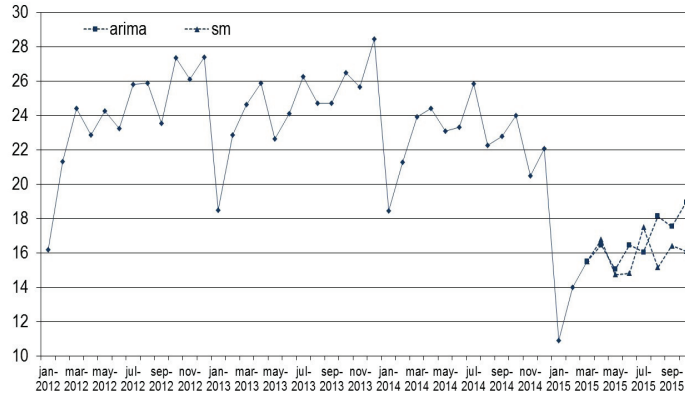


Fig. 15. The consumer price index (as a percentage of that in December of the previous year)

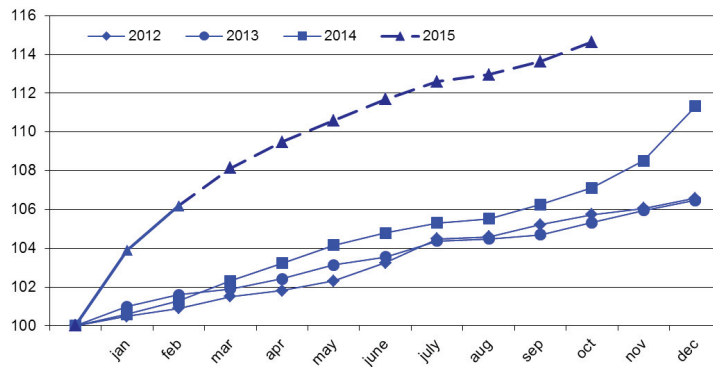


Fig. 15a. The consumer price index (as a percentage of that in December of the previous year) (SM)

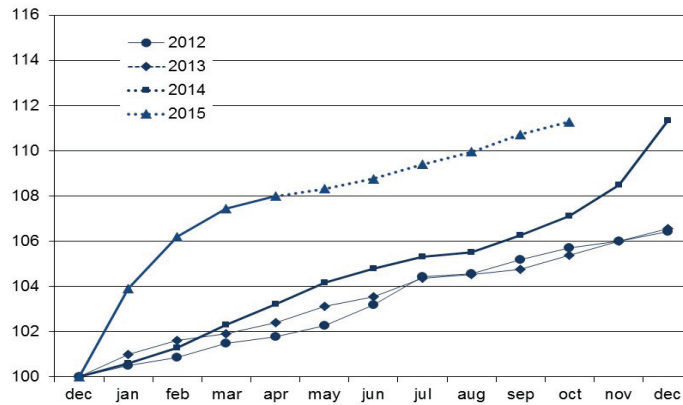


Fig. 16. The producer price index for industrial goods (as a percentage of that in December of the previous year)

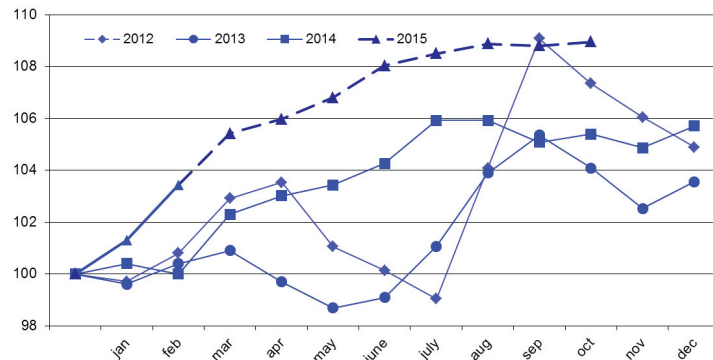


Fig. 17. The price index for mining
(as a percentage of that in December of the previous year)

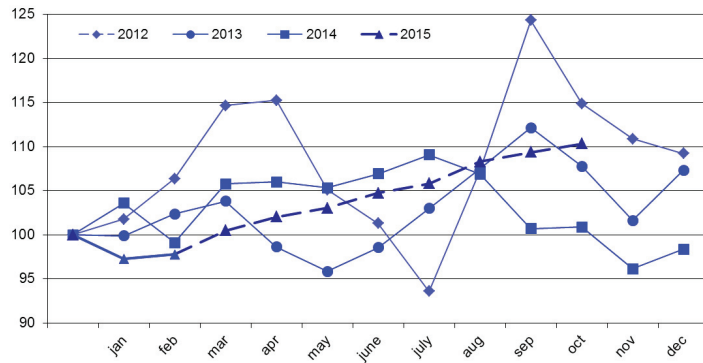


Fig. 18. The price index for manufacturing
(as a percentage of that in December of the previous year)

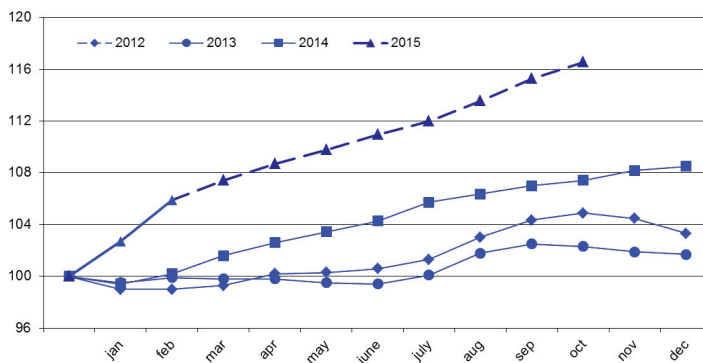


Fig. 19. The price index for utilities (electricity, water, and gas)
(as a percentage of that in December of the previous year)

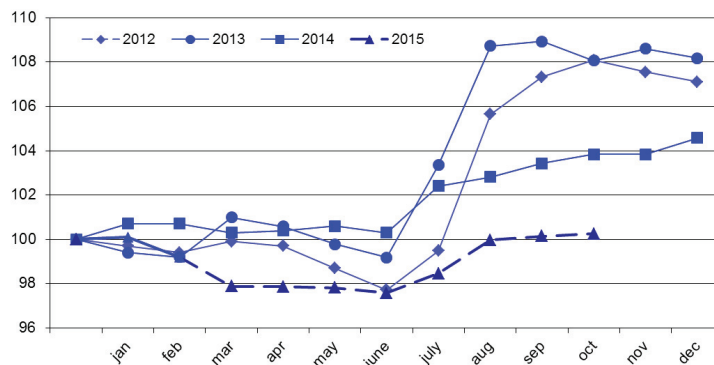


Fig. 20. The price index for food products
(as a percentage of that in December of the previous year)

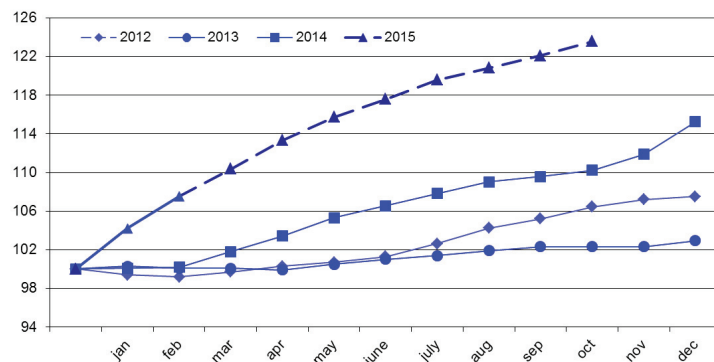


Fig. 21. The price index for the textile and sewing industry
(as a percentage of that in December of the previous year)

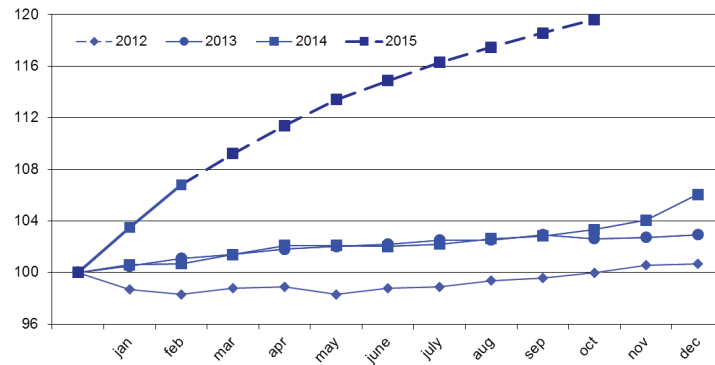


Fig. 22. The price index for wood products
(as a percentage of that in December of the previous year)

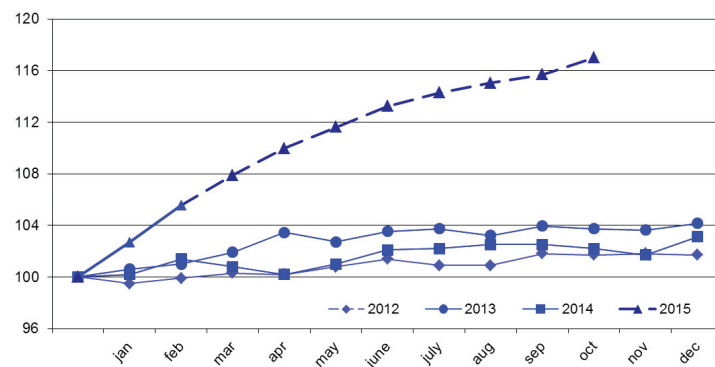


Fig. 23. The price index for the pulp and paper industry
(as a percentage of that in December of the previous year)

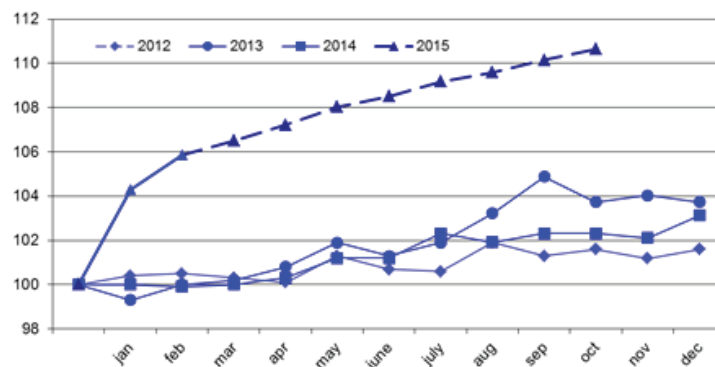


Fig. 24. The price index for coke and petroleum
(as a percentage of that in December of the previous year)

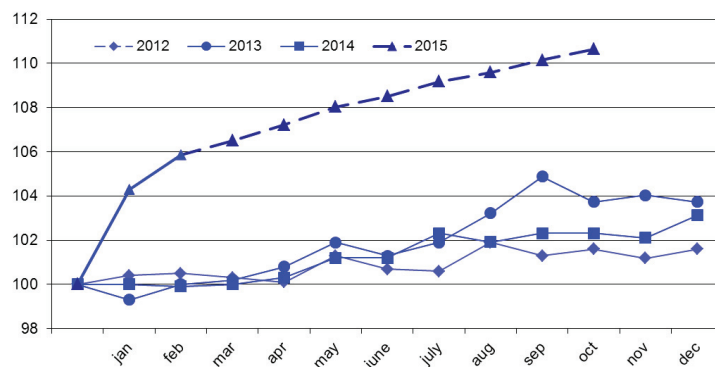


Fig. 25. The price index for the chemical industry (as a percentage of that in December of the previous year)

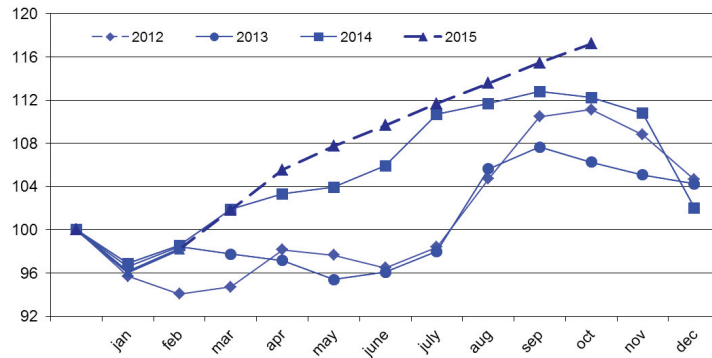


Fig. 26. The price index for primary metals and fabricated metal products (as a percentage of that in December of the previous year)

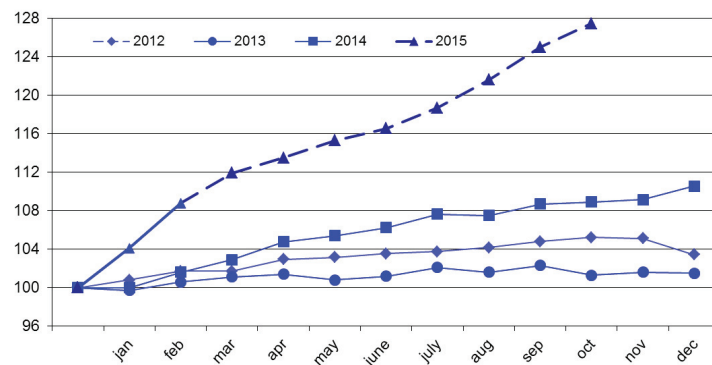


Fig. 27. The price index for machinery (as a percentage of that in December of the previous year)

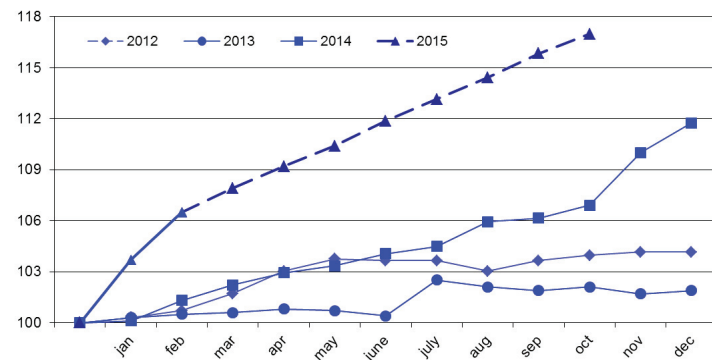


Fig. 28. The price index for transport equipment manufacturing (as a percentage of that in December of the previous year)

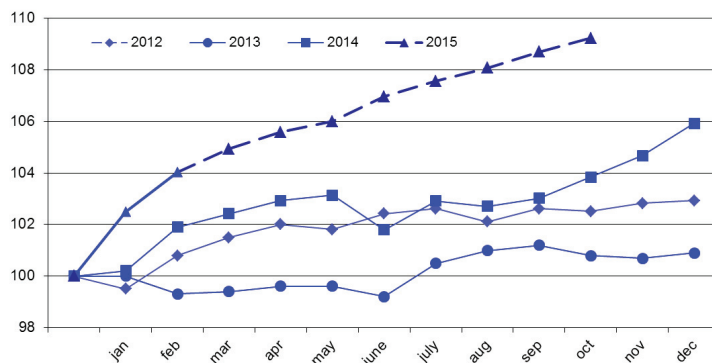


Fig. 29. The cost of the monthly per capita minimum food basket (Rb.)

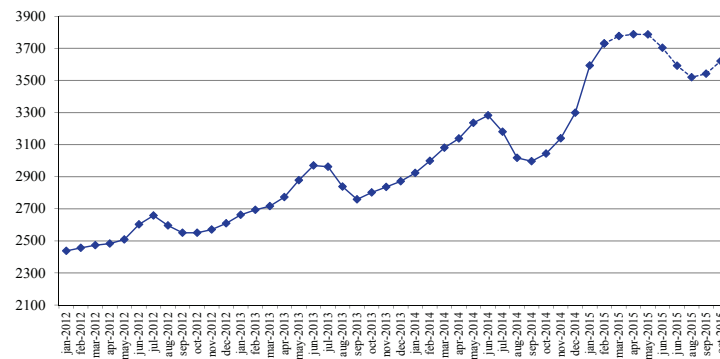


Fig. 30. The composite index of transport tariffs (for each year, as a percentage of that in the previous month)

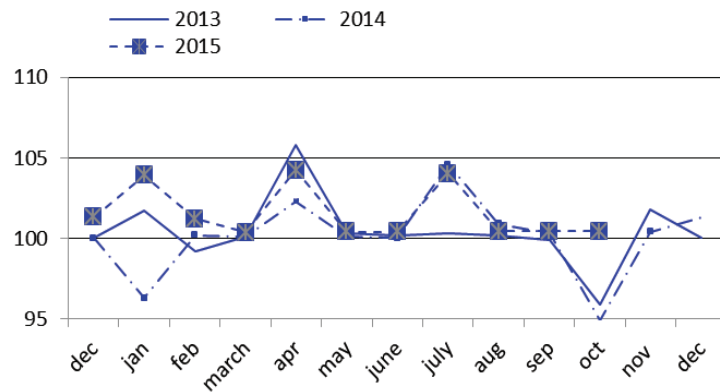


Fig. 31. The index of motor freight tariffs (for each year, as a percentage of that in the previous month)

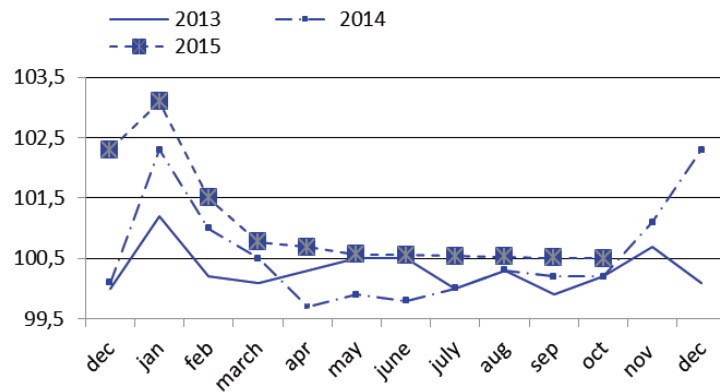


Fig. 32. The index of pipeline tariffs (for each year, as a percentage of that in the previous month)

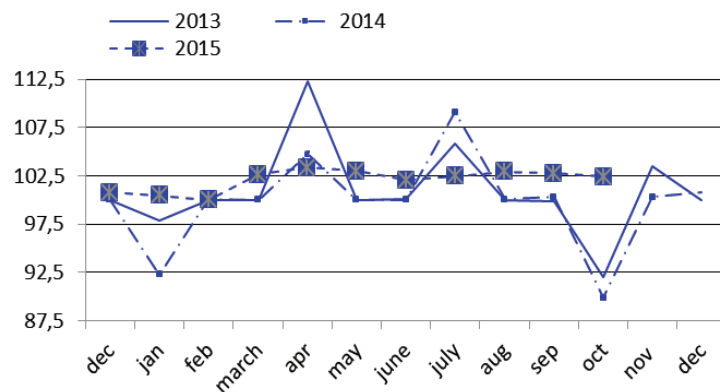


Fig. 33. The Brent oil price (\$ per barrel)

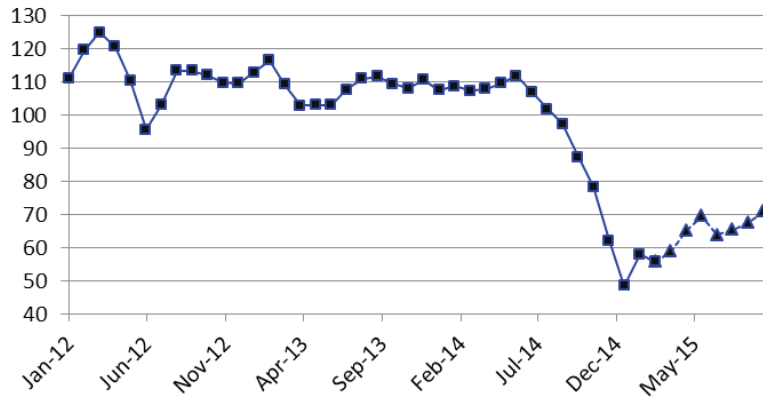


Fig. 34. The aluminum price (\$ per ton)

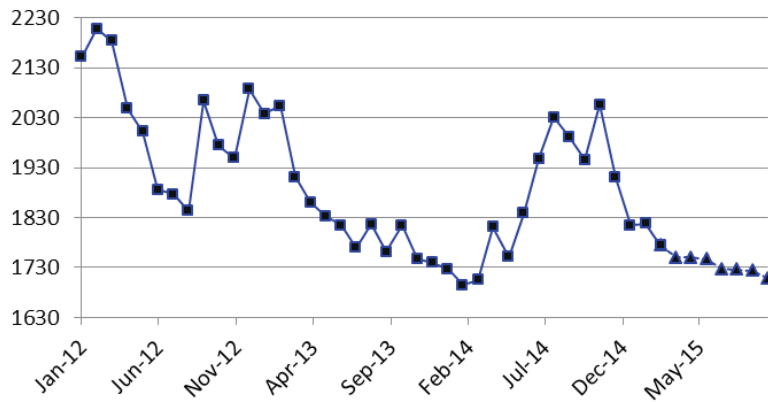


Fig. 35. The gold price (\$ per ounce)

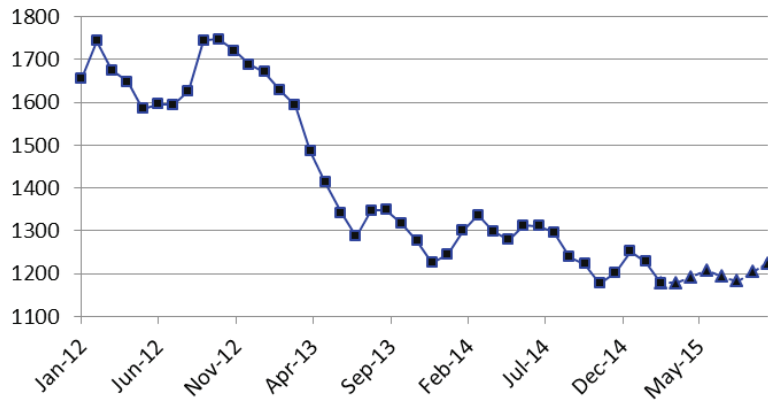


Fig. 36. The nickel price (\$ per ton)

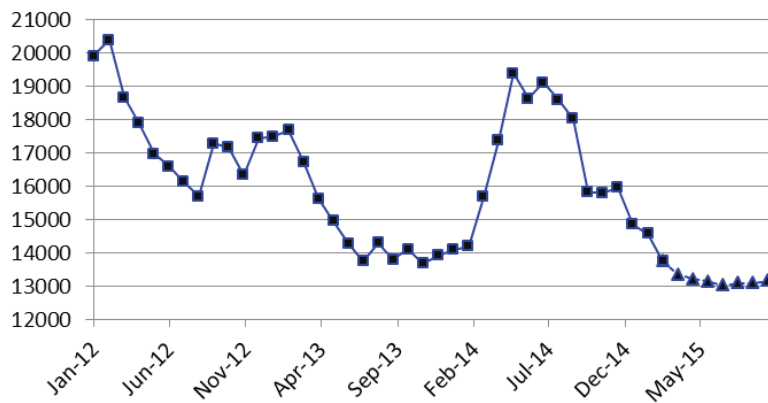


Fig. 37. The copper price (\$ per ton)

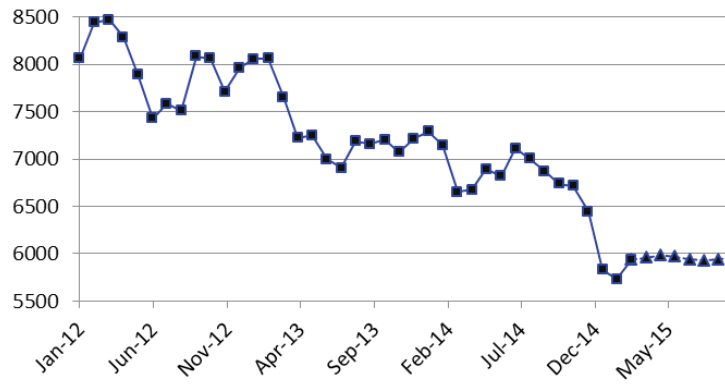


Fig. 38. The monetary base, billion Rb

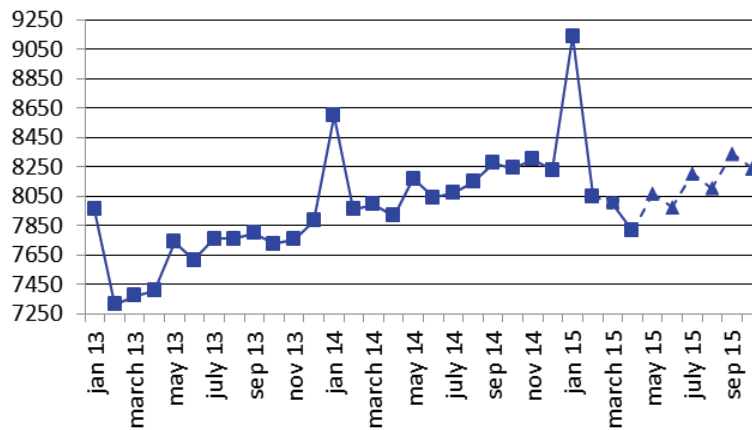


Fig. 39. M2, billion Rb

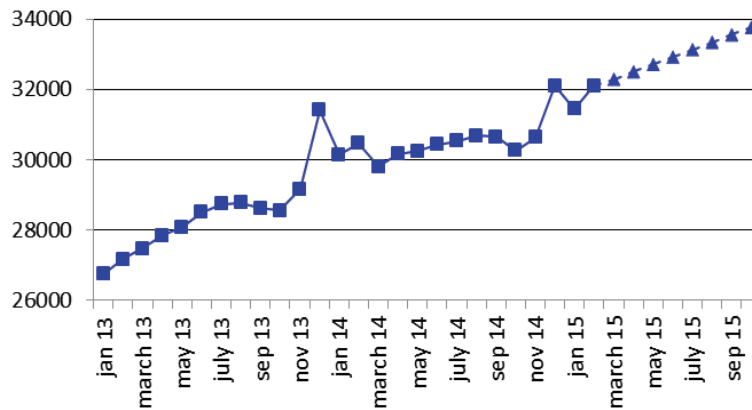


Fig. 40. The international reserves of the Russian Federation, million USD

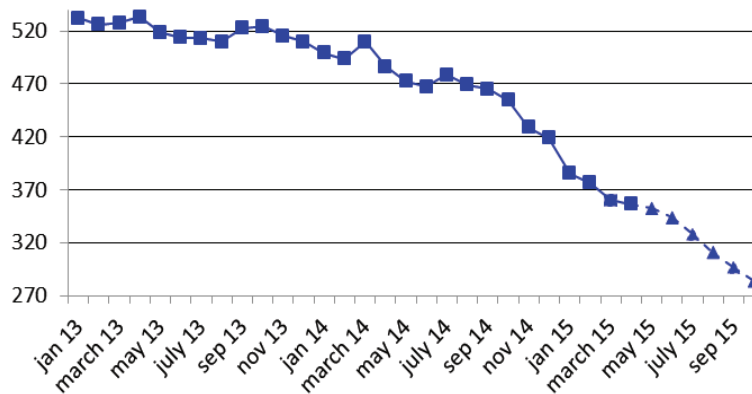


Fig. 41. The RUR/USD exchange rate

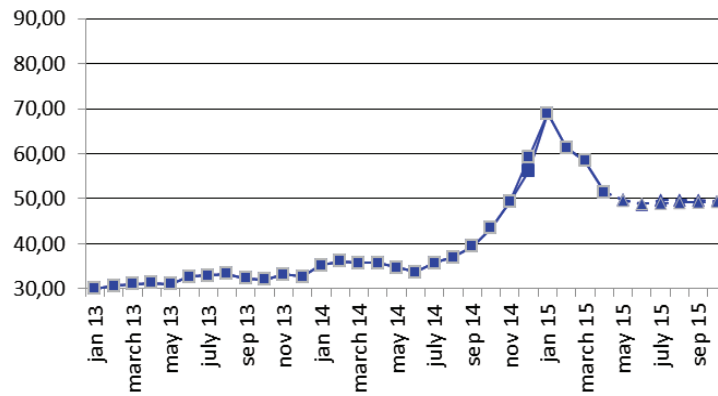


Fig. 42. The USD/EUR exchange rate

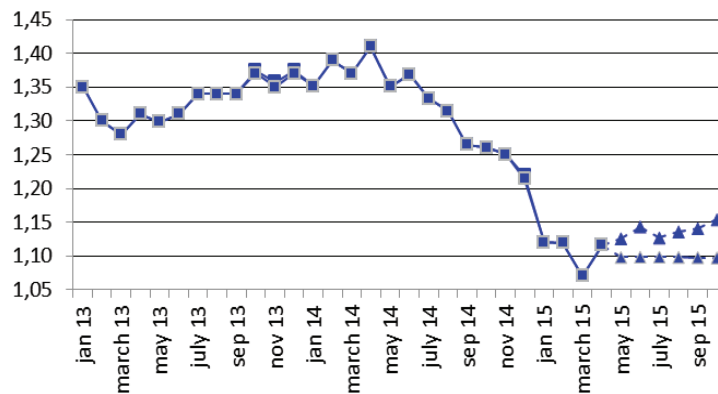


Fig. 43. Real disposable cash income (as a percentage of that in the same period of the previous year)

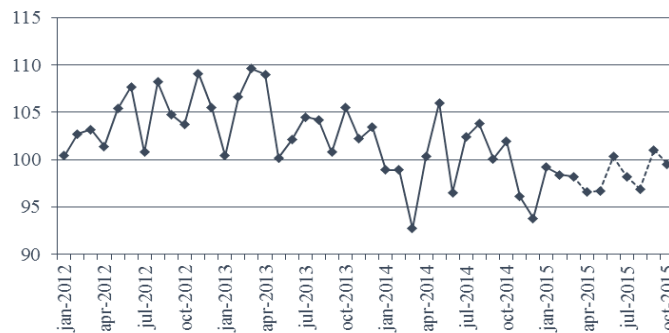


Fig. 44. Real cash income (as a percentage of that in the same period of the previous year)

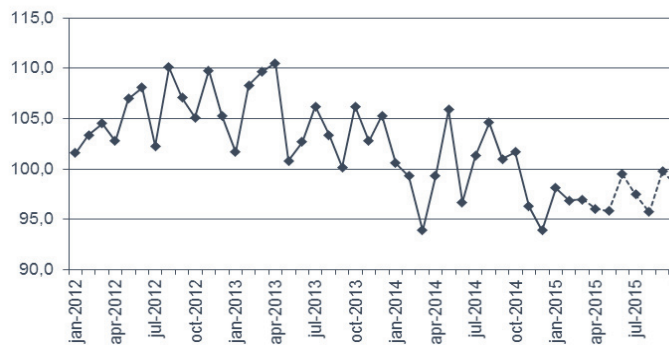


Fig. 45. Real accrued wages
(as a percentage of those in the same period of the previous year)

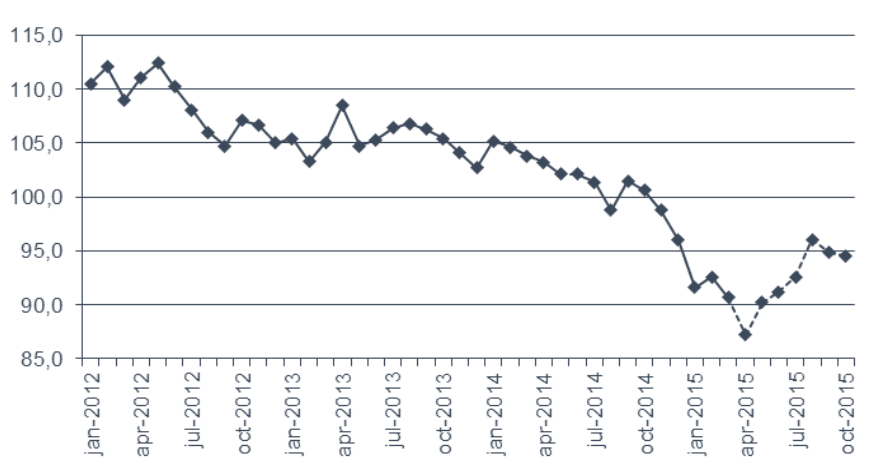


Fig. 46. Employment (million people)

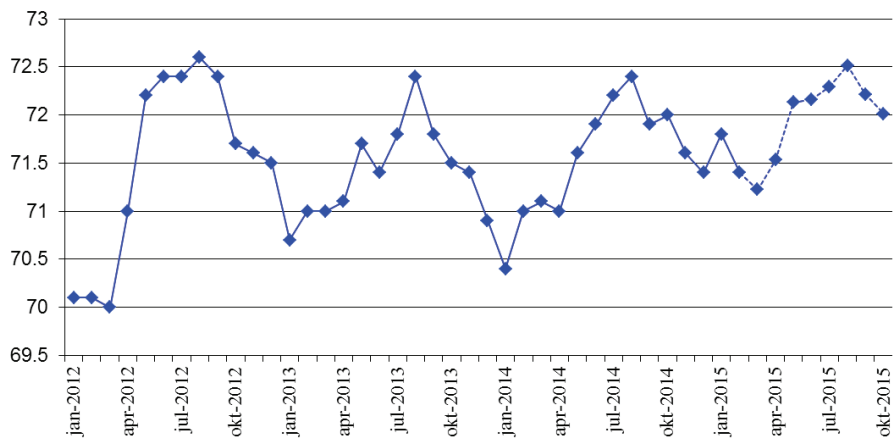


Fig. 47. Unemployment (million people)

