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Model Calculations of Short-Run Forecasts of Russian Economic Time Series
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Introduction to All the Issues

This paper presents calculations of various economic indicators for the Russian Federation in June–November 2015, which were performed using time series models developed as a result of research conducted by the Gaidar Institute over the past few years[1]. A method of forecasting falls within the group of *formal* or *statistical* methods. In other words, the calculated values neither express the *opinion* nor *expert evaluation* of the researcher, rather they are calculations of future values for a specific economic indicator, which were performed using formal ARIMA-models (p, d, q) given a prevailing trend and its, in some cases, significant changes. The presented forecasts are of inertial nature, because respective models rely upon the dynamics of the data registered prior to the moment of forecasting and depend too heavily on the trends which are typical of the time series in the period immediately preceding the time horizon to be forecasted. The foregoing calculations of future values of economic indicators for the Russian Federation can be used in making decisions on economic policy, provided that the general trends, which were seen prior to forecasting for each specific indicator, remain the same, i.e. prevailing long-term trends will see no serious shocks or changes in the future.

Despite that there is a great deal of data available on the period preceding the crisis of 1998, models of forecasting were analyzed and constructed using only the time horizon which followed August 1998. This can be explained by the findings of previous studies[2] which concluded, among other key inferences, that the quality of forecasts was deteriorated in most of the cases when the data on the pre-crisis period was used. Additionally, it currently seems incorrect to use even shorter series (following the crisis of 2008), because statistical characteristics of models based on such a short time horizon are very poor.

Models for the economic indicators in question were evaluated using standard methods of time series analysis. Initially, the correlograms of the studied series and their first differences were analyzed in order to determine the maximum number of delayed values to be included into the specifications of a model. Then, the results of analyzed correlograms served as the basis for testing all the series for weak stationarity (or stationarity around the trend) using the Dickey–Fuller test. In some cases, the series were tested for stationarity around the segmented trend using Perron and Zivot–Andrews tests for endogenous structural changes.[3]

The series were broken down into weak stationary, stationary near the trend, stationary near the trend with structural change or difference stationary, and then models, which corresponded to each type (regarding the levels and including, if necessary, the trend or segmented trend or differences), were evaluated. The Akaike and Schwartz information criteria, the properties of models' residuals (lack of autocorrelation, homoscedasticity and normality) and the quality of the in-sample-forecasts based on these models were used to choose the best model. Forecast values were calculated for the best of the models constructed for each economic indicator.

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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.

Additionally, the Bulletin presents future monthly values of the CPI, which were calculated using models developed at the Gaidar Institute, and volumes of imports/exports from/to all countries, which were calculated using structural models (SM). The forecast values based on the structural models may, in some cases, produce better results than ARIMA-models do, because structural models are constructed by adding information of the dynamics of exogenous variables. Besides, the use of structural forecasts in making aggregated forecasts (i.e. forecasts obtained as average value from several models) may help make forecast values more accurate.

The dynamics of the Consumer Price Index was modeled using theoretical assumptions arising from the monetary theory. The following was used as explanatory variables: money supply, output volume, the dynamics of the ruble-dollar exchange rate which reflects the dynamics of alternative cost of money-keeping. The model for the Consumer Price Index also included the price index in the electric power industry, because the dynamics of manufacturers' costs relies heavily on this indicator.

The baseline indicator to be noted is the real exchange rate, which can influence the value of exports and imports, and its fluctuations can result in changes to the relative value of domestically-produced and imported goods, though the influence of this indicator turns out to be insignificant in econometric models. Global prices of exported resources, particularly crude oil prices, are most significant factors which determine the dynamics of exports: a higher price leads to greater exports of goods. The level of personal income in the economy (labor costs) was used to describe the relative competitive power of Russian goods. Fictitious variables D12 and D01 – equal to one in December and January and zero in other periods – were added so that seasonal fluctuations were factored in. The dynamics of imports is effected by personal and corporate incomes whose increase triggers higher demand for all goods including imported ones. The real disposable money income reflects the personal income; the Industrial Production Index reflects the corporate income.

The forecast values of foreign exchange rates were also calculated using structural models of their dependence on global crude oil prices.

The forecast values of explanatory variables, which are required for forecasting on the basis of structural models, were calculated using ARIMA-models (p, d, q).

The paper also presents calculations of the values of the Industrial Production Index, the Producer Price Index and the Total Unemployment Index, which were calculated using the results of business surveys conducted by the Gaidar Institute. Empirical studies show[4] that the use of series of business surveys as explanatory variables [5] in forecasting models can make forecasting more accurate on the average. Future values of these indicators were calculated using ADL-models (seasonal autoregressive delays were added).

The Consumer Price Index and the Producer Price Index are also projected using large datasets (factor models – FM). The construction of factor models relies basically on the evaluation of the principal components of a large dataset of socio-economic indicators (112 indicators in this case). The lags of these principal components and the lags of the explanatory variable are used as explanatory variables in these models. A quality analysis of the forecasts obtained for different configurations of the factor models was used to chose a model for the CPI, which included 9th, 12th and 13th lags of the four principal components, as well as 1st and 12th lags of the variable itself, and a model for the PPI, which included 8th,

[4] 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.

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

9th and 12th lags of the four principal components, as well as 1st, 3rd and 12th lags of the variable itself.

All calculations were performed using the Eviews econometric package.

Industrial Production and Retail Sales

Industrial production

For making forecast over summer–autumn 2015, the series of monthly data of indices of industrial production released by the Federal State Statistics Service (Rosstat) from January 2002 to February 2015, as well as the series of the base indices of industrial production released by the National Research University Higher School of Economics (NRU HSE[6]) over the period from January 1999 to March 2015 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 the NRU HSE indices of industrial production are calculated on business surveys (BS) as well. The obtained results are shown in Table 1.

Table 1

Calculations of forecast values of indices of industrial production,[7] (%)

	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																		
June 2015	0.9	0.8	-1.6	0.1	0.3	-0.1	0.2	-2.8	4.1	5.3	1.7	4.7	-0.8	1.1	-5.0	-3.1	-5.7	-15.9
July 2015	0.1	-1.3	-1.3	-1.4	0.4	1.1	-1.7	-3.0	3.5	5.0	1.2	2.7	4.2	5.4	-5.5	-2.8	-0.2	-13.9
August 2015	1.0	-1.3	-0.1	-1.5	-0.6	0.6	1.0	-0.9	3.9	4.8	1.8	1.4	2.8	3.3	-5.7	-1.2	-6.5	-6.0
September 2015	-0.8	-1.3	-1.4	-1.7	-2.5	0.0	-2.6	-3.6	3.7	4.7	0.8	-1.7	3.3	2.9	-7.8	-2.6	-8.0	-6.9
October 2015	-1.3	-2.2	-1.7	-2.8	-2.1	-0.1	-3.6	-3.0	-1.6	-1.5	1.5	-0.9	3.0	3.8	-8.9	-2.5	-18.5	-11.9
November 2015	2.3	0.9	0.0	0.2	-1.5	-0.3	-2.3	-1.8	0.2	0.1	3.4	0.0	3.4	3.4	-10.9	-2.2	-7.4	1.6
For reference: actual growth in 2014 on the respective month of 2013																		
June 2014	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	-6.8
July 2014	1.5		-0.1		0.2	0.0	2.4	-0.2	0.8	0.2	4.7	1.2	1.3	-1.1	1.9	3.9	-7.2	-0.9
August 2014	0.0		-1.0		0.8	0.0	-0.6	-1.9	1.2	0.8	4.1	2.7	3.5	1.4	-0.6	3.6	-0.3	-13.5
September 2014	2.8		0.8		2.4	0.7	3.6	1.3	-0.8	-1.4	5.1	4.6	6.5	4.6	0.5	5.1	-4.9	-12.4
October 2014	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	-6.8
November 2014	-0.4		0.5		2.5	1.0	-3.0	-1.9	7.0	9.2	-1.8	-0.6	4.9	3.8	1.0	6.9	-17.0	-20.5

Note: in the time spans under review, the series of the Rosstat and the 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 the 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.

As seen from *Table 1*, the average[8] decline of the industrial production index computed by NRU HSE over June–November 2015 constitutes 1.1% against corresponding period of previous year on industrial production overall. For the Rosstat industrial production index, this indicator comes to 0.2%.

[6] The indices in question are calculated by E.A. Baranov and V.A. Bessonov.

[7] 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.

[8] The average growth of industrial production indices is understood here as the average value of the said indices for six forecast months.

Average monthly values of industrial production index of mining and quarrying released by Rosstat and NRU HSE over June–November 2015 constitute (-1.0%) and 0.2%, respectively. In manufacture of coke and oil products, average growth for the Rosstat index and the NRU HSE index is forecasted at 2.7% and 3.3%, respectively.

Average growth of industrial production index of manufacturing computed by NRU HSE in June–November 2015 comes to (-2.5%), and the Rosstat index (-1.5%) in comparison with corresponding period of previous year. Average monthly values of industrial production index of manufacture of food products computed by Rosstat and NRU HSE constitute 1.7% and 1.0%, respectively. Average monthly values of industrial production index computed by Rosstat and NRU HSE constitute for manufacture of basic metals and fabricated metal products over June–November 2015 constitute (-7.3%) and (-2.4%), respectively. Manufacture of machinery and equipment average growth is forecasted at (-7.7%) and (-8.8%) for the Rosstat and the NRU HSE indices, respectively.

Average growth of industrial production index of electricity, gas and water supply computed by Rosstat constitutes 2.3% over June–November 2015 in comparison with corresponding period of previous year, the same indicator for the NRU HSE index comes to 3.1%.

Retail Sales

This section (Table 2) presents forecasts of monthly retail sales made on the basis of monthly Rosstat data over the period from January 1999 to April 2015.

As follows from the findings demonstrated in *Table 2*, average forecast increment of the monthly trade turnover (in nominal terms) constitutes about 6.6% over June–November 2015 against corresponding period of 2014.

Average forecast decline of the monthly real turnover constitutes 10.5% fover June–November 2015 against corresponding period 2014.

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)**
June 2015	2260.5 (6.7)	90.3
July 2015	2338.2 (6.7)	90.2
August 2015	2414.8 (6.7)	90.6
September 2015	2386.7 (6.5)	89.2
October 2015	2470.4 (6.9)	88.6
November 2015	2485.3 (6.0)	88.1
For reference: actual values in the same months of 2014		
June 2014	2118.8	101.1
July 2014	2192.2	101.6
August 2014	2263.8	101.6
September 2014	2241.3	101.8
October 2014	2310.9	101.7
November 2014	2343.6	101.9

Note: the series of retail sales and real retail sales over January 1999 – April 2015.

Investments in Capital Assets

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

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)**
June 2015	1278.6 (8.3)	95.1
July 2015	1163.7 (8.2)	94.4
August 2015	1273.5 (9.0)	94.7
September 2015	1319.2 (9.6)	94.9
October 2015	1623.0 (10.5)	94.9
November 2015	1524.2 (11.1)	94.9
For reference: actual values in the same months of 2014		
June 2014	1180.5	99.3
July 2014	1075.1	99.1
August 2014	1168.5	98.4
September 2014	1204.0	98.1
October 2014	1468.5	99.2
November 2014	1372.5	92.2

Note: the series of investments in capital assets over the period from January 1999 to April 2015 are series of DS type.

Findings presented in *Table 3* demonstrate that the average forecast increment of investment in capital assets (in nominal terms) constitutes about 3.6% over June–November 2015 against corresponding period of previous year.

Average forecast decline of real investment comes to 5.2% over June–November 2015 against the same period 2014.

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 over the period from September 1998 to April 2015 on the basis of the data released by the Central Bank of Russia[9]. The results of calculations are shown in Table 4.

Forecast average decline of indices for export, import, export outside the CIS and import from countries outside CIS over June–November 2015 against the same period 2014 will constitute 14.2%, 27.7%, 20.6% and 28.9%, respectively. Forecast average surplus volume of trade balance with all countries over June–November 2015 will constitute $ 96.3bn which corresponds to an increase by 10.0% from the same period 2014.

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

Table 4.1

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
June 2015	33.8	30.1	83	74	16.2	18.7	61	70	24.4	28.2	70	81	14.7	14.0	63	60
July 2015	34.3	32.0	74	69	19.4	19.4	66	66	28.0	30.4	68	74	16.1	17.8	62	69
August 2015	35.3	35.6	85	86	18.7	18.4	74	73	27.7	30.0	76	82	18.0	15.1	81	68
September 2015	33.2	33.5	87	88	18.5	18.5	71	71	24.4	28.5	74	86	16.2	16.7	71	73
October 2015	38.3	37.1	92	89	20.1	19.5	75	73	25.1	33.4	69	92	17.7	16.0	74	67
November 2015	38.9	37.7	106	103	20.6	19.2	89	83	25.7	32.3	82	102	18.0	16.9	88	83
For reference: actual values in respective months of 2014 (billion USD)																
June 2014	40.7				26.7				34.7				23.3			
July 2014	46.2				29.2				41.0				25.8			
August 2014	41.5				25.3				36.4				22.3			
September 2014	38.1				26.0				33.0				22.8			
October 2014	41.5				26.8				36.2				24.0			
November 2014	36.8				23.1				31.5				20.5			

Note: over the period from January 1999 to April 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 Index

This section presents calculations of forecast values of the consumer price index and producer price index (as regards both manufacturing industry and some types of manufacture activities under the National Industry Classification Standard (NICS)) made on the basis of the time-series models evaluated on the basis of the data released by Rosstat over the period from January 1999 to March 2015[10]*. Table 5 presents the results of model calculations of forecast values over June–November 2015 in accordance with ARIMA-models, structural models (SM) and models computed with the help of business surveys (BS).*

Table 5

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 previous month)																		
June 2015	101.0	100.4	100.9	101.4	99.6	101.7	100.1	101.2	100.0	100.6	101.0	101.4	101.0	101.6	100.9	101.9	100.8	100.9
July 2015	100.7	100.3	100.7	100.8	100.3	101.6	102.9	101.0	100.0	101.0	100.8	100.9	100.6	101.4	101.8	101.4	100.6	100.6
August 2015	100.3	100.4	100.7	100.7	100.4	102.3	103.4	101.4	99.9	100.6	100.8	100.7	100.4	101.4	102.4	101.2	100.6	100.5
September 2015	100.6	100.3	100.5	100.3	99.8	101.1	100.5	101.5	101.9	100.8	100.8	100.6	100.5	101.4	102.6	101.2	100.8	100.6
October 2015	100.9	100.3	100.5	100.1	99.6	98.7	100.7	101.5	99.6	101.1	100.8	101.1	100.5	101.3	101.7	101.6	100.5	100.5
November 2015	101.0	100.5	100.7	100.3	99.7	98.6	101.8	101.4	100.7	101.3	100.9	100.8	100.0	101.3	100.7	102.6	100.7	100.6
Forecast values (% of December 2014)																		
June 2015	110.3	108.9	110,7	115.2	111,8	116,8	122.4	114.5	101.6	112.4	112.3	112.8	112.9	117.1	113.8	129.1	107.5	107.0
July 2015	111.0	109.2	111,5	116.0	112,1	118,7	126.0	115.6	101.6	113.5	113.3	113.8	113.6	118.7	115.9	131.0	108.1	107.6
August 2015	111.4	109.6	112,3	116.9	112,5	121,4	130.3	117.2	101.5	114.1	114.2	114.6	114.1	120.4	118.7	132.6	108.8	108.1
September 2015	112.1	110.0	112,8	117.2	112,3	122,7	131.0	119.0	103.4	115.0	115.0	115.2	114.7	122.1	121.8	134.2	109.6	108.7
October 2015	113.0	110.3	113,4	117.4	111,9	121,2	131.9	120.8	103.0	116.3	116.0	116.5	115.2	123.7	123.8	136.4	110.2	109.3
November 2015	114.1	110.8	114,2	117.8	111,6	119,5	134.3	122.5	103.7	117.8	117.0	117.4	115.2	125.3	124.7	139.9	111.0	110.0
For reference: actual values in the same periods of 2014 (% of December 2013)																		
June 2014	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
July 2014	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
August 2014	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
September 2014	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
October 2014	107.1			105.4			100.9	107.4	103.8	110.2	103.3	102.2	102.3	112.2	108.9	108.7	106.9	103.8
November 2014	108.5			104.9			96.2	108.2	103.8	111.9	104.1	101.7	102.1	110.8	109.1	110.4	110.0	104.7

Note: over the period from January 1999 to March 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 growth of the consumer price index over June–November 2015 will come at monthly rate of 0.9%. Price growth of industrial goods manufacturers for this period is forecasted on average at monthly rate of 0.4%. It should be noted that the index of inconsistency in forecasts computed along various models is rather high.

For producer price index computed by Rosstat over the period from June to November 2015, the following average monthly growth rates are forecasted: in mining and quarrying 1.6%, manufacturing 1.3%, electricity, gas and water supply 0.4%, manufacture of food products 0.6%, manufacture of textiles and textile products 0.8%, manufacture of wood and wood products 0.9%, manufacture of pulp, paper and paper products 0.5%, manufacture of coke and refined

[10] Structural models were evaluated in the period from October 1998.

petroleum products 1.4%, manufacture of chemical products 1.7%, manufacture of basic metals and fabricated metal products 1.7%, manufacture of machinery and equipment 0.7% and manufacture of means of transport and transport equipment 0.6%.

The Cost of the Monthly per Capita Minimum Food Basket

This section presents the results of calculations of forecast values of the cost of the monthly per capita minimum food basket over June–November 2015. The forecasts were made on the basis of time series with use the Rosstat data over the period from January 2000 to March 2015. The results of calculations are shown in Table 6.

Table 6

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

Forecast values according to ARIMA-model (Rb)	
June 2015	3699.0
July 2015	3588.8
August 2015	3517.5
September 2015	3539.7
October 2015	3618.4
November 2015	3721.2
For reference: actual values in the same months of 2014 (billion Rb)	
June 2014	3281.9
July 2014	3180.1
August 2014	3017.5
September 2014	2996.1
October 2014	3043.7
November 2014	3139.4
Expected growth on the respective month of the previous year (%)	
June 2015	12.7
July 2015	12.9
August 2015	16.6
September 2015	18.1
October 2015	18.9
November 2015	18.5

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

As can be seen from *Table 6*, cost growth of the monthly per capita minimum food basket is forecasted compared with corresponding period of previous year. Herewith, average forecast cost of a minimum set of food products comes to nearly Rb 3,614.1. Thus, projected increment of the cost of a minimum set of food products comes on average to about 16.3% against corresponding period of previous year. Annual increment of the cost of minimum set of food products will constitute 18.5% in November 2015.

Indices of Freight Rates

This section presents calculations of forecast values of freight rate indices on cargo carriage[11], made on the basis of time-series models evaluated on the basis of data released by Rosstat over the period from September 1998 to March 2015. Table 7 shows the results of model calculations of forecast values over June–November 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

[11] 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).

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

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)			
June 2015	100.2	101.2	100.6
July 2015	103.5	101.2	101.6
August 2015	100.2	101.2	101.1
September 2015	100.2	101.2	100.1
October 2015	100.2	101.1	100.6
November 2015	100.2	101.1	101.6
Forecast values according to ARIMA-models (% of December of the previous year)			
June 2015	115,2	113,4	103,0
July 2015	119,2	114,8	104,7
August 2015	119,4	116,1	105,9
September 2015	119,7	117,4	106,0
October 2015	120,0	118,8	106,7
November 2015	120,2	120,1	108,4
For reference: actual values in the same period of 2014 (% of the previous month)			
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
November 2014	100.4	101.1	100.3

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

According to the forecast findings over June–November 2015, the composite freight rate index will be growing at average monthly rate of 0.9%. In June 2015, a seasonal index's pickup is forecasted by 3.5 p.p.

Trucking freight rate will be up by monthly average rate of 1.2% over given six months.

Pipeline rate index will also be growing over the coming six months. The average monthly growth rate will stand at 1.0%. As a result, its monthly increment will constitute 1.0%.

World Prices of Some Type of Natural Resources

This section presents calculations of such average monthly values of Brent crude prices (USD per barrel), the aluminum prices (USD per ton), the gold prices ($ per ounce), the copper prices (USD per ton) and the nickel prices (USD per ton)over June–November 2015 as were received on the basis of nonlinear models of time series evaluated on the basis of the IMF data over the period from January 1980 to April 2015.

Table 8

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					
June 2015	63.75	1816	1235	6124	12355
July 2015	70.37	1830	1218	6115	12208
August 2015	73.32	1830	1209	6119	12212
September 2015	78.06	1822	1238	6143	12200
October 2015	88.05	1823	1256	6177	12195
November 2015	93.55	1817	1263	6208	12214
Expected growth on the respective month of the previous year (%)					
June 2015	-43.0	-1.3	-3.4	-10.2	-33.7
July 2015	-34.2	-6.1	-7.1	-14.0	-36.1
August 2015	-28.1	-9.9	-6.7	-12.6	-34.3
September 2015	-19.8	-8.5	-0.1	-10.6	-32.4
October 2015	0.9	-6.3	2.7	-8.3	-22.9
November 2015	19.3	-11.6	7.4	-7.5	-22.7
For reference: actual values in the same period of 2014					
June 2014	111.87	1839	1279	6821	18629
July 2014	106.98	1948	1311	7113	19118
August 2014	101.92	2030	1296	7002	18600
September 2014	97.34	1990	1239	6872	18035
October 2014	87.27	1946	1222	6737	15812
November 2014	78.44	2056	1176	6713	15807

Note: over the period from January 1980 to April 2015, the series of prices of crude oil, nickel, gold, copper and aluminum are series of DS type.

The average forecast crude price amounts to about $77.9 per barrel which is down on corresponding indicators of last year by 17.5%. Aluminum prices are forecasted at about $1,823.0 per ton and their average projected reduction constitutes about 7% compared with the same level of last year. Forecast gold prices constitute about $1,237.0 per ounce. Average forecast copper prices constitute about $6,148.0 per ton and prices of nickel – about $12,230 per ton. Average forecast price fall on gold constitutes about 1%, average reduction of copper prices – about 11%, average reduction of nickel prices – 30% compared with corresponding level of 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 over June–November 2015 were received on the basis of models of time-series of respective indices calculated by the CBR[12] over the period from October 1998 to May 2015 for the monetary base and from October 1998 to March 2015 for M2 monetary aggregate. Table 9 presents the results of calculations of forecast values and actual values of those indices for the same period of 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.

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

Table 9

The forecast of M_2 and the monetary base

Period	The Monetary base		M_2	
	Billion Rb	Growth on the previous month, %	Billion Rb	Growth on the previous month, %
June 2015	7912	-1.0	32144	0.5
July 2015	8131	2.8	32305	0.5
August 2015	8041	-1.1	32467	0.5
September 2015	8262	2.8	32628	0.5
October 2015	8171	-1.1	32788	0.5
November 2015	8395	2.7	32948	0.5
For reference: actual value in the respective months of 2014 (growth on the previous month, %)				
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	
November 2014	0,7		1,2	

Note: over the period from October 1998 to May 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.

Over June–November 2015, the monetary base and money indicator M2 will be up during the period under review at the average monthly rate of 0.8% and 0.5%, respectively

International Reserves

This section presents the outputs of the statistical estimation of such future values of the international reserves of the Russian Federation[13] 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 over the period from October 1998 to April 2015. This index is forecasted without taking into account a decrease in the amount of reserves due to foreign debt payments and for that reason the values of 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 over June–November 2015, international reserves will be down by average monthly rate of 4.5%.

Table 10

The forecast of the international reserves of the Russian Federation

Period	Forecast values according to ARIMA-model	
	Billion USD	Growth on previous month, %
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
November 2015	267.9	-5.6
For reference: actual values in the same period of 2014		
	Billion USD	**Growth on the previous month. %**

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

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
November 2014	428.6	-5.6

Note: in the period from October 1998 to April 2015, 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 released by the RF Central Bank as of the last date of each month over the periods from October 1998 to May 2015 and from January 1999 to May 2015[14], respectively.

USD/RUR exchange rate during the reviewed period is forecasted on average along two models in the amount of Rb 52.61 for USD. USD/Euro exchange rate is forecasted at USD1.13 per 1 euro. It is worth noting that inconsistency in USD/Euro exchange rate along two models are 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
June 2015	52.35	52.39	1.11	1.10
July 2015	52.52	53.16	1.13	1.10
August 2015	52.25	53.30	1.14	1.10
September 2015	52.07	53.51	1.15	1.10
October 2015	51.23	53.71	1.18	1.10
November 2015	50.90	53.91	1.20	1.10
For reference: actual values in the similar period of 2014				
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	43,39		1.25	
November 2014	49.32		1.25	

Note: over 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 (see Table 12) presents calculations of forecast values of indices of real wages, real disposable income and real income [15] as were received on the basis of the model of time series of respective indices computed by Rosstat and taken over the period from January 1999 to April 2015. The above indices depend to a certain extent on the centralized decisions regarding wages and salaries raise of public sector workers, as well as those on raising of pensions, scholarships and allowances; such a situation introduces some changes in the dynamics of indices under review. As a result, the future values of the indices of real wages and real disposable income calculated on

[14] The Bulletin applies the IMF data over the period from January 1999 to March 2015. The data from April to May 2015 was obtained from the foreign exchange rate statistics website: www.oanda.com

[15] *Real money 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).

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.

According to the results presented in *Table 12*, real disposable income will be down on average by 0.4% a month (against corresponding period of previous year) over the reviewed period. Real money income will be down on average by 1.8%. Projected decline of real wages will be more significant and will average 6.9% a month against corresponding period of 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)			
June 2015	100.2	99.0	90.8
July 2015	97.9	96.7	92.2
August 2015	96.6	95.1	95.6
September 2015	100.8	99.2	94.4
October 2015	99.2	97.9	94.2
November 2015	102.8	101.5	96.4
For reference: actual values in the respective period of 2014 (% of the same period of 2013)			
June 2014	96.6	96.9	102.1
July 2014	102.6	101.5	101.4
August 2014	104.0	104.7	98.8
September 2014	100.2	101.1	101.5
October 2014	102.1	101.8	100.6
November 2014	96.2	96.4	98.8

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). Over the period from January 1999 to April 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 over the period from October 1998 to March 2015 on the basis of the monthly data released by Rosstat[16] were used. The unemployment was calculated on the basis of the models with results of the findings of business surveyss[17], too.

It is to be noted that possible logical differences[18] 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 other indices.

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

[17] The model is evaluated over the period from January 1999 to March 2015.

[18] 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 economically active population.

Table 13

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
June 2015	71.8	-0.2	4.1	11.8	5.8	4.4	17.7	6.1
July 2015	72.2	0.1	4.2	12.6	5.8	4.3	15.4	6.0
August 2015	72.6	0.3	4.1	11.6	5.7	4.3	14.9	5.9
September 2015	71.8	-0.1	4.2	12.8	5.8	4.3	15.4	6.0
October 2015	71.6	-0.5	4.3	10.2	6.0	4.3	10.6	6.0
November 2015	71.4	-0.3	4.4	12.1	6.1	4.4	10.9	6.2
For reference: actual values in the same periods of 2014 (million people)								
June 2014	71.9		3.7					
July 2014	72.2		3.7					
August 2014	72.4		3.7					
September 2014	71.9		3.7					
October 2014	72.0		3.9					
November 2014	71.6		3.9					

Note: over the period from October 1998 to March 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.

According to forecasts along ARIMA-models (*Table 13*), over June–November 2015, contraction of the number of employed in the economy will average at monthly rate of 0.1% against corresponding period of previous year.

Average increment of total number of unemployed is forecasted at monthly rate of 13.0% against corresponding period of last year (on average along two models).

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)

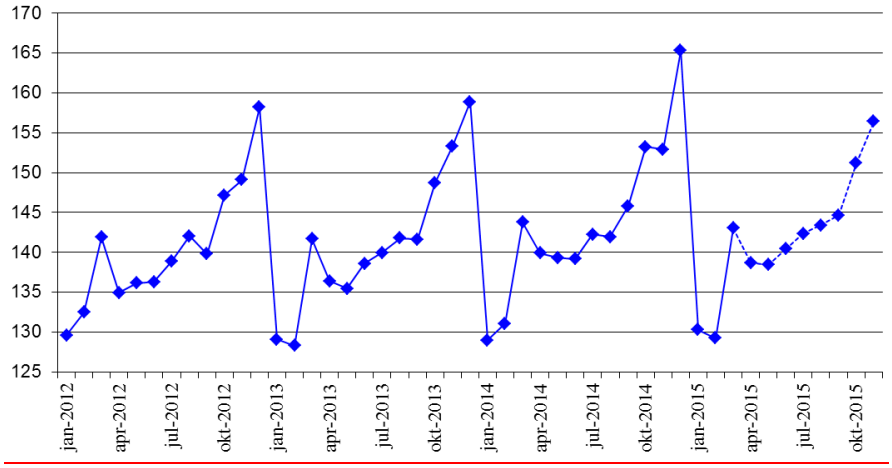

Fig. 1b. The NRU HSE industrial production index (ARIMA-model) (% of January 2005)

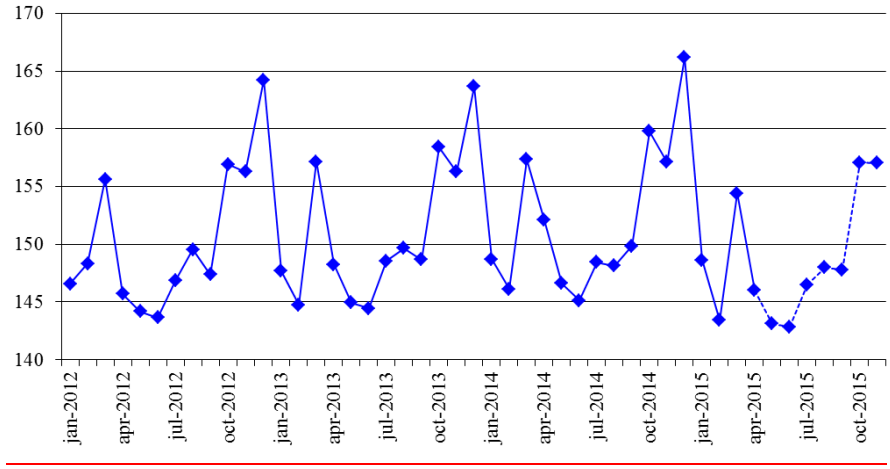

Fig. 2a. The Rosstat industrial production index for mining (% of December 2001)

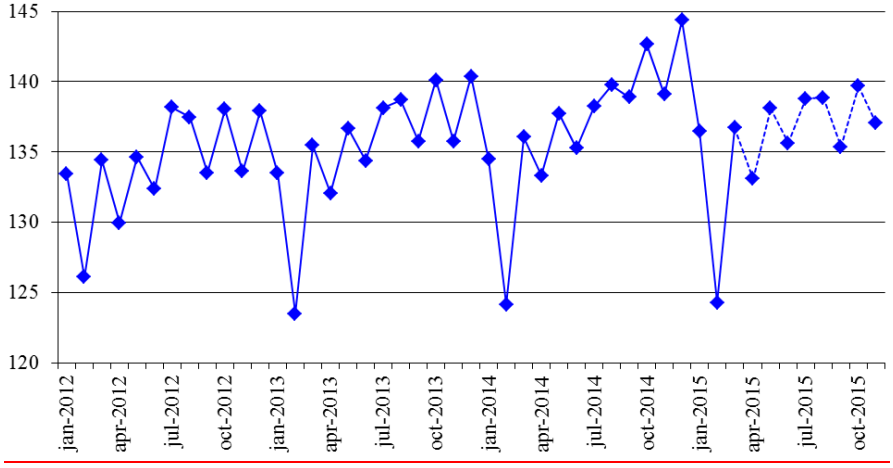

Fig. 2b. The NRU HSE industrial production index for mining (% of January 2005)

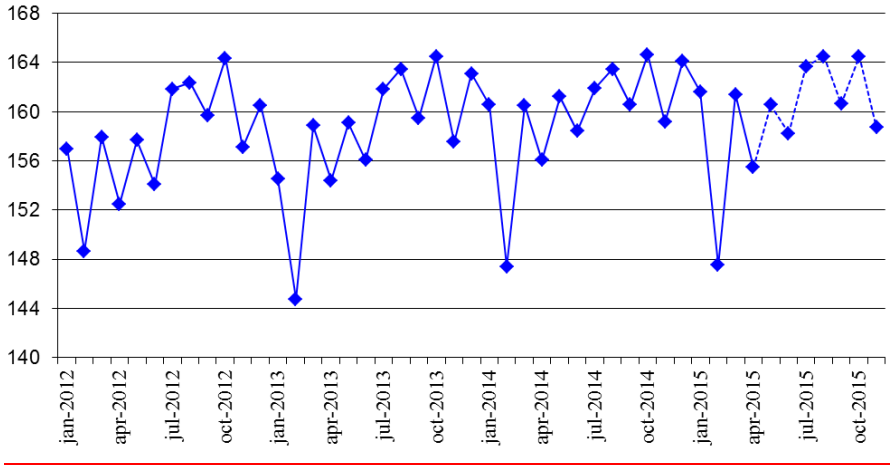

Fig. 3a. The Rosstat industrial production index for manufacturing (% of December 2001)

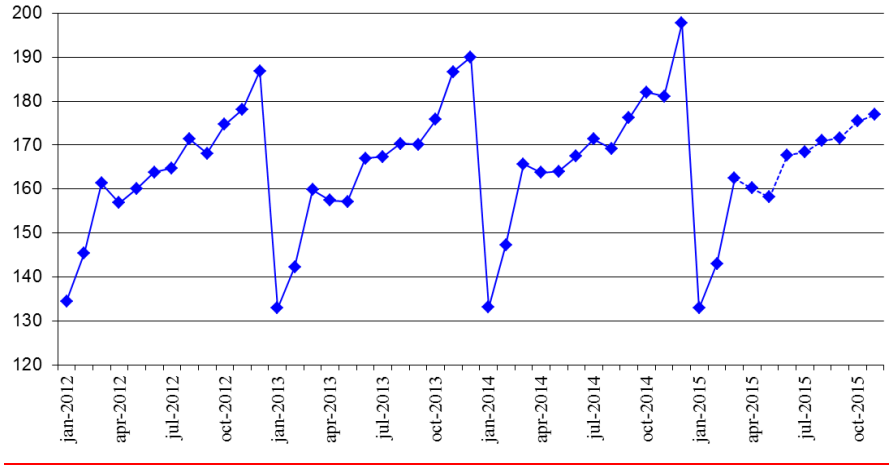

Fig. 3b. The NRU HSE industrial production index for manufacturing (% of January 2005)

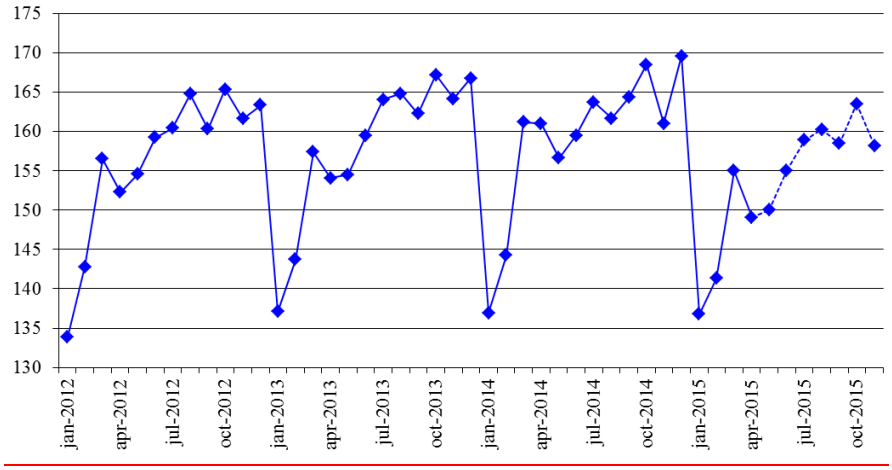

Fig. 4a. The Rosstat industrial production index for utilities (electricity, water, and gas) (as a percentage of that in December 2001)

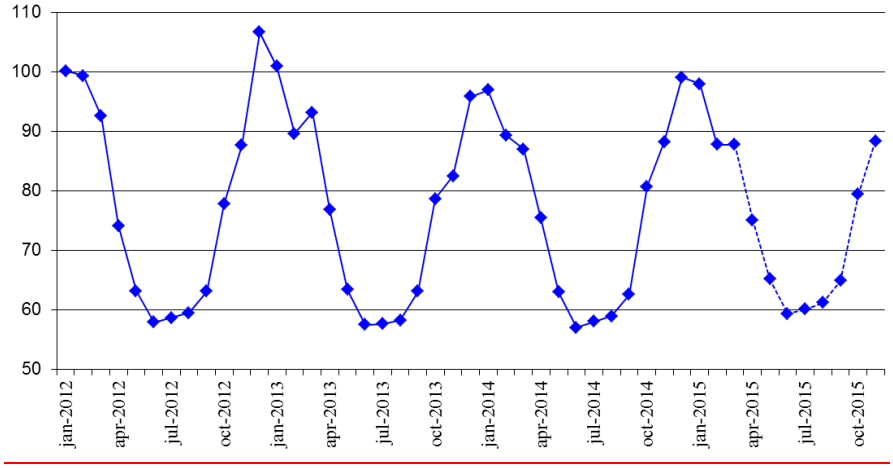

Fig. 4b. The NRU HSE industrial production index for utilities (electricity, water, and gas) (as a percentage of that in January 2005)

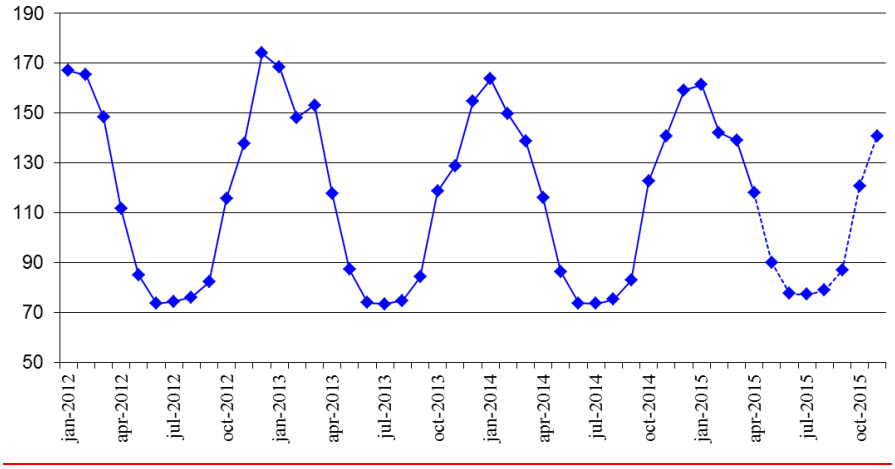

Fig. 5a. The Rosstat industrial production index for food products (as a percentage of that in December 2001)

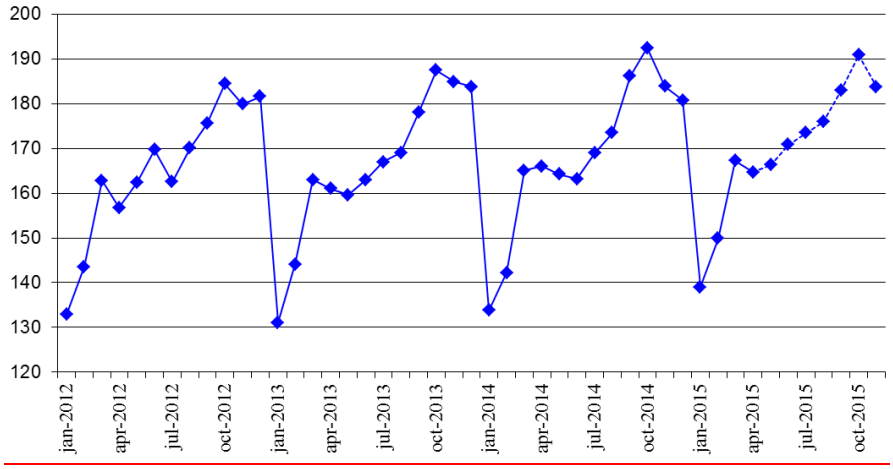

Fig. 5b. The NRU HSE industrial production index for food products
(as a percentage of that in January 2005)

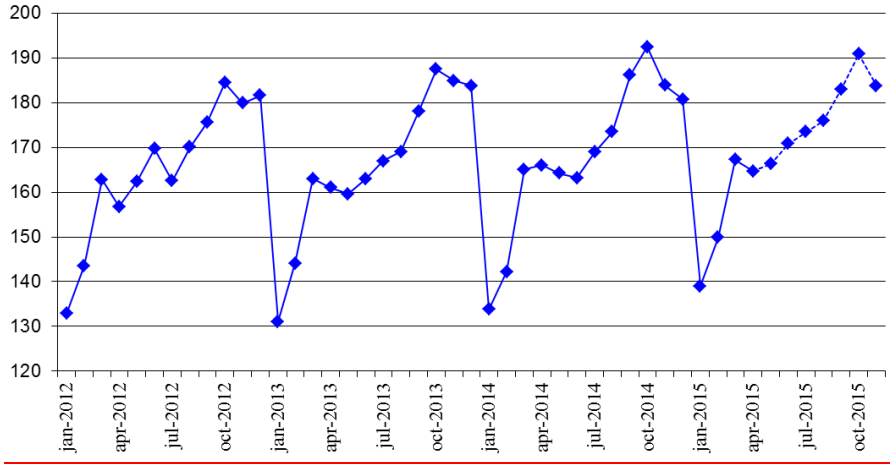

Fig. 6a. The Rosstat industrial production index for coke and petroleum
(as a percentage of that in December 2001)

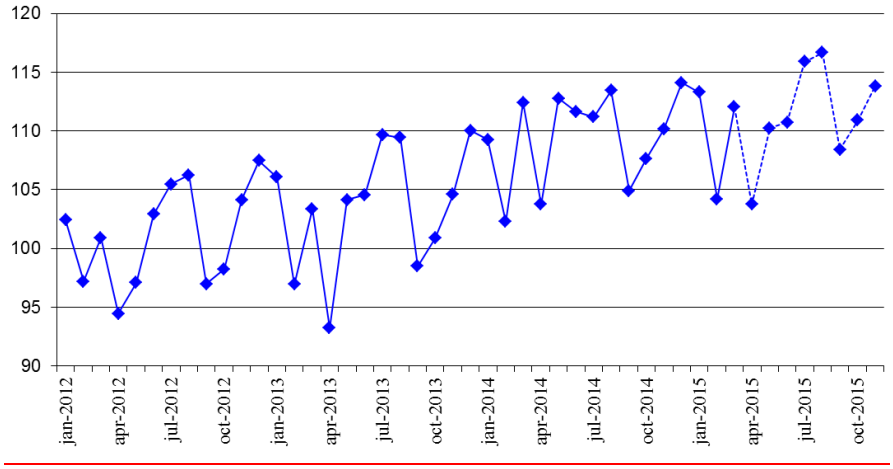

Fig. 6b. The NRU HSE industrial production index for petroleum and coke
(as a percentage of that in January 2005)

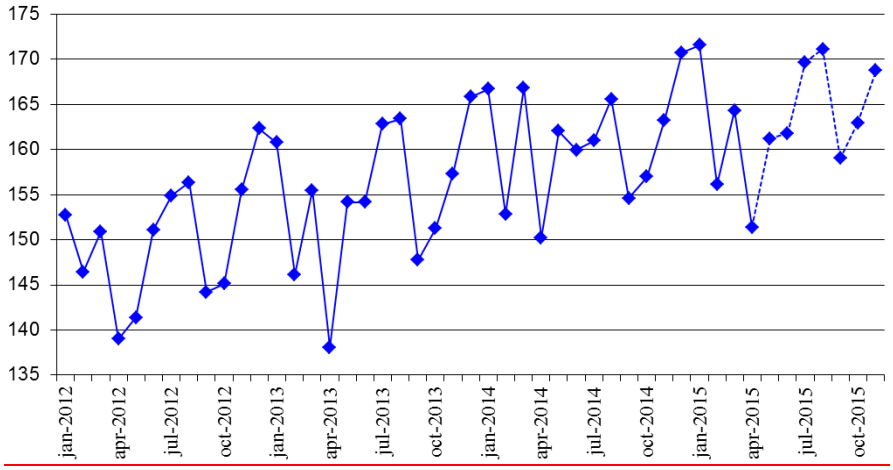

Fig.7a. The Rosstat industrial production index for primary metals and fabricated metal products (as a percentage of that in December 2001)

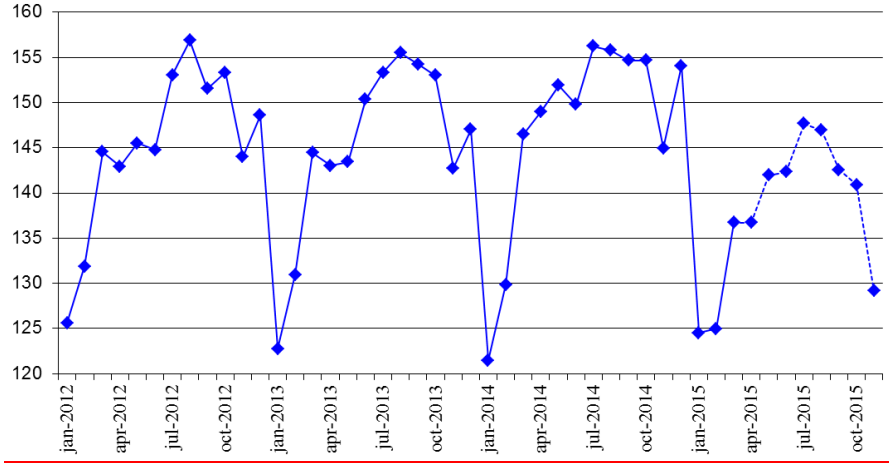

Fig. 7b. The NRU HSE industrial production index for primary metals and fabricated metal products (as a percentage of that in January 2005)

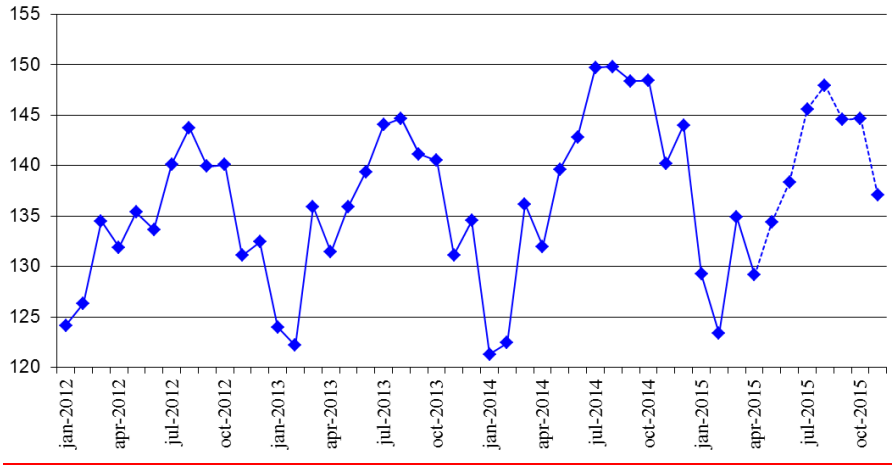

Fig. 8a. The Rosstat industrial production index for machinery (as a percentage of that in December 2001)

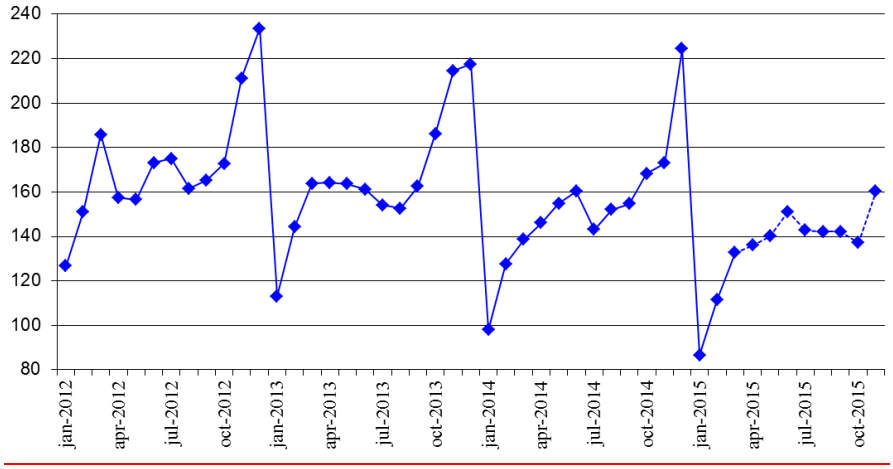

Fig. 8b. The NRU HSE industrial production index for machinery
(as a percentage of that in January 2005)

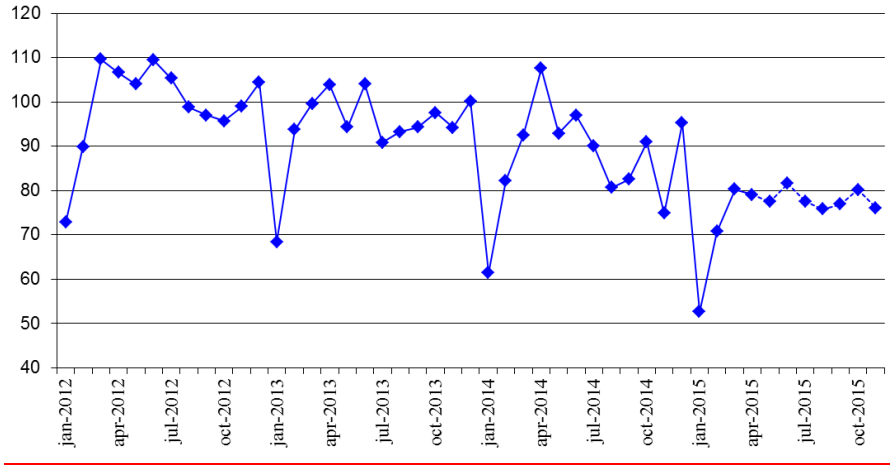

Fig. 9. The volume of retail sales (billion Rb)

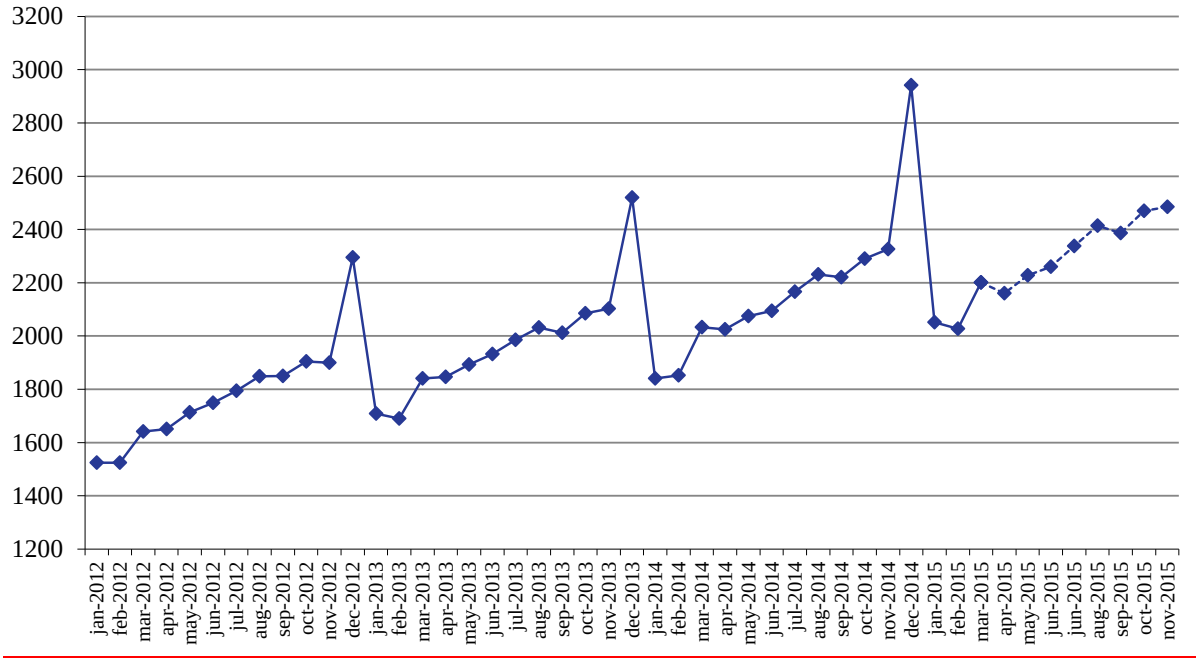

Fig. 9a. The real volume of retail sales (as a percentage of that in the same period of the previous year)

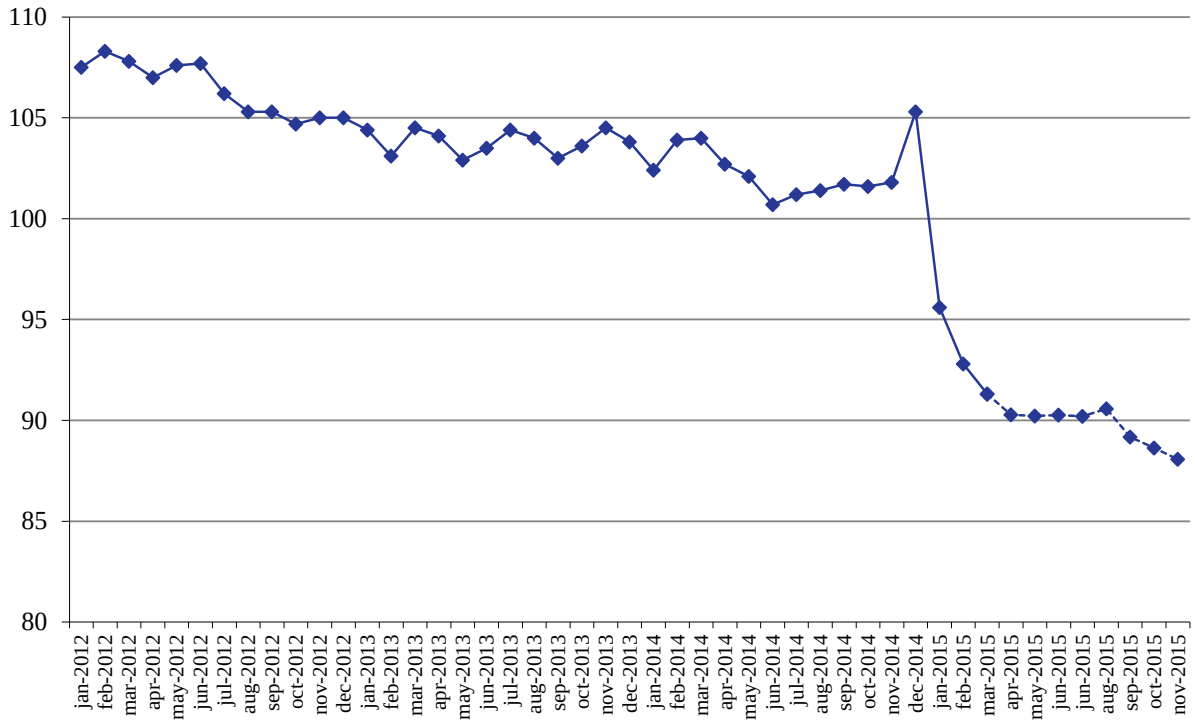

Fig. 10. Investments in capital assets (billion Rb)

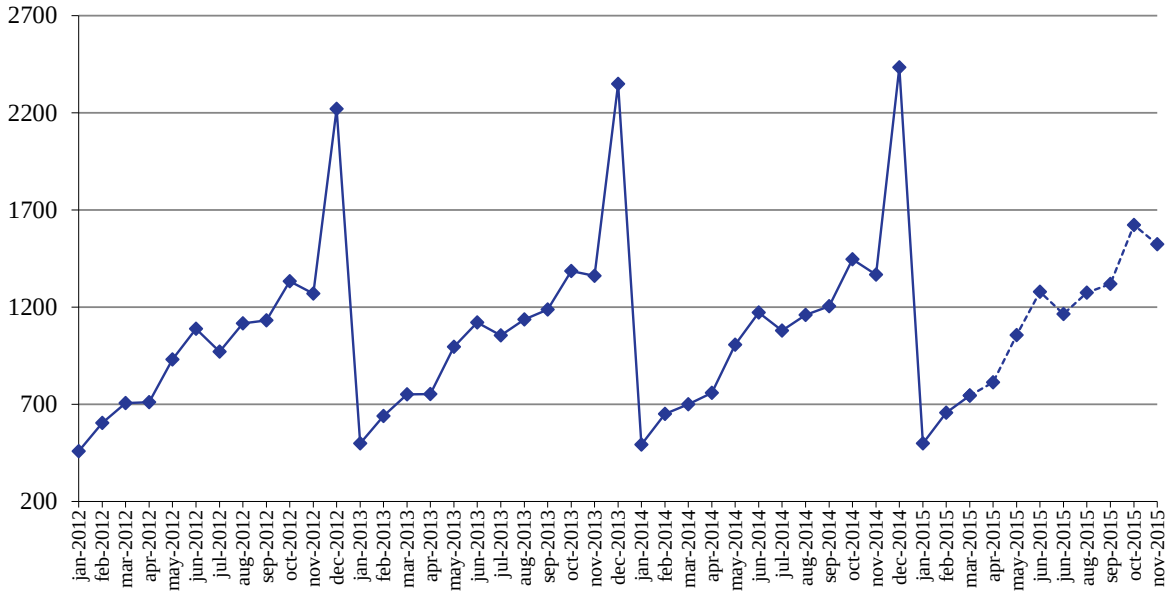

Fig. 10a. Real investments in capital assets
(as a percentage of those in the same period of the previous year)

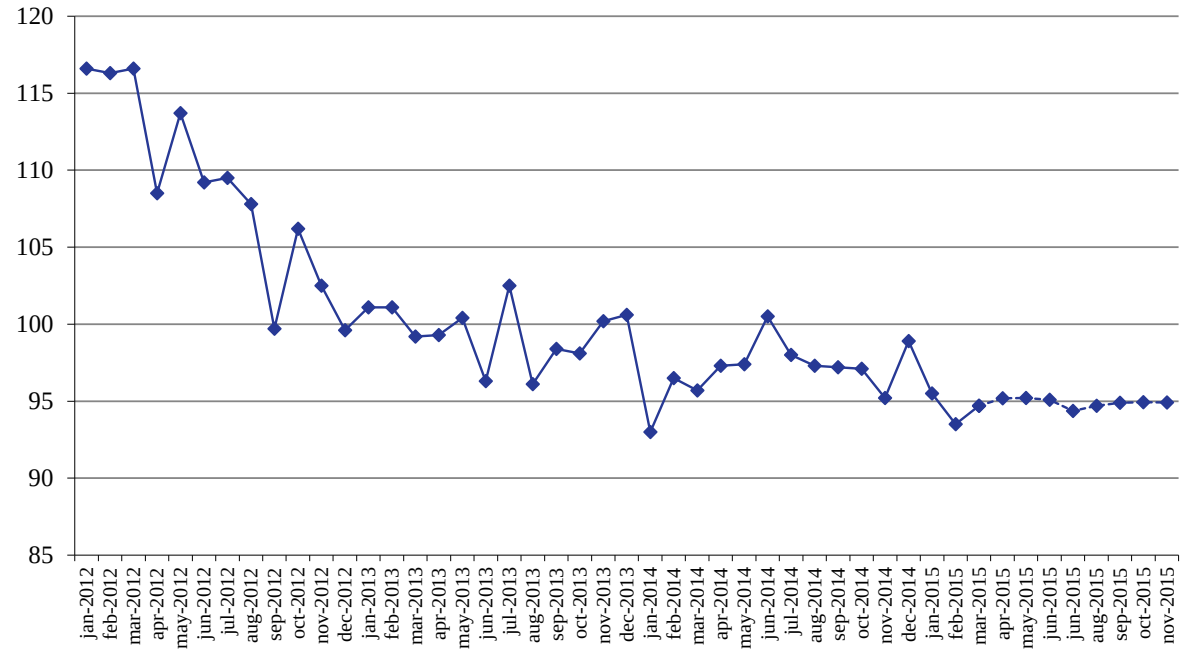

Fig.11. Export to all countries (billion USD)

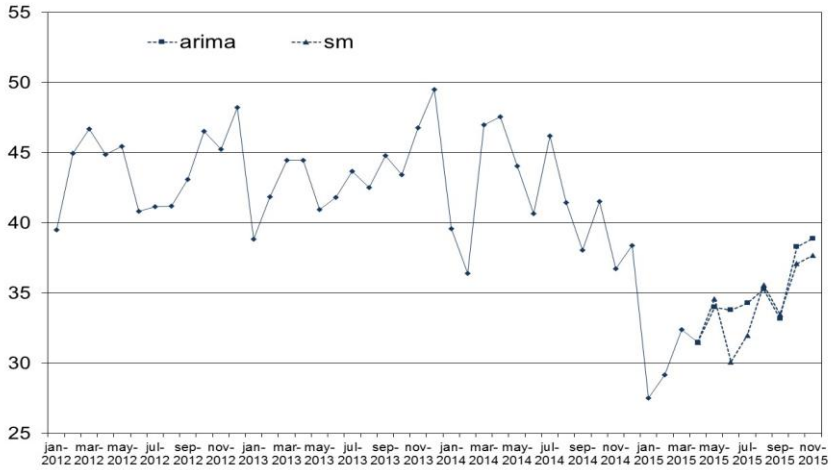

Fig. 12. Export to countries outside the CIS (billion USD)

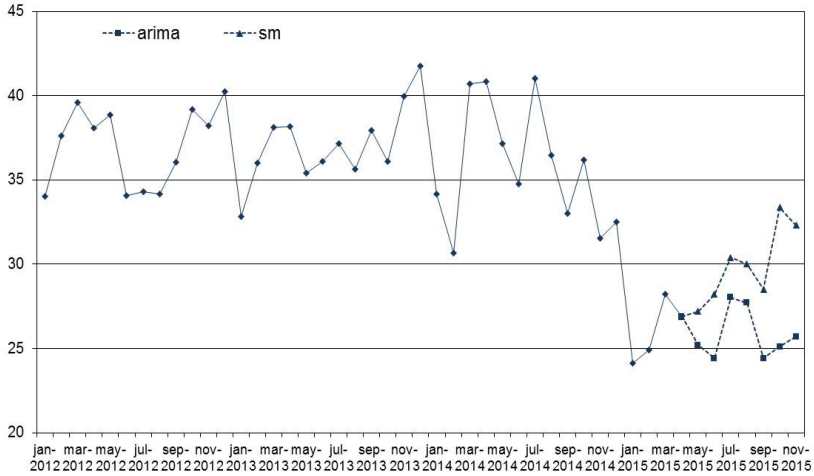

Fig. 13. Import from all countries (billion USD)

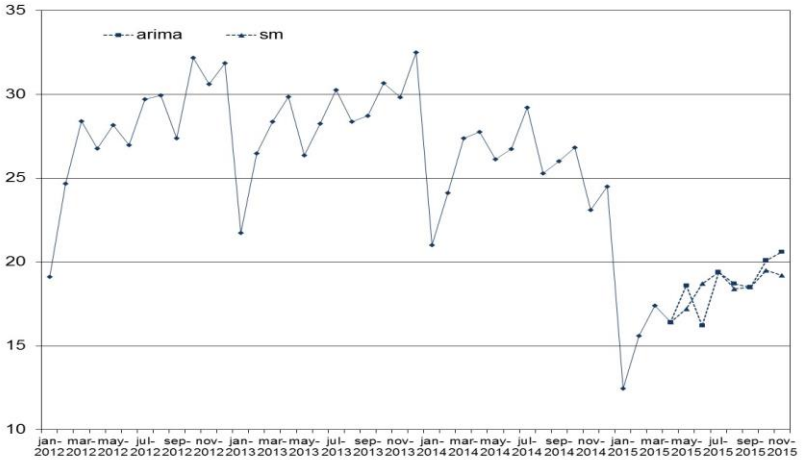

Fig. 14. Import from countries outside the CIS (billion USD)

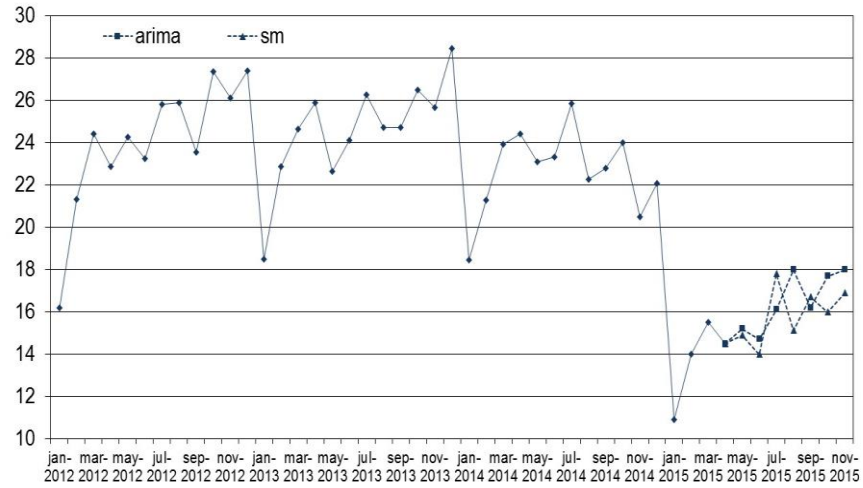

Fig. 15. The consumer price index (as a percentage of that in December of the previous year)

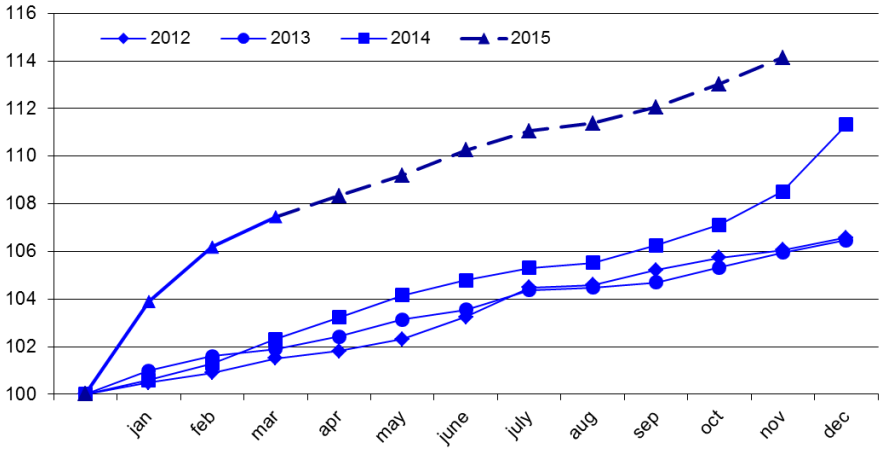

Fig. 15a. The consumer price index (as a percentage of that in December of the previous year) (SM)

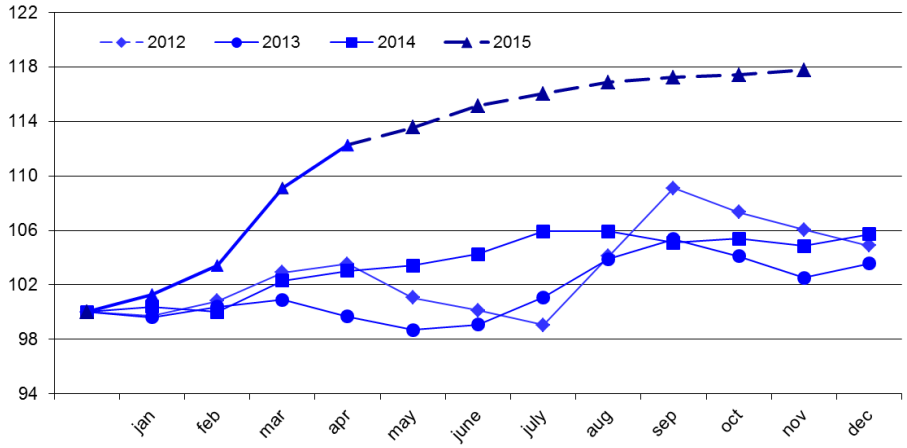

Fig.16. The producer price index for industrial goods
(as a percentage of that in December of the previous year)

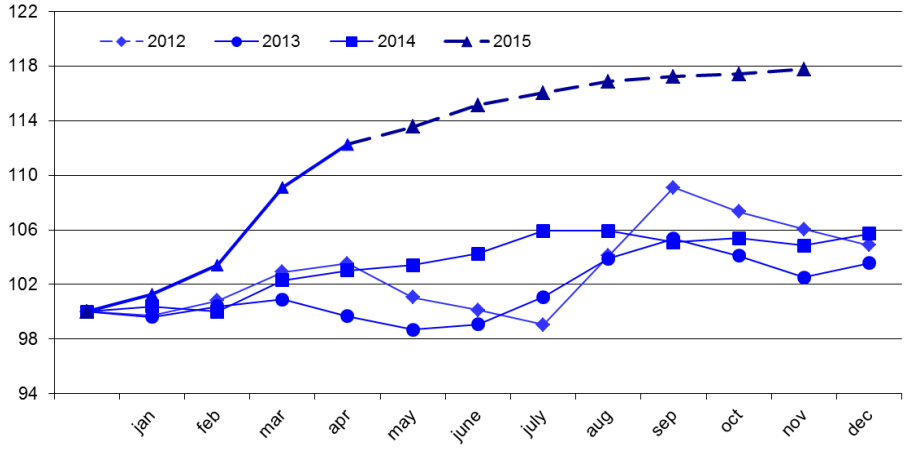

Fig. 17. The price index for mining (as a percentage of that in December of the previous year)

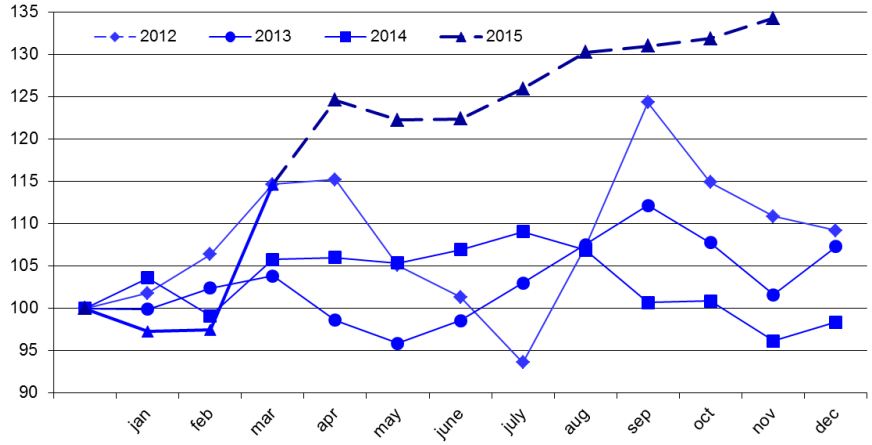

Fig. 18. The price index for manufacturing (as a percentage of that in December of the previous year)

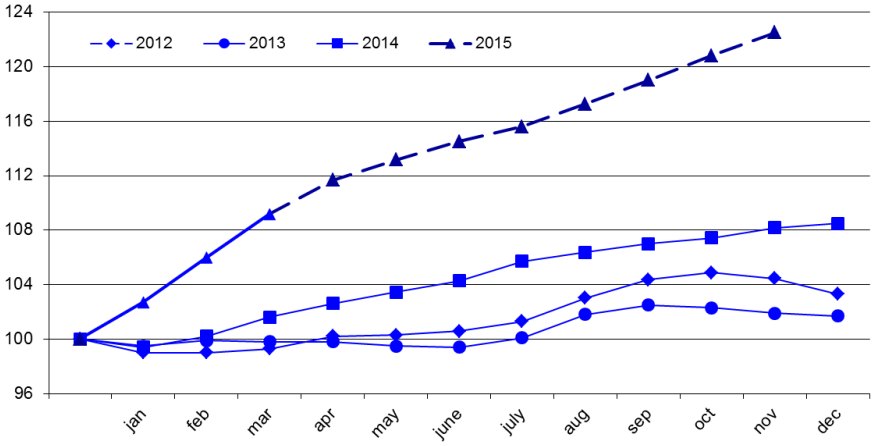

Fig. 19. The price index for utilities (electricity, water, and gas)
(as a percentage of that in December of the previous year)

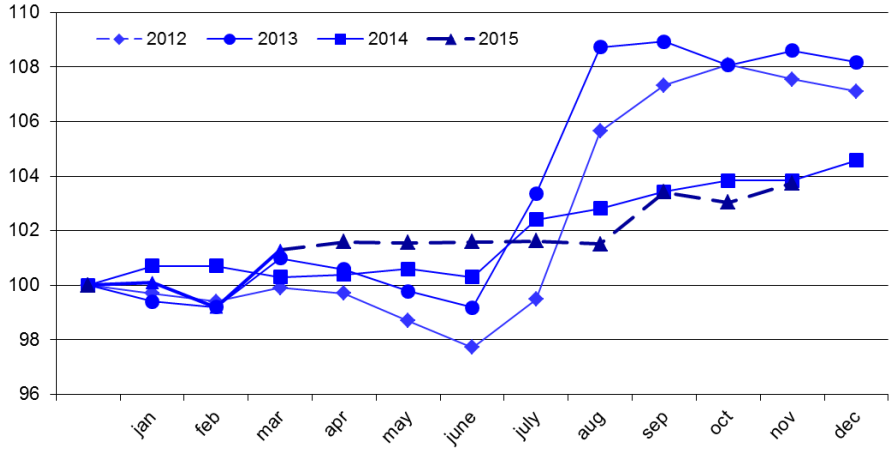

Fig. 20. The price index for food products (as a percentage of that in December of the previous year)

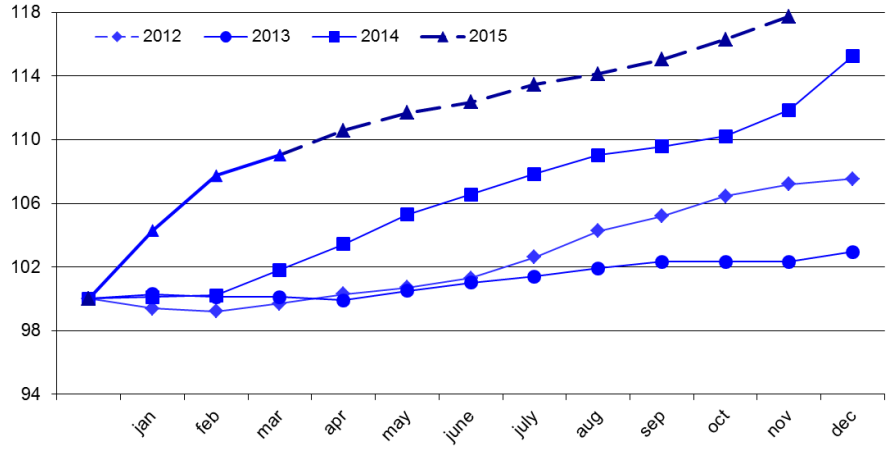

Fig. 21. The price index for the textile and sewing industry
(as a percentage of that in December of the previous year)

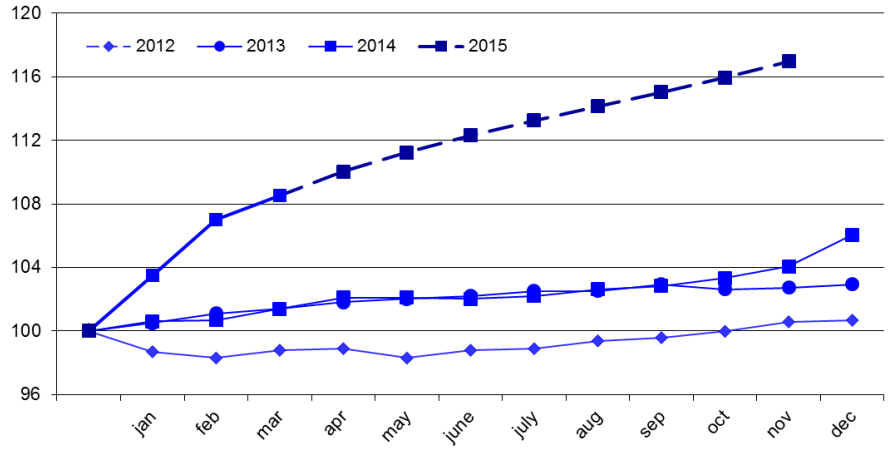

Fig. 22. The price index for wood products (as a percentage of that in December of the previous year)

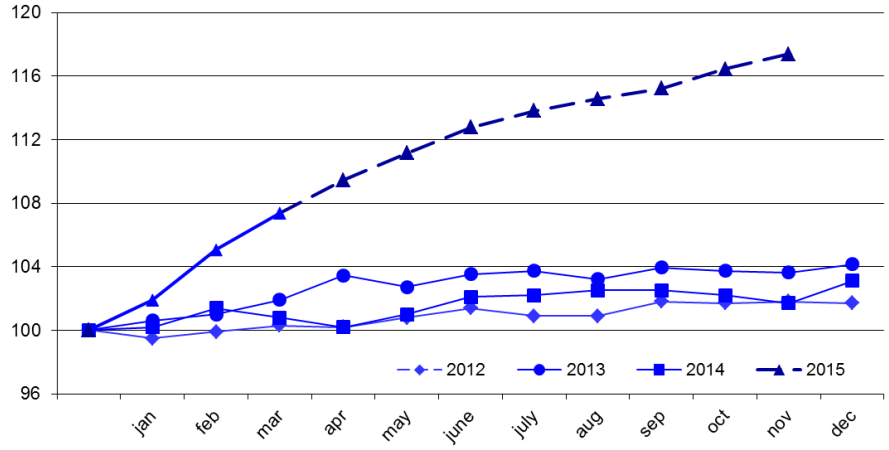

Fig. 23. The price index for the pulp and paper industry
(as a percentage of that in December of the previous year)

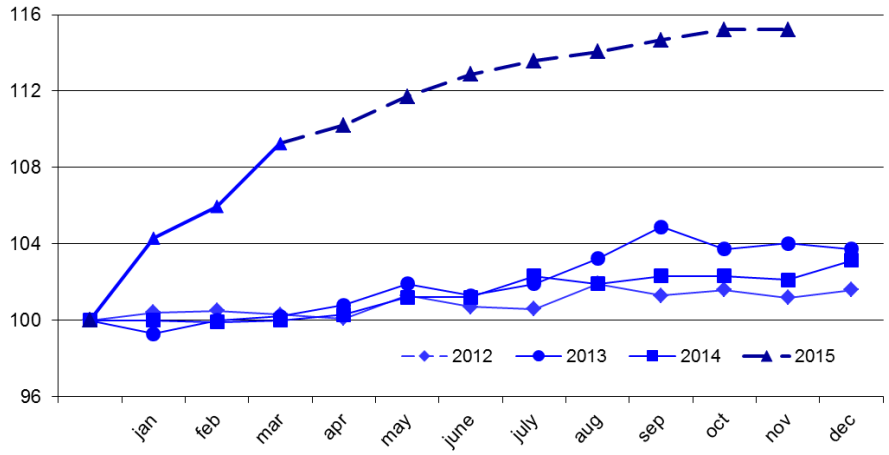

Fig. 24. The price index for coke and petroleum
(as a percentage of that in December of the previous year)

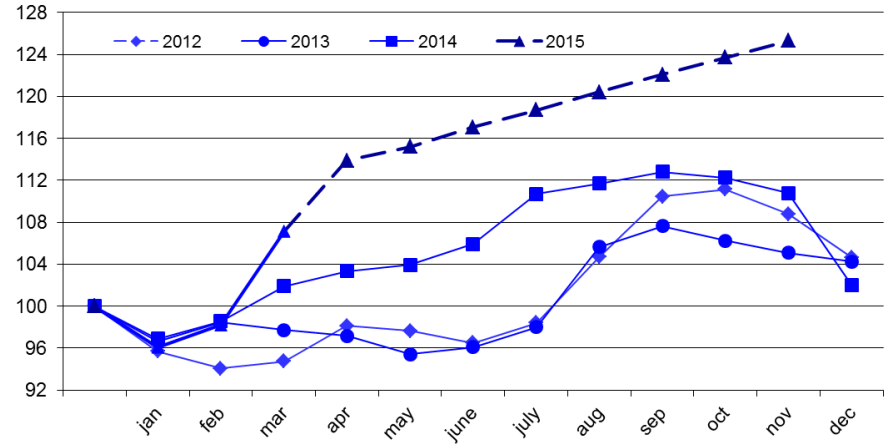

Fig. 25. The price index for the chemical industry
(as a percentage of that in December of the previous year)

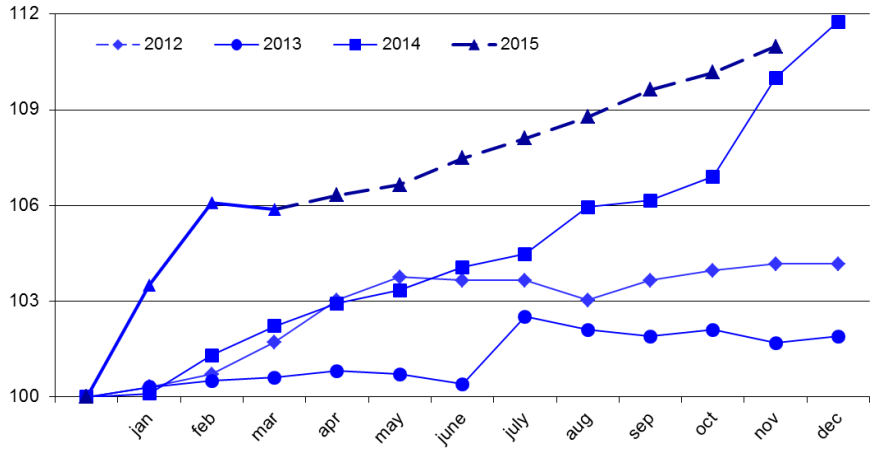

Fig.26. The price index for primary metals and fabricated metal products (as a percentage of that in December of the previous year)

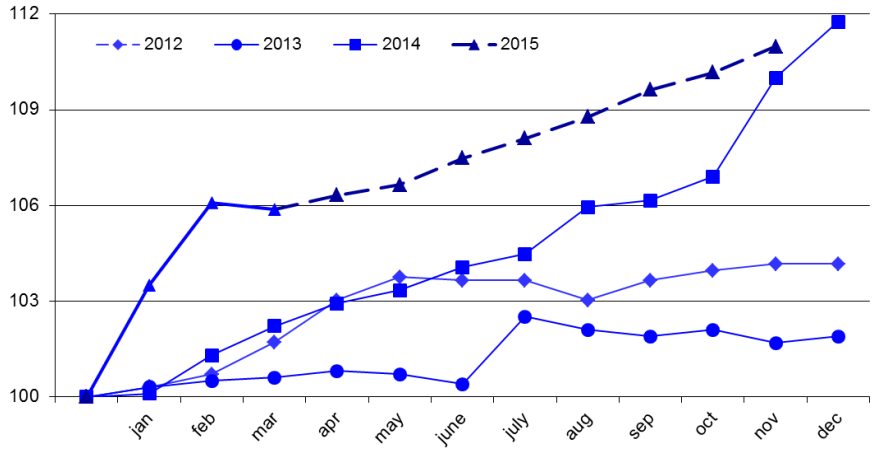

Fig.27. The price index for machinery (as a percentage of that in December of the previous year)

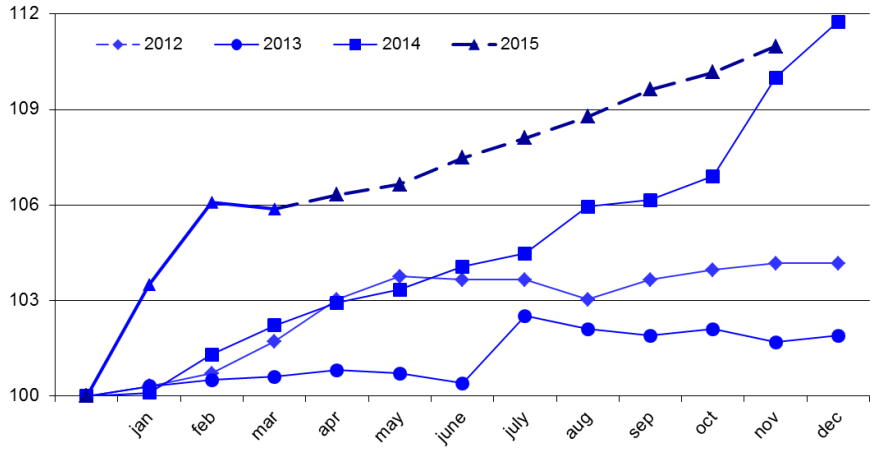

Fig.28. The price index for transport equipment manufacturing (as a percentage of that in December of the previous year)

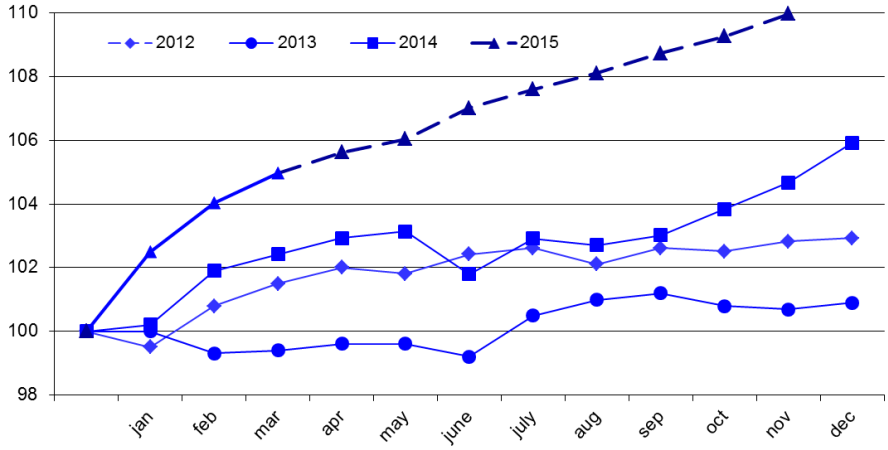

Fig. 29. The cost of the monthly per capita minimum food basket (Rb.)

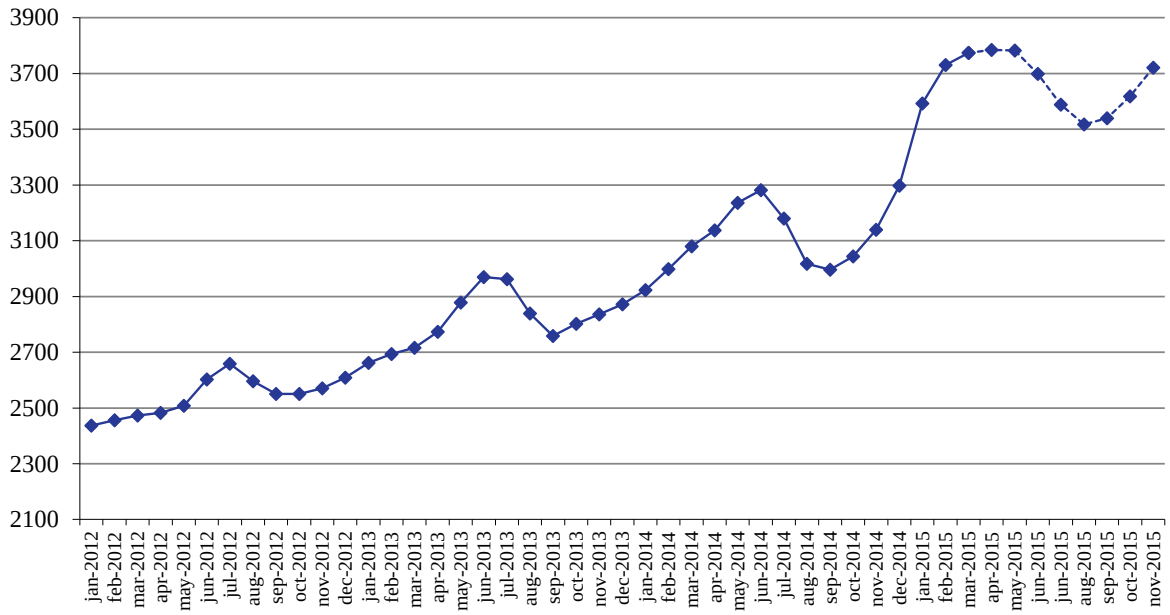

Fig. 30. The composite index of transport tariffs
(for each year, as a percentage of that in the previous month)

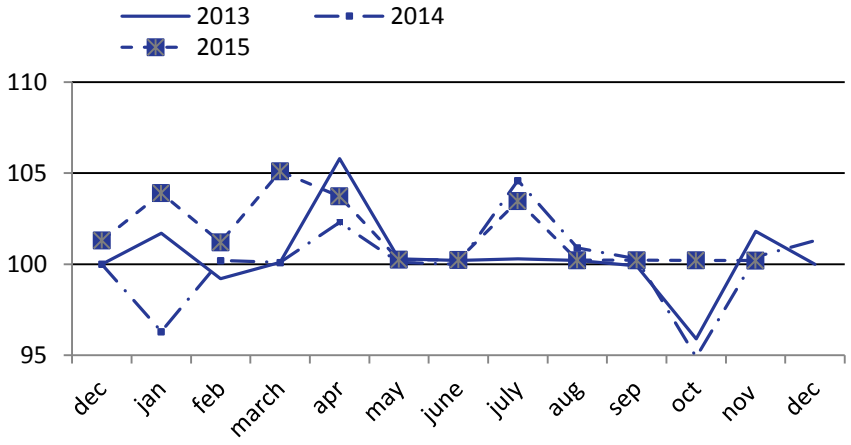

Fig. 31. The index of motor freight tariffs (for each year, as a percentage of that in the previous month)

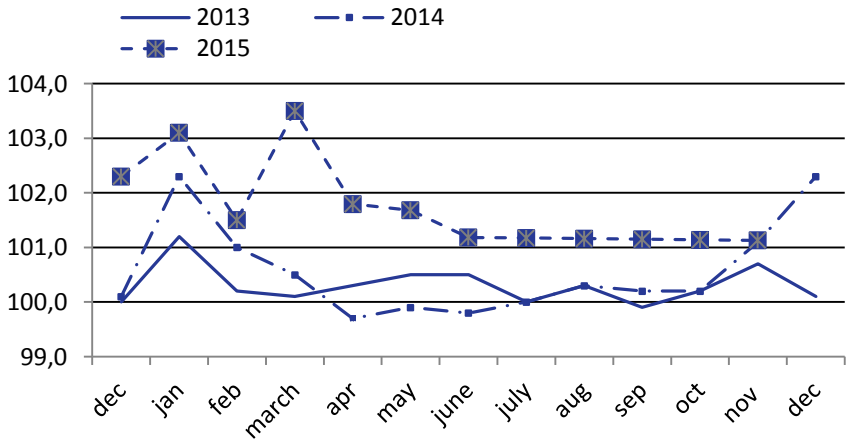

Fig. 32. The index of pipeline tariffs (for each year, as a percentage of that in the previous month)

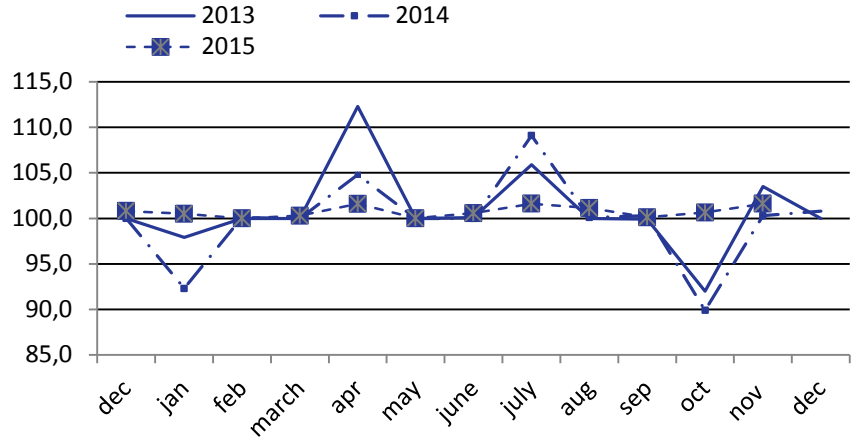

Fig. 33. The Brent oil price ($ per barrel)

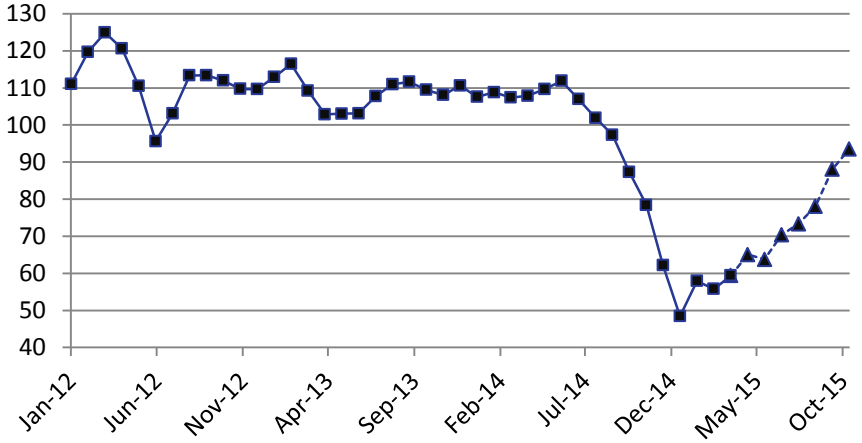

Fig. 34. The aluminum price ($ per ton)

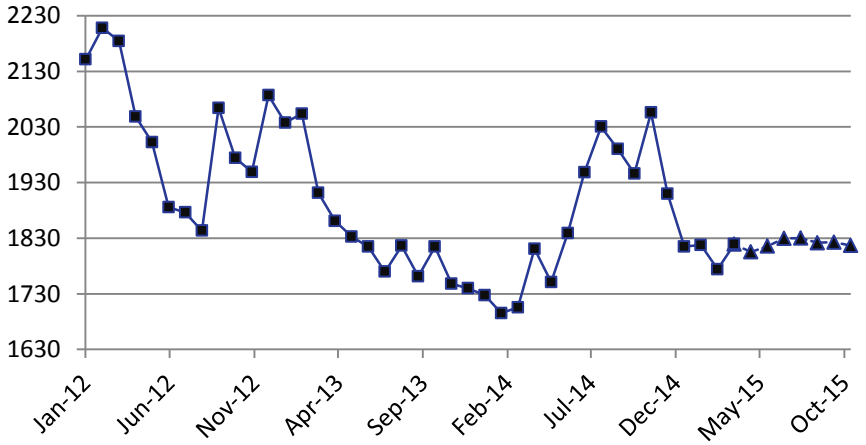

Fig. 35. The gold price ($ per ounce)

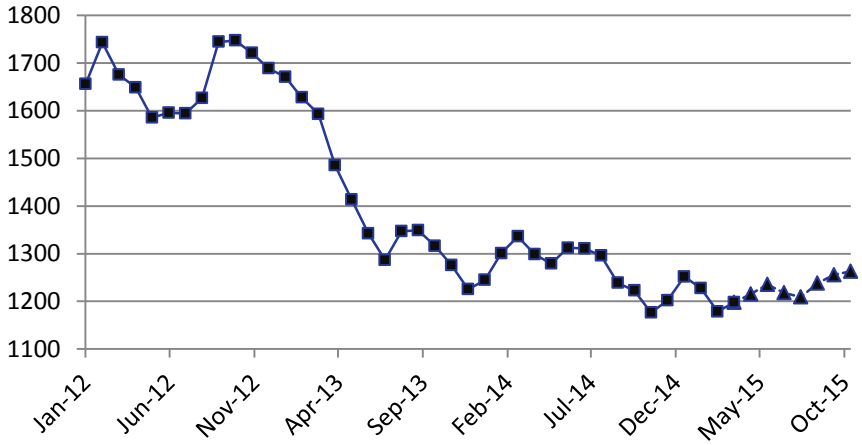

Fig. 36. The nickel price ($ per ton)

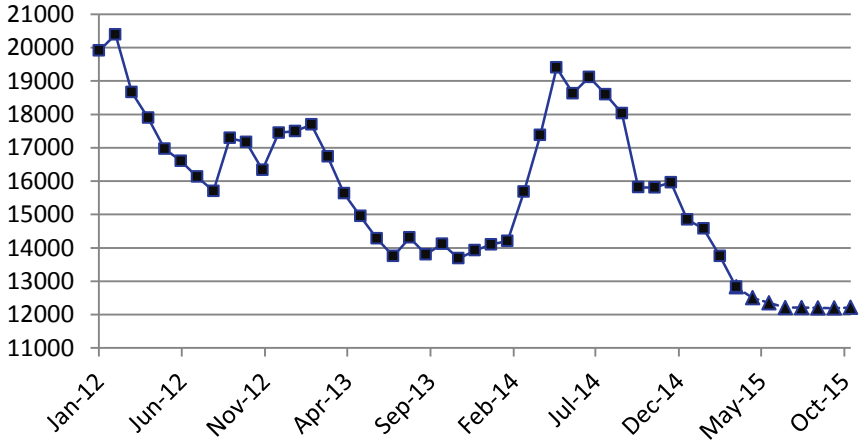

Fig. 37. The copper price ($ per ton)

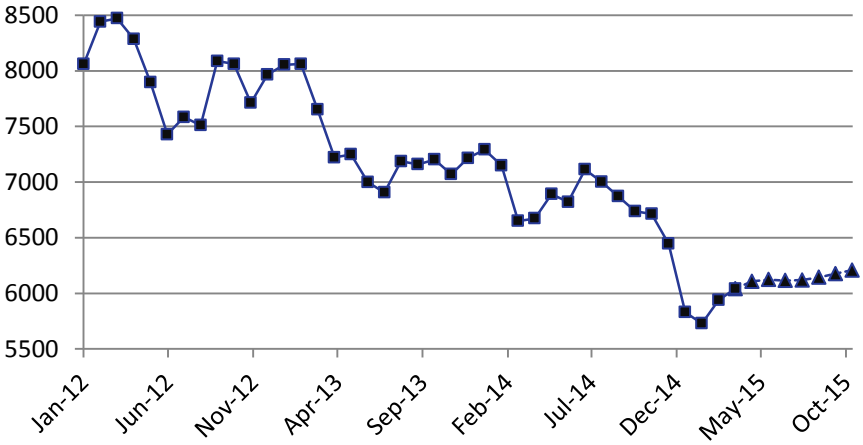

Fig. 38. The monetary base, billion Rb

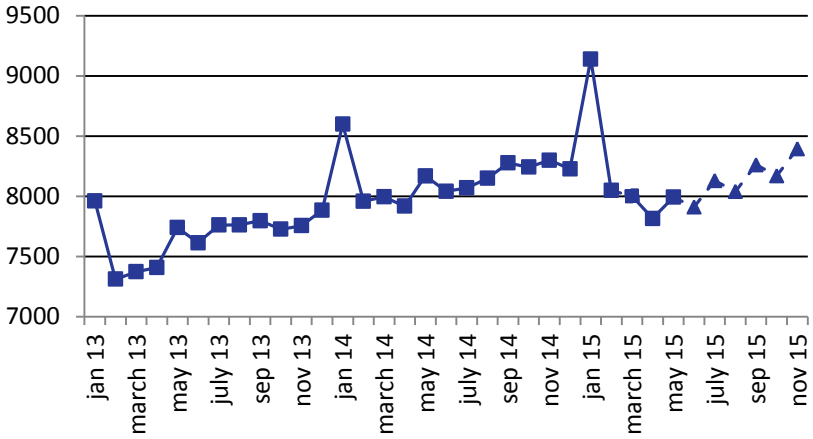

Fig. 39. M_2, billion Rb

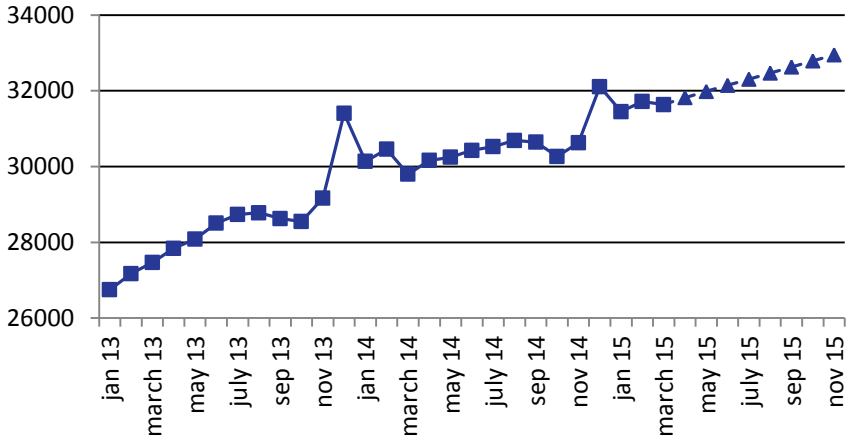

Fig. 40. The international reserves of the Russian Federation, million USD

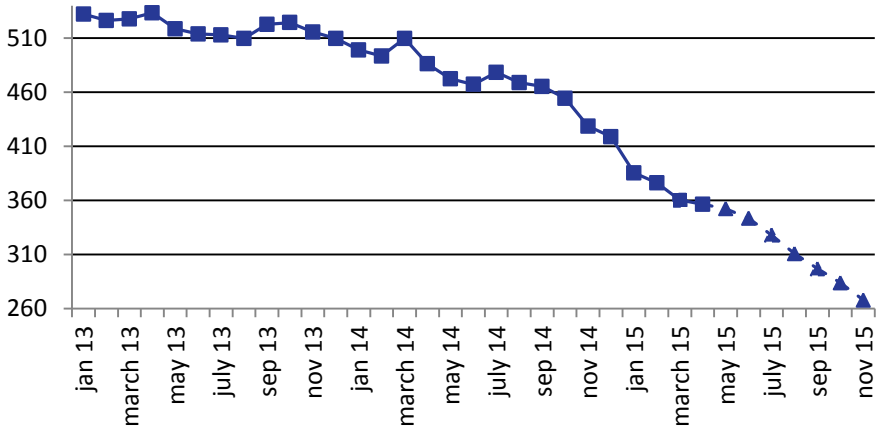

Fig. 41. The RUR/USD exchange rate

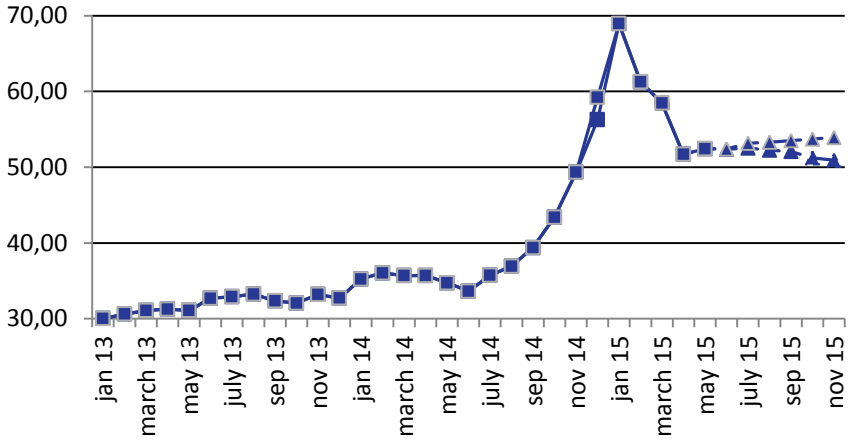

Fig. 42. The USD/EUR exchange rate

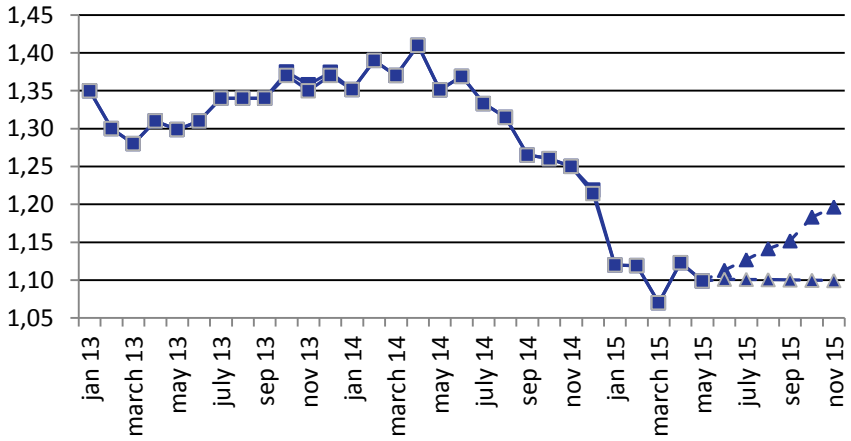

Fig. 43. Real disposable cash income (as a percentage of that in the same period of the previous year)

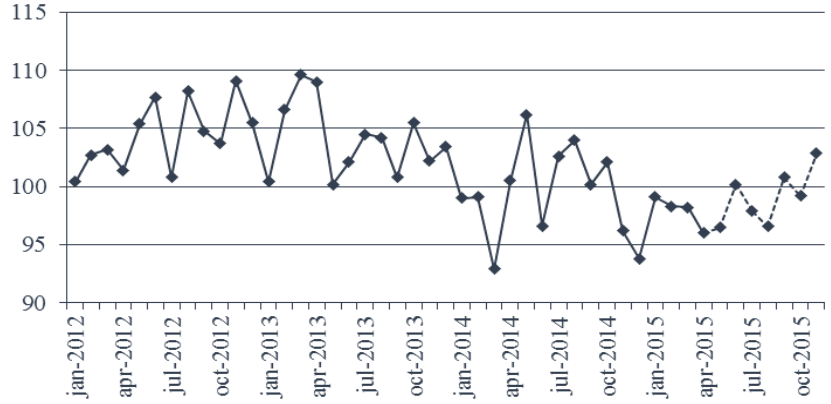

Fig. 44. Real cash income (as a percentage of that in the same period of the previous year)

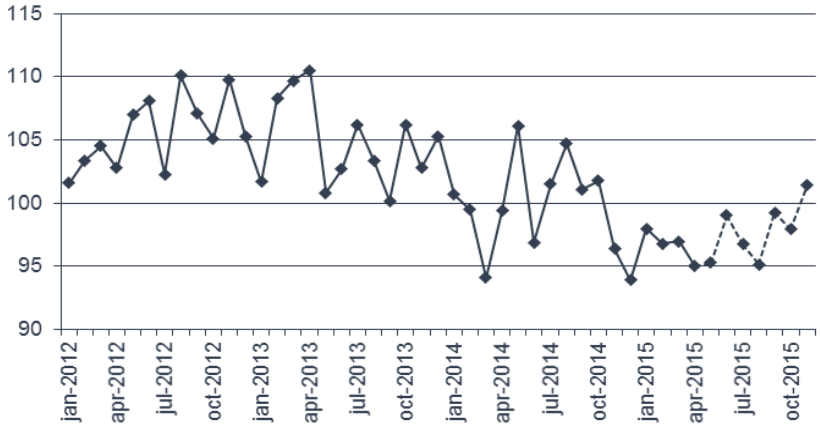

Fig. 45. Real accrued wages (as a percentage of those in the same period of the previous year)

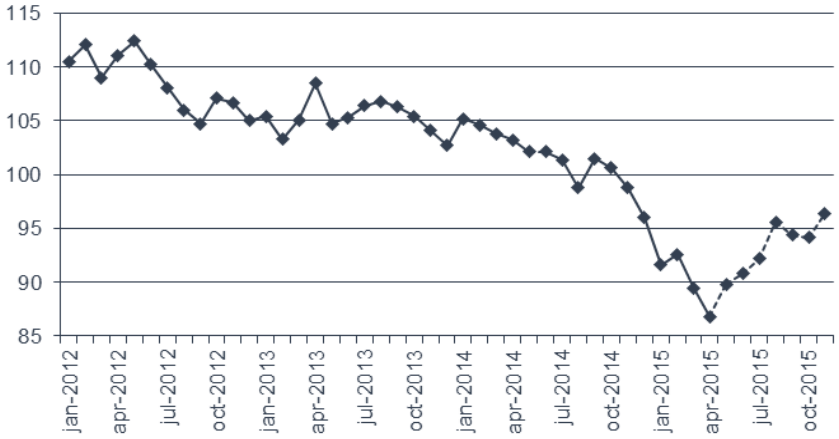

Fig. 46. Employment (million people)

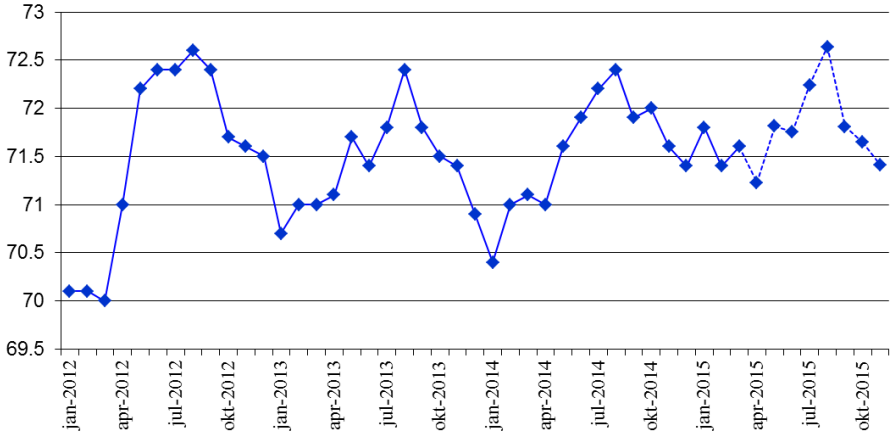

Fig. 47. Unemployment (million people)