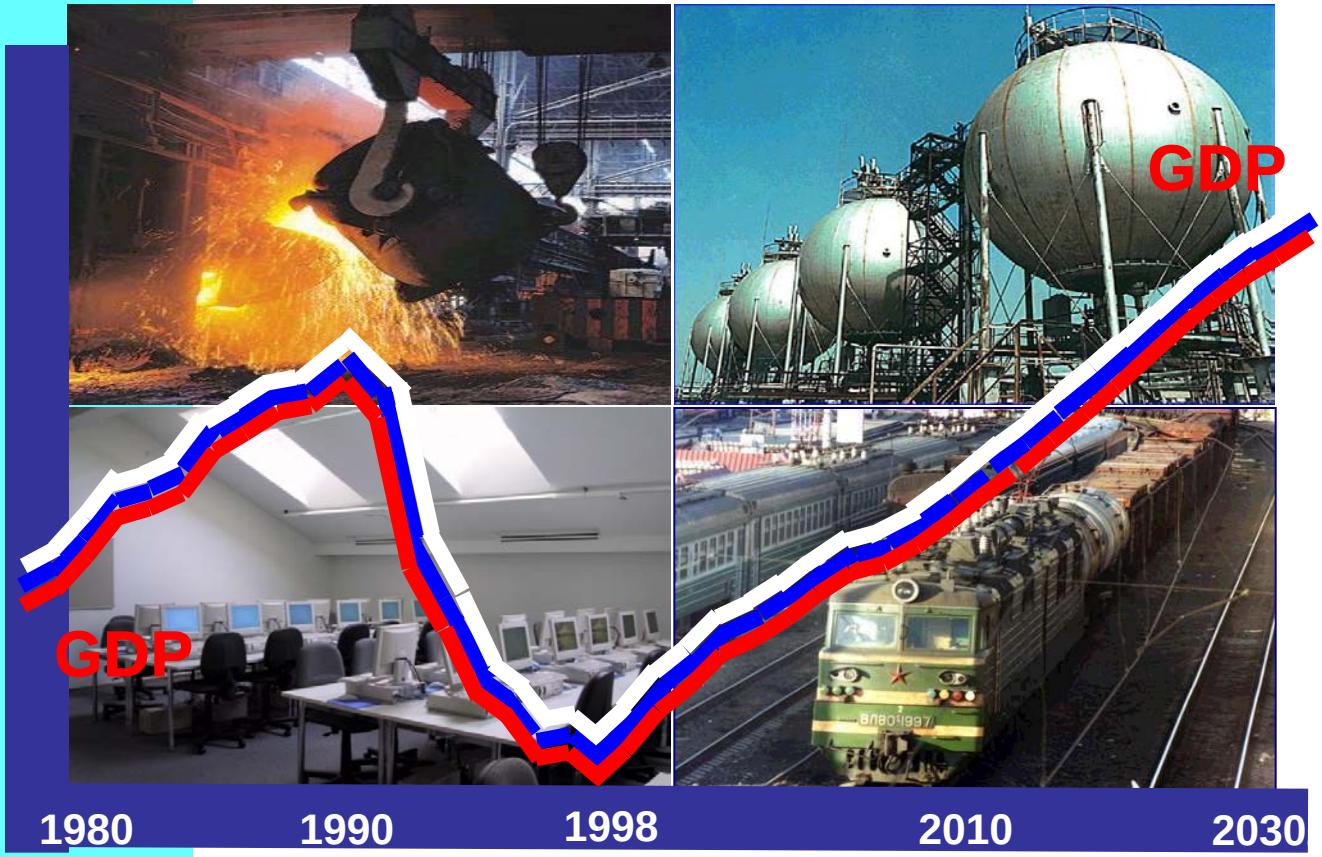
Development of new version of RIM model (and sector investment estimations)



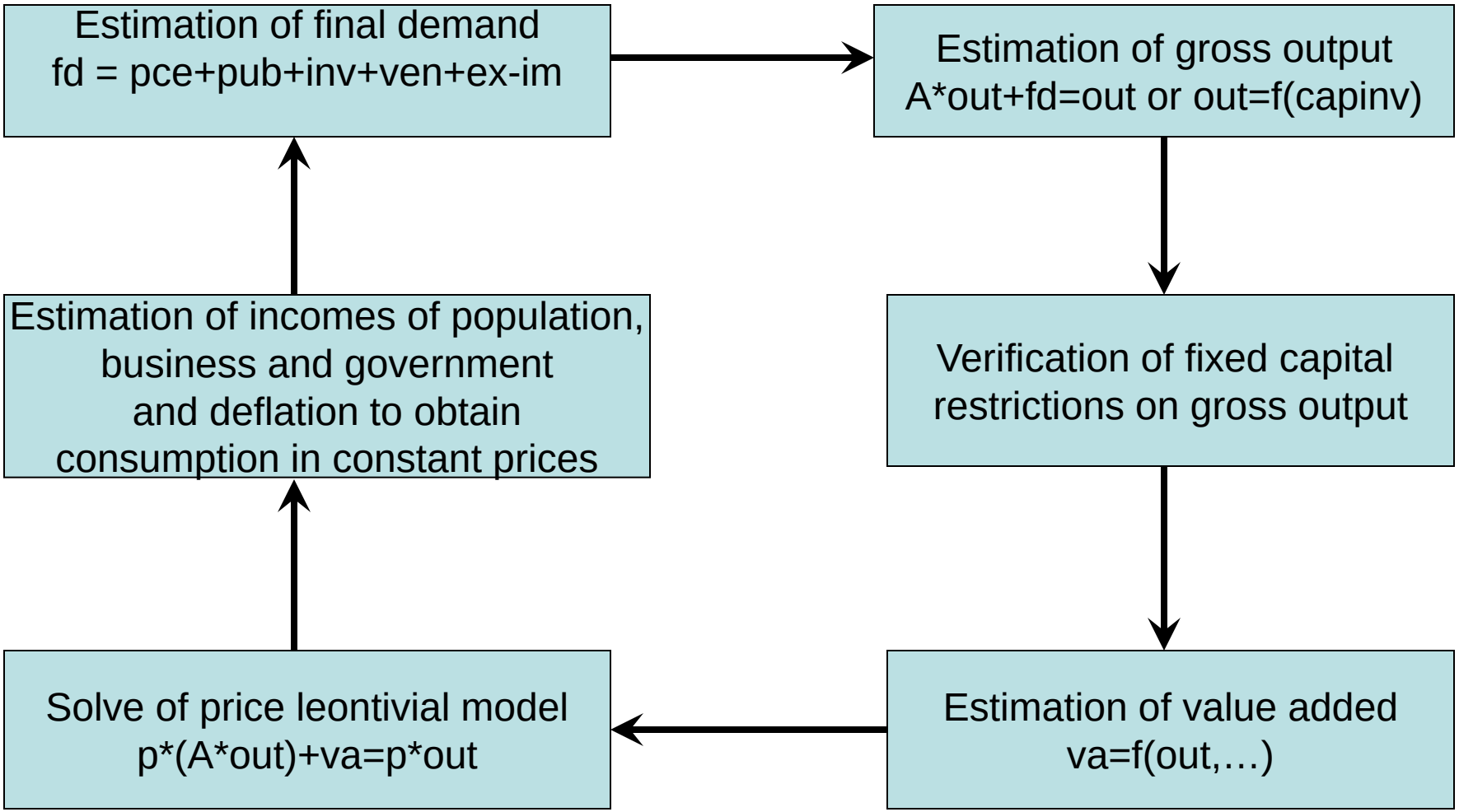
Statistic base

- Input-output tables in constant and current prices for years 1980-2008
- National accounts (2002-2009)
- Institutional accounts (2002-2009)
- Matrixes of trade and transport margins
- Tax matrix
- Rows of sector investment and estimations of fixed capital
- Consolidated budget data

Current state of model

- Redesigned blocks
  - Household consumption
  - Investment and fixed capital
  - Foreign trade
- Under consideration and construction
  - Budget block
  - Financial market’ s block

General scheme of model



ИНП РАН

Production functions

- Oil extraction

outR[2] = 0.94*outRlag[1][2]+
(0.11*capinv[2]+0.27*capinvlag[1][2])/capintensity2[t];

capintensity2[t] =(38.91 + 1.02*oilstock[t-1]/10^6)*rateusd[t]

oilstock[t] = oilstock[t-1] + outR2[t]

- Ferrous metals

outR[16] = 0.97*outRlag[1][16]+
(0.14*capinv[16]+0.29*capinvlag[1][16]);

Sector investment

- Sector investment is regressed on replacement needs in that industry, deflated profit and first differences of the output

  capinv[i] = a_1 * replace[i] + a_2*profit[i]/(invD) +

  a_3 * dout;

  where

  dout = outR[i] –peakout[i][t-1];

  peakout[i][t] =max(peakout[i][t-1]*(1-b), outR[i][t])

  invD = invT[t]/invRT[t],

  b – fixed capital retirement rate

Sector investment

Replacement is calculated as

replace[i] = b1 * capstock[i][t-1];

fixed capital: capstock[i][t] = (1-b1)*capstock[i][t-1]
+capinv[i][t]

Problem to solve: in real inputs of capacities are distributed in time. We need to obtain and use matrix of distributed investment lags

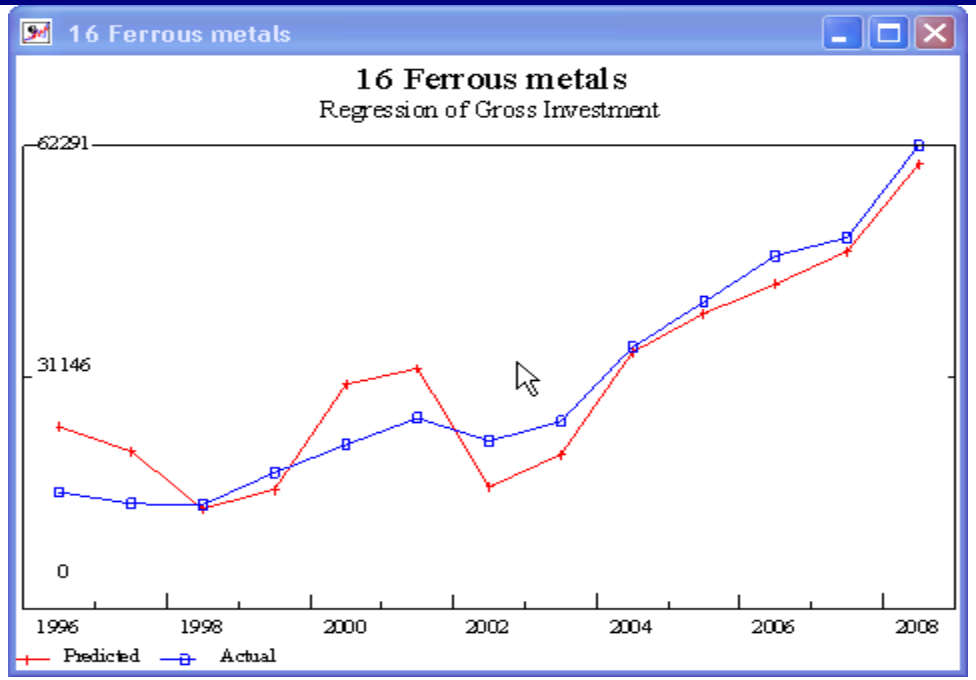
Values of fixed capital with lag and with use of coefficients of production capabilities, estimated at base period, are also used for verification of calculated outputs

Sector investment

- A possible solution to problem of different approaches to fixed capital evaluation is to use investment lags when we are verifying production capabilities. We made some estimations of these lags values using Domar's model.

	Construction lags		
	2002 - 2006	2003 - 2007	2004 - 2008
Coal mining	3,41	3,24	3,30
Food, beverages, tobacco	2,77	2,74	2,74
Wood and wood products; paper and printing	3,08	3,23	3,38
Ferrous metals	1,24	1,56	2,04
Chemicals	3,22	3,10	3,15
Machinery	3,73	3,57	3,46
Stone, Clay, and Glass products	3,07	3,08	3,18
Transport equipment	4,91	4,25	3,42

Sector investment



- As an example of forecast equation I want to show the equation for ferrous metals production

SEE = 5022.76 RSQ = 0.8873 RHO = 0.44 Obser = 13 from 1996.000
SEE+1 = 4799.40 RBSQ = 0.8648 DW = 1.12 DoFree = 10 to 2008.000
MAPE = 19.35

Variable name	Reg-Coef	Mexval	Elas	NorRes	Mean	Beta
0 capinv16	- - - - - - - - - - - - - - - - -				30260.57	- - -
1 replace16[1]	0.04674	8.4	0.21	13.17	69563.69	
2 profit16[1]/invD	0.52098	244.8	0.57	1.03	50662.22	0.983
3 dif	0.08153	1.5	0.24	1.00	13910.28	0.069

Sector investment

- $inv[i] = \sum_j (capinv[j] * \sum InvTS[j][n]*InvEl[i][n])$

- InvTS – matrix of technological structure of investment made by purchaser. Structure includes construction, machinery and equipment and other sectors (for example structure of capital investments in oil extraction is 32% construction, 23% machinery,44% other)
- InvEl –matrix of coefficients, which show sector share in construction, machinery and production of other investment goods.

InvEI matrix contents (part I)

	Construction	Machinery	Other goods
Agriculture	0,00	0,00	0,00
Petroleum extraction	0,00	0,00	0,00
Natural gas extraction	0,00	0,00	0,00
Coal mining	0,00	0,00	0,00
Other Fuels, incl. nuclear	0,00	0,00	0,00
Ores and other mining	0,00	0,00	0,00
Food, beverages, tobacco	0,00	0,00	0,00
Textiles, apparel, leather	0,00	0,00	0,00
Wood and wood products	0,00	0,00	0,00
Paper and printing	0,00	0,00	0,02
Petroleum refining	0,00	0,00	0,00
Chemicals	0,00	0,00	0,00
Pharmaceuticals	0,00	0,00	0,00
Plastic products	0,00	0,00	0,00
Stone, Clay, and Glass products	0,00	0,00	0,00
Ferrous metals	0,00	0,00	0,00
Non-ferrous metals	0,00	0,00	0,00
Fabricated metal products	0,00	0,00	0,10
Machinery	0,00	0,52	0,00
Computers, office machinery	0,00	0,03	0,00
Electical apparatus	0,00	0,05	0,00
Radio, television, communication equipment	0,00	0,07	0,00

InvEI matrix contents (part I)

	Construction	Machinery	Other goods
Medical, optical, and precision instruments	0,00	0,06	0,00
Automobiles, highway transport equipment	0,00	0,13	0,00
Sea transport equipment and its repair	0,00	0,02	0,00
Airplanes, rockets, and repair	0,00	0,05	0,00
Railroad equipment and its repair	0,00	0,06	0,00
Recycling	0,00	0,00	0,00
Electric, gas, and water utilities	0,00	0,00	0,00
Construction	1,00	0,00	0,00
Wholesale and retail trade	0,00	0,00	0,34
Hotels and restaurants	0,00	0,00	0,00
Transport and storage	0,00	0,00	0,07
Communication	0,00	0,00	0,00
Finance and insurance	0,00	0,00	0,00
Real estate	0,00	0,00	0,03
Equipment rental	0,00	0,00	0,00
Computing service	0,00	0,00	0,00
Research and development	0,00	0,00	0,43
Other business services	0,00	0,00	0,00
Government, defense, social insurance	0,00	0,00	0,00
Education	0,00	0,00	0,00
Health services	0,00	0,00	0,00
Other social and personal services	0,00	0,00	0,00

Household consumption

- Household consumption depends on money income, difference in personal consumption compared with previous year and relative sector prices

- pcepc[i] =a + b*moneyinc[t]/pop[t] + c*dpce + d* relprice[i];

dpce = pcepc[t] – pcepc[t-1]
pcepc[t] =pceRT[t]/pop[t];
relprice = price[i]/(pceT[t]/pceRT[t])
moneyinc = 0.8* wagesT[t] + 0.3*(profitT[t] – invT[t])

Imports

- Sector imports are calculated from flows of intermediate and final consumption by use of elasticity coefficients

  These import coefficients depend on exchange rate and share of new capital funds (which are assumed to be competitive with foreign producers)

$$imcoeff[i] = imcoeff[i][t-1]* (1-a_1*rateusd[t]/rateusd[t-1]) – a_2* capinv[i]/capstock[i]$$

Exchange rate

- Exchange rate of ruble was regressed from difference between consumer price index and import/export ratio

- $rateusd[t] = rateusd[t-1]*(1+a_1*(CPI[t]-brent[t]/brent[t-1])+a_2*(imT[t]/exT[t] -1)$

Exports

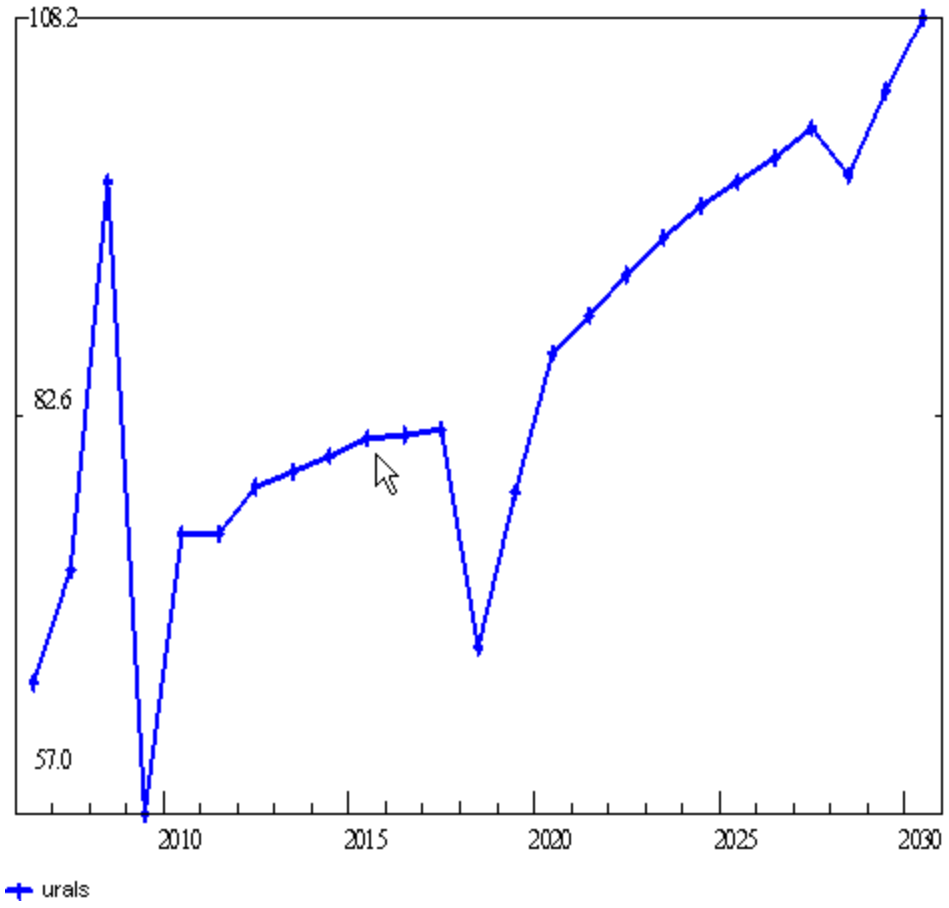
- Export is calculated by regression equations, in which a large set of variables is used, such as outputs, internal consumption, exchange rate

- $exR[i] = a_0 + \sum a_j * outR[j] + \sum b_j * pceR[j] + \ldots$

Goverment consumption

- In current version structure of government consumption remains constant on whole forecasting period. Total government consumption is regressed from tax incomes and reserve fund volume.
- An exogenous parameter describing minimal amount of government expensive can be set. When deficit appears, it is financed from reserve fund, if possible

Oil prices forecast



- A key exogenous parameter of forecast is oil prices. For look-ahead calculations has been used the world oil prices, based on forecast made by the Ministry of Economic Development of the Russian Federation

Forecast scenarios

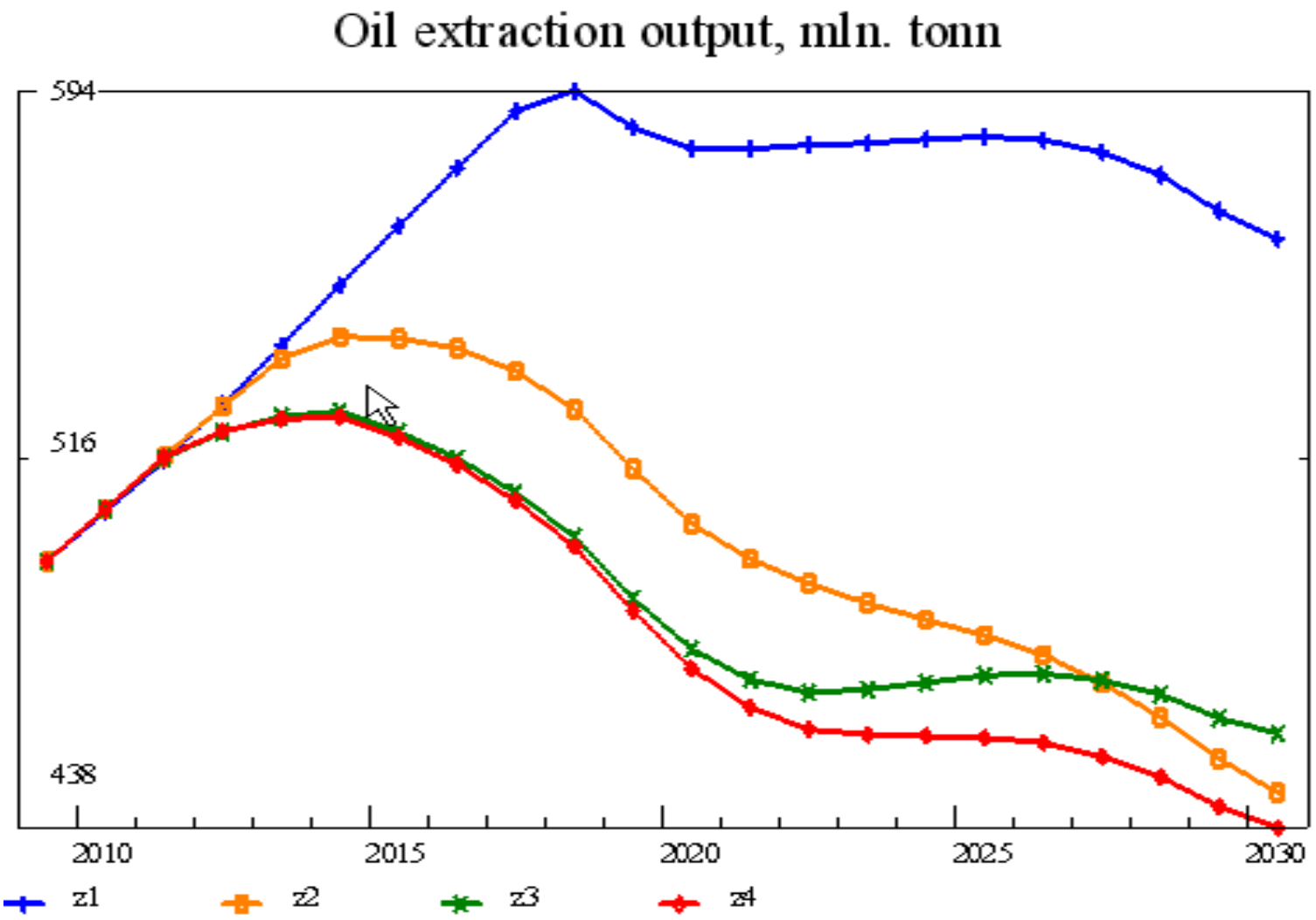
1. Inertial (“orange’). All tax variables remain at present levels.
2. Modernization (“green”). Government provides subsidies for increasing investment in manufacture, especially in machinery and equipment and high technology industries (computers, electical apparatus, radio, television, communication equipment, medical, optical, and precision instruments). Mineral extraction tax for oil is increased by 11%

Forecast scenarios

3. Modernization with corruption parameter(“red”). Same as previous scenario, but 40% of subsidies are lost due to corruption.
4. Reduced tax burden for oil sector(“blue”).

   Mineral extraction tax and export duty for oil are reduced by 20%.

Forecast results: oil extraction



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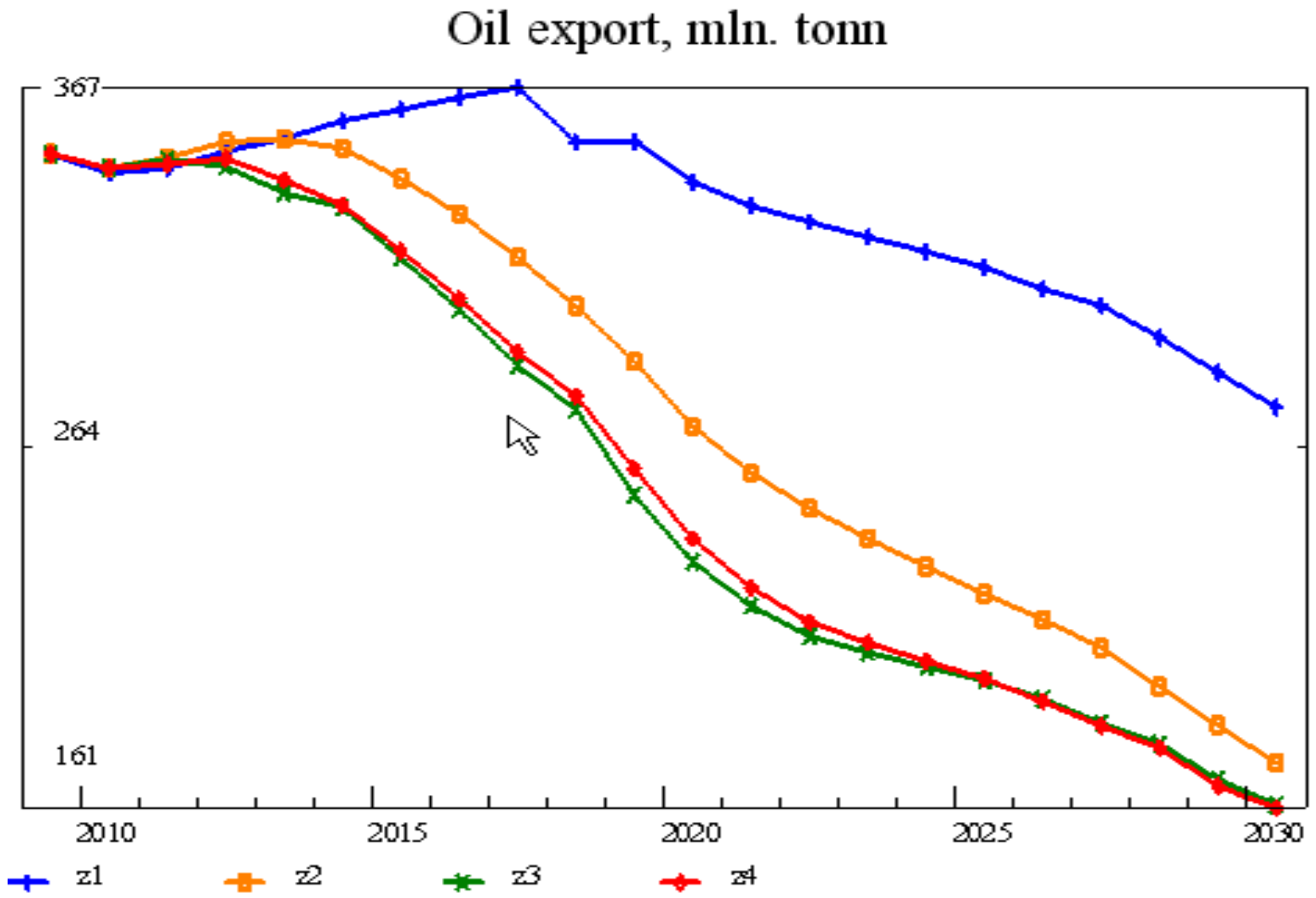
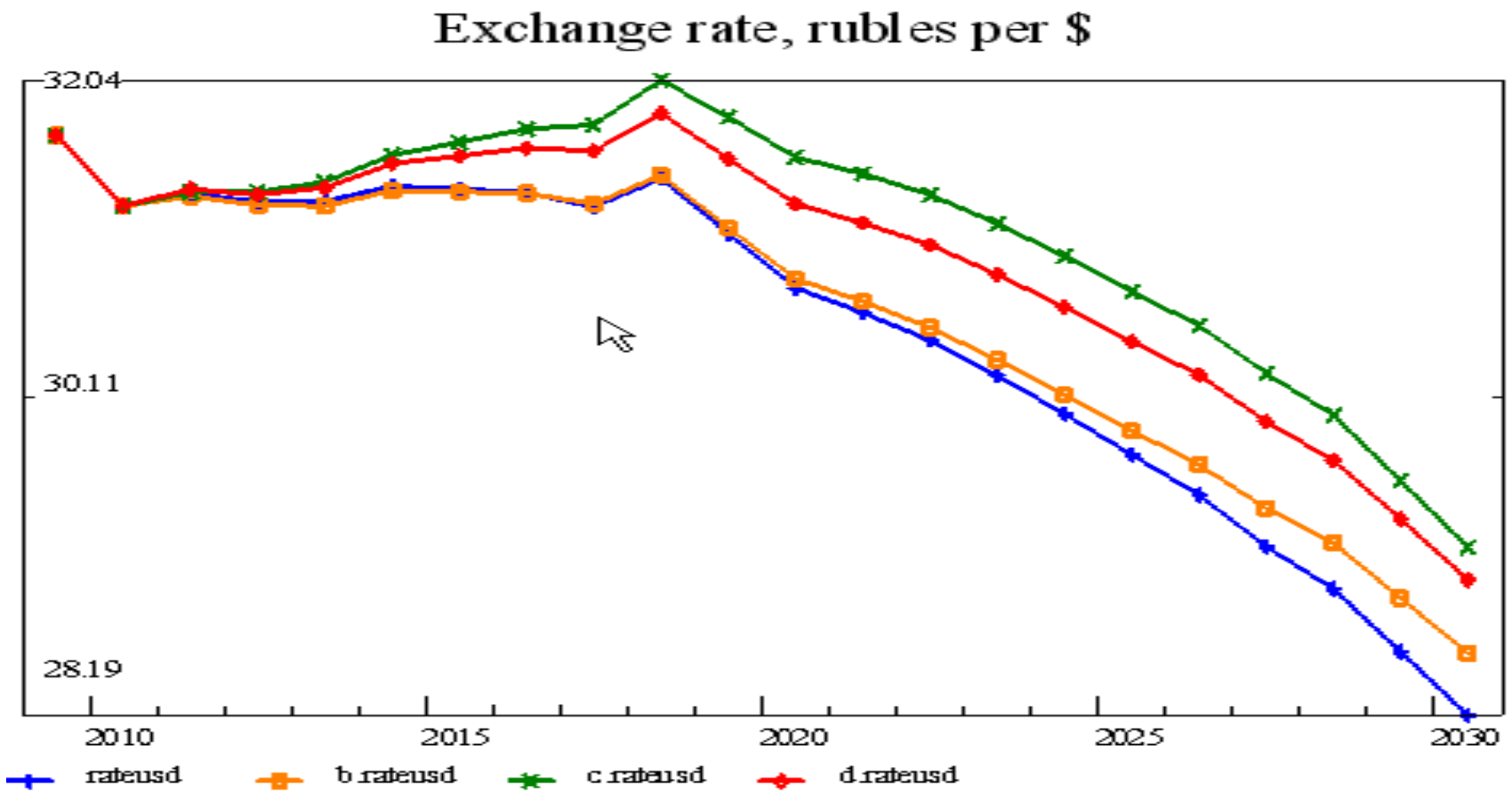
Forecast results: oil export

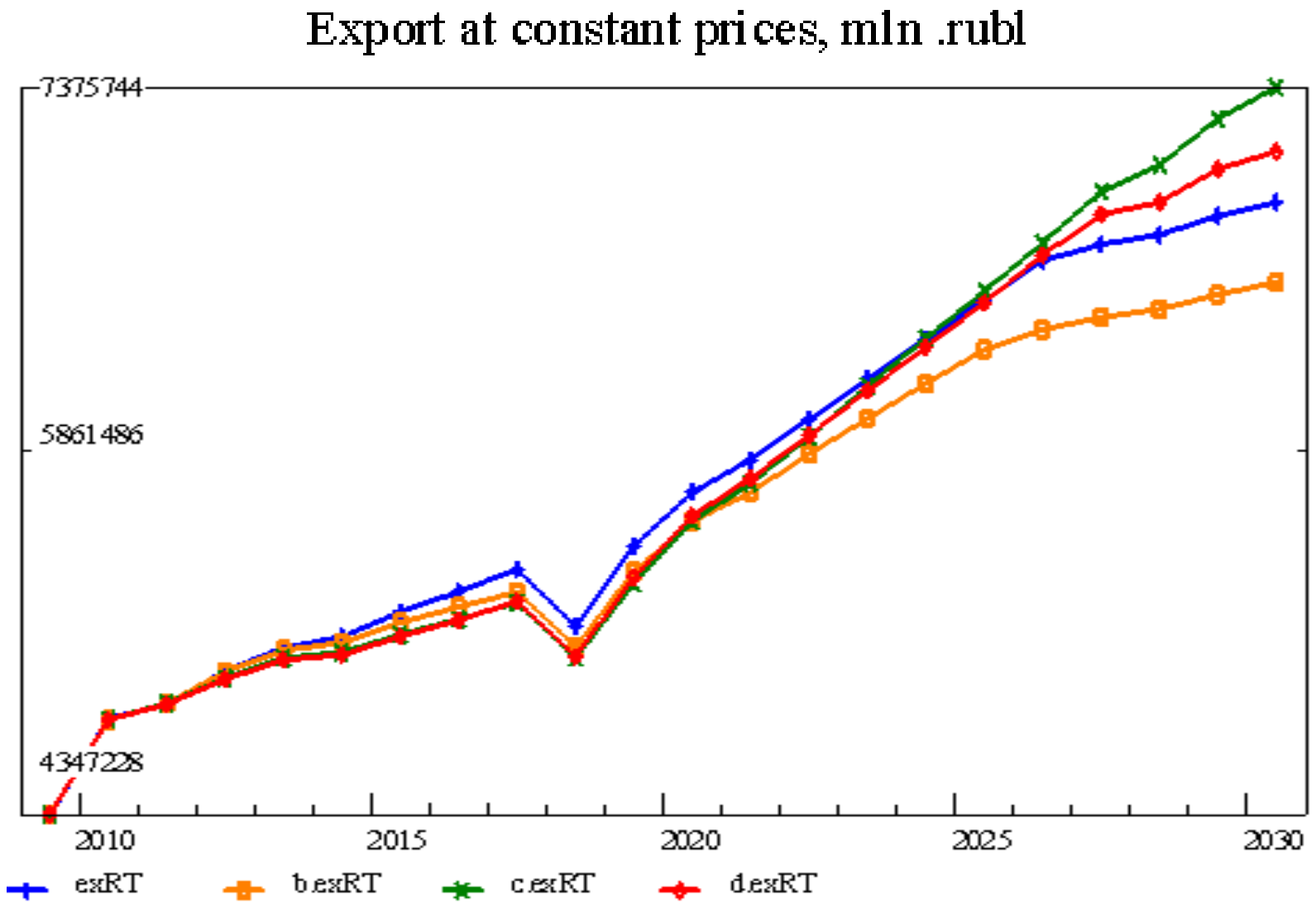


Forecast results: exchange rate



Decreasing rates of inflation (from 8% in 2011 to 2% in 2030) and more quickly Increasing oil prices causes strengthening of ruble. The difference with official MED Forecast lies in scale of year 2017 crisis.

Forecast results: export



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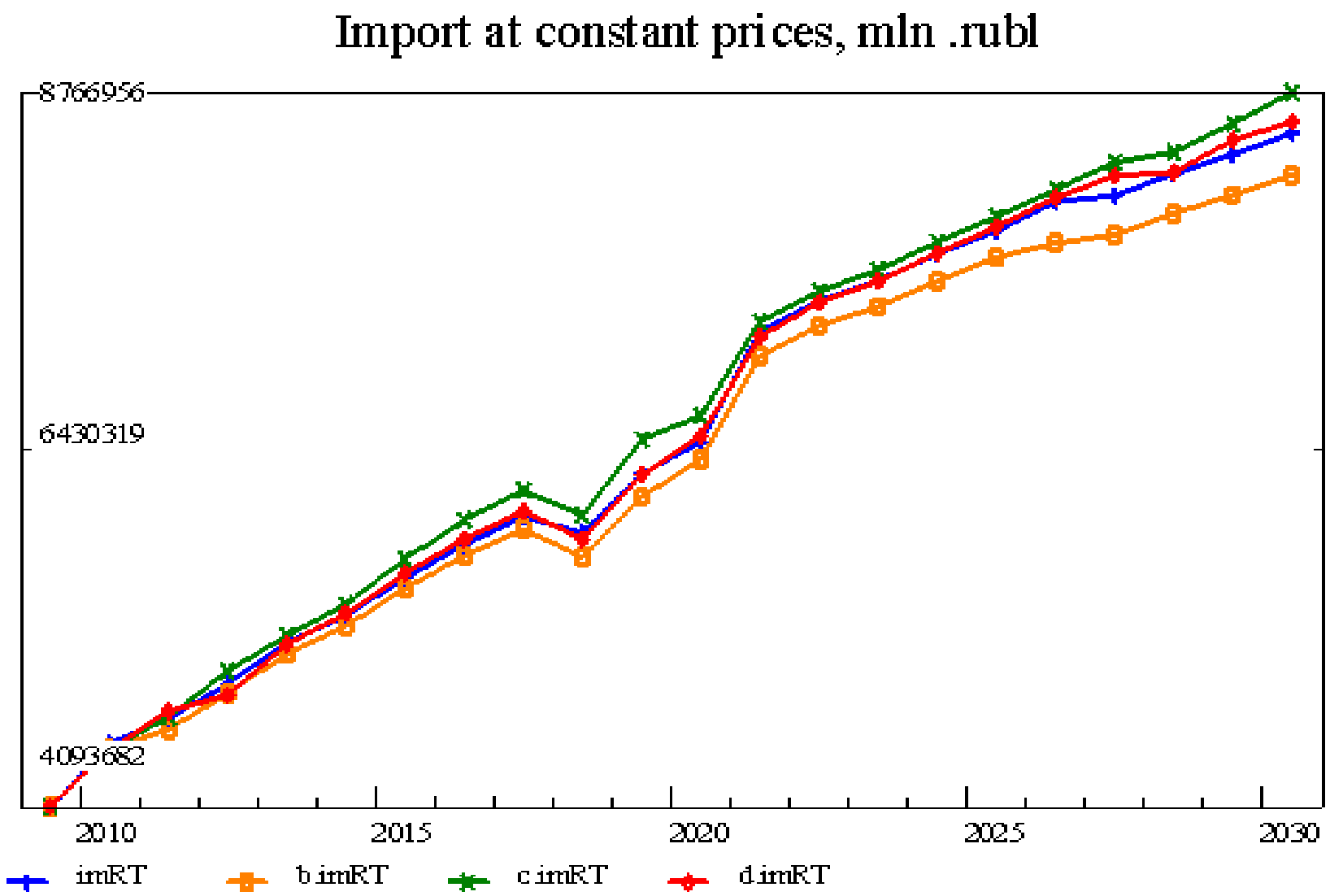
Forecast results: imports



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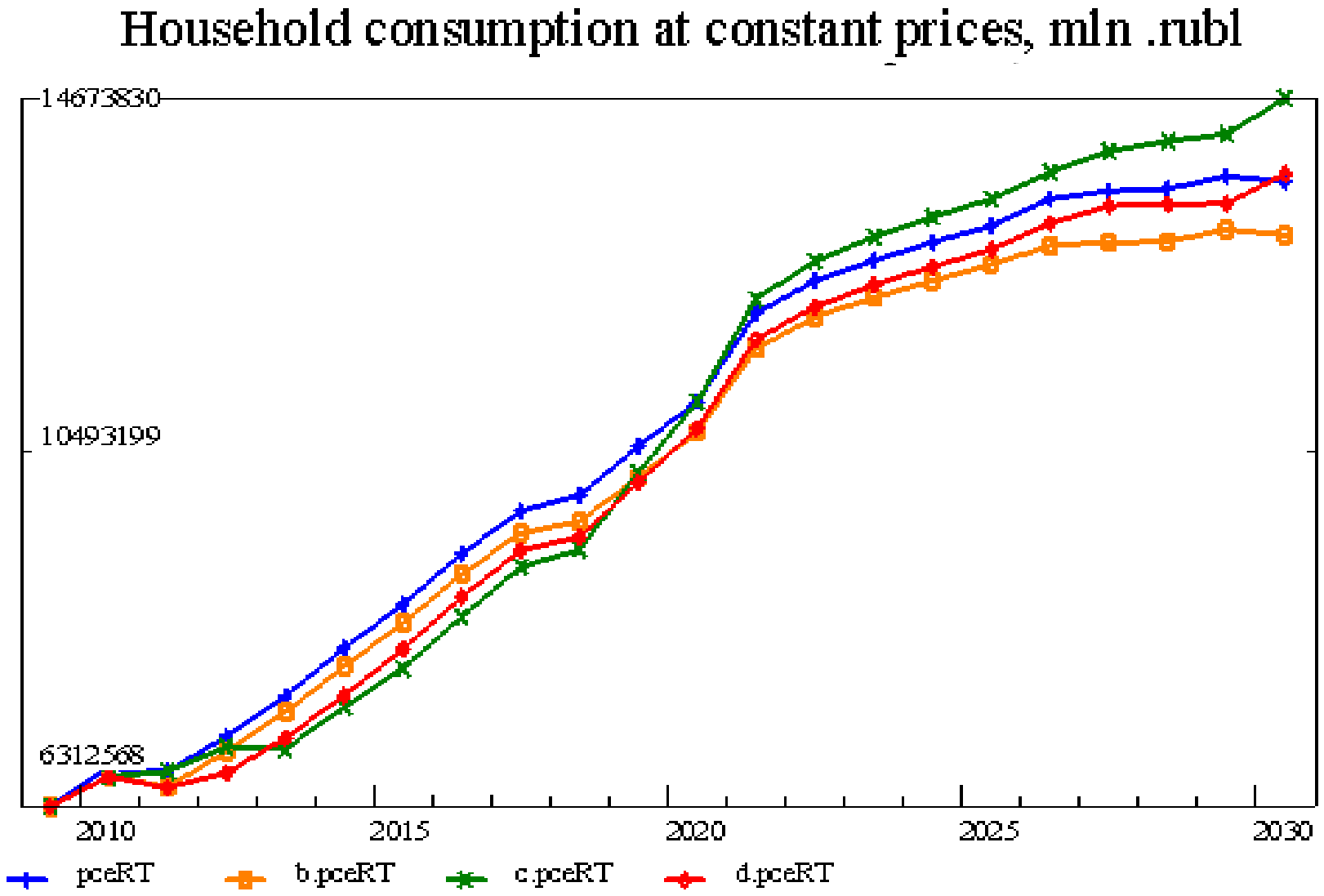
Forecast results: households consumption



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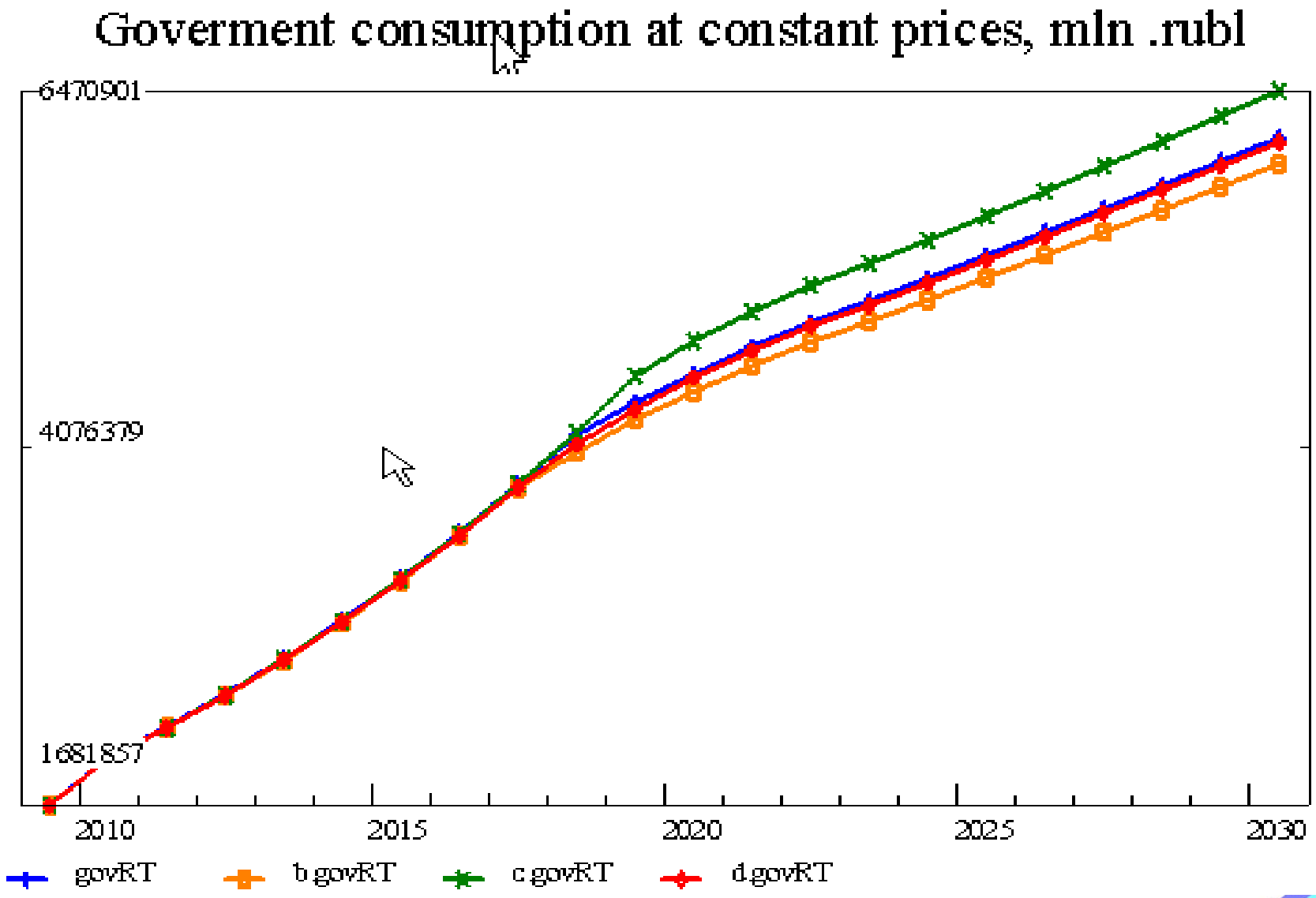
Forecast results: government consumption



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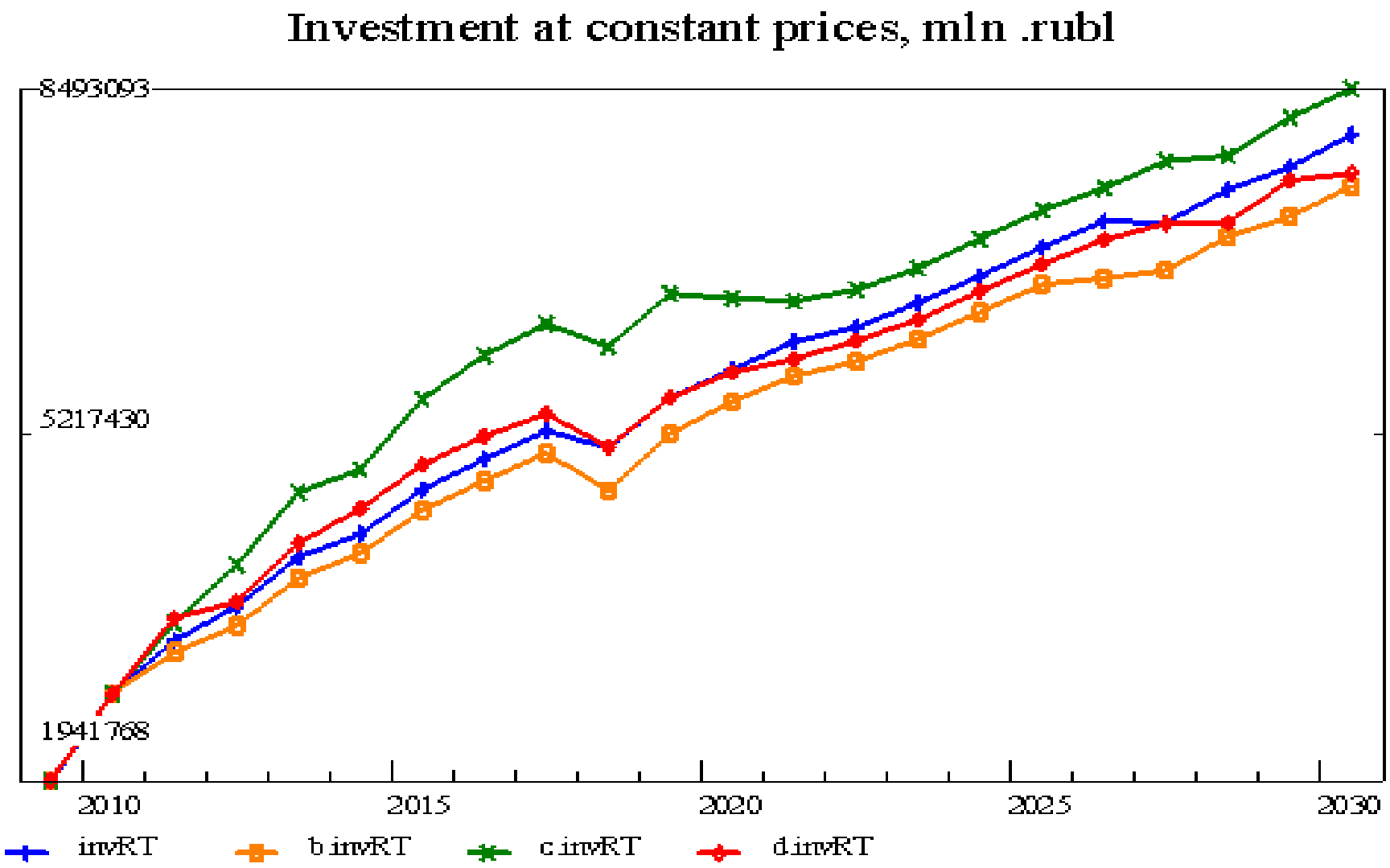
Forecast results: investment



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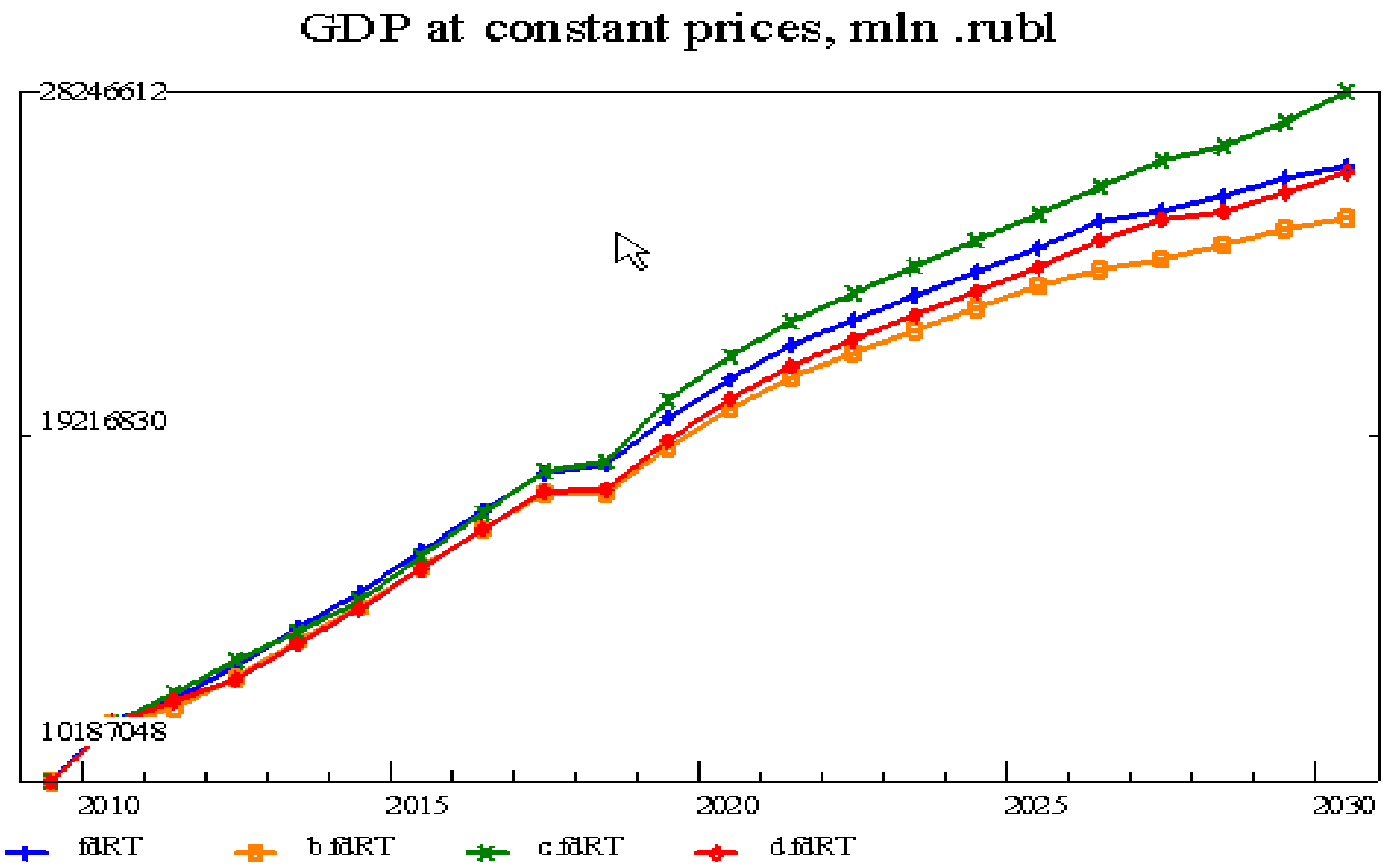
Forecast results: GDP



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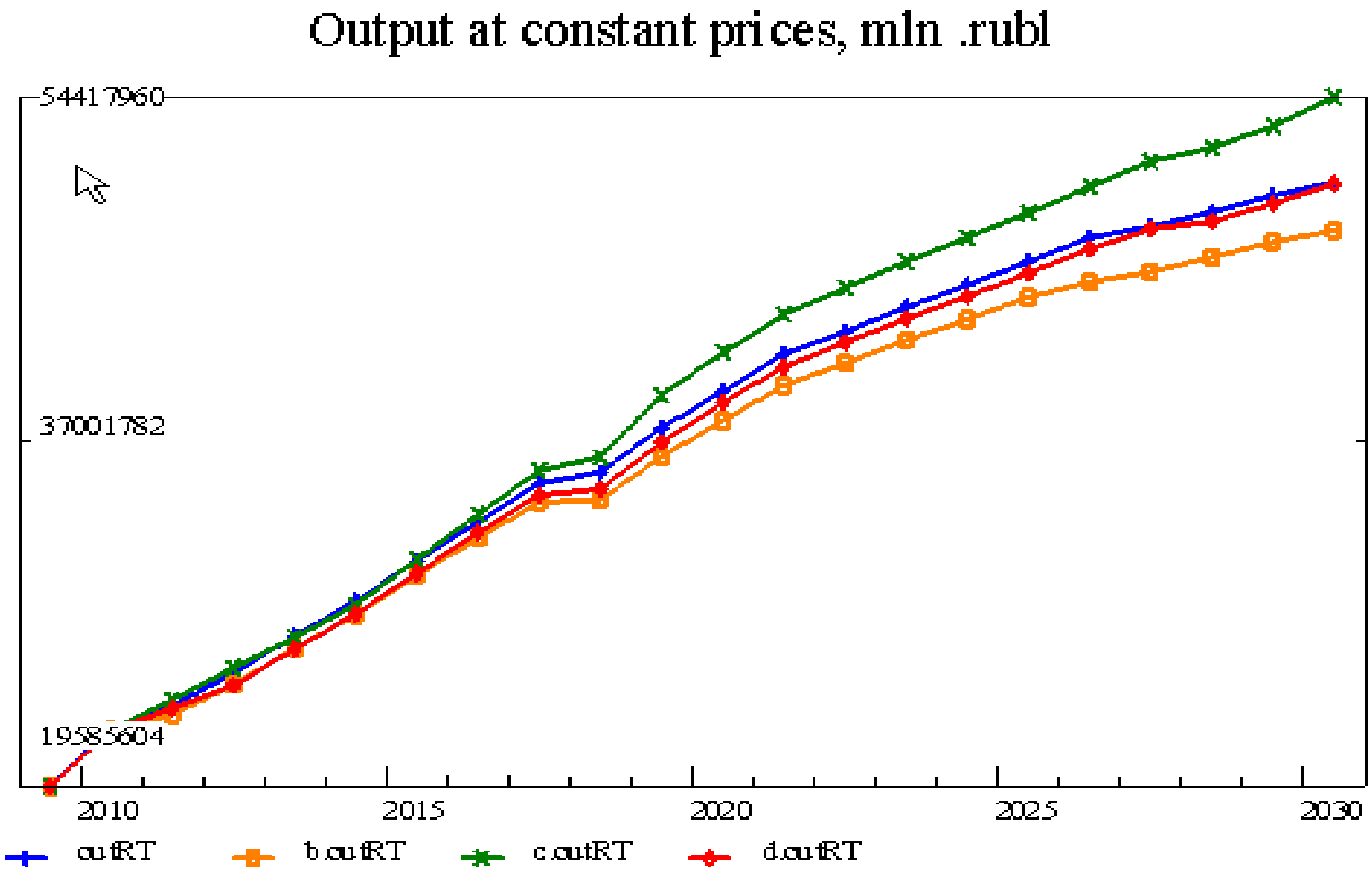
Forecast results: output



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Forecast results: average GDP rates

	2010-2015	2015-2020	2020-2025	2025-2030
Inertial ("orange")	1.052	1.038	1.031	1.015
Modernization ("green")	1.066	1.058	1.053	1.025
Modernization ("red")	1.051	1.038	1.042	1.020
Reduced oil taxes ("blue")	1.057	1.050	1.038	1.017

- The most efficient scenario is “”green” modernization
- Due to oil price scenario support of oil industry proves to be better then “corrupted modernization”in short-term forecast, but loses in long-term perspective due to increasing capital intensity of oil extraction and lower dynamic of oil prices

Forecast results: structure of investment

	Construction	Machinery	Other goods
Initial(2008)	33,5%	48,2%	18,4%
Inercial	33,1%	51,1%	15,8%
Modernization	32,2%	54,5%	13,3%
Modernization with corruption	32,5%	53,3%	14,1%
Reduced tax burden for oil sector	33,1%	50,4%	16,5%

In all scenarios share of machinery and equipment in investment increases,
share of construction remains sensibly constant, while share of other goods significantly decreases.

Conclusion

- We need to improve verifycation of production capabilities.
- Investment must have some effect on input coefficients.
- Blocks of government consumption and financial market require be developed more in detail
- Using present version of model we can study different scenarios of investment policy on the assumption of conservative budget administration

THANK YOU

FOR YOU ATTENTION