Estimation of Transition to Inflation Targeting for Russian Economy Development

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Key issues

1. A problem under consideration

2. A Dynamic inter-sectoral model of Russia with aggregated money and currency markets

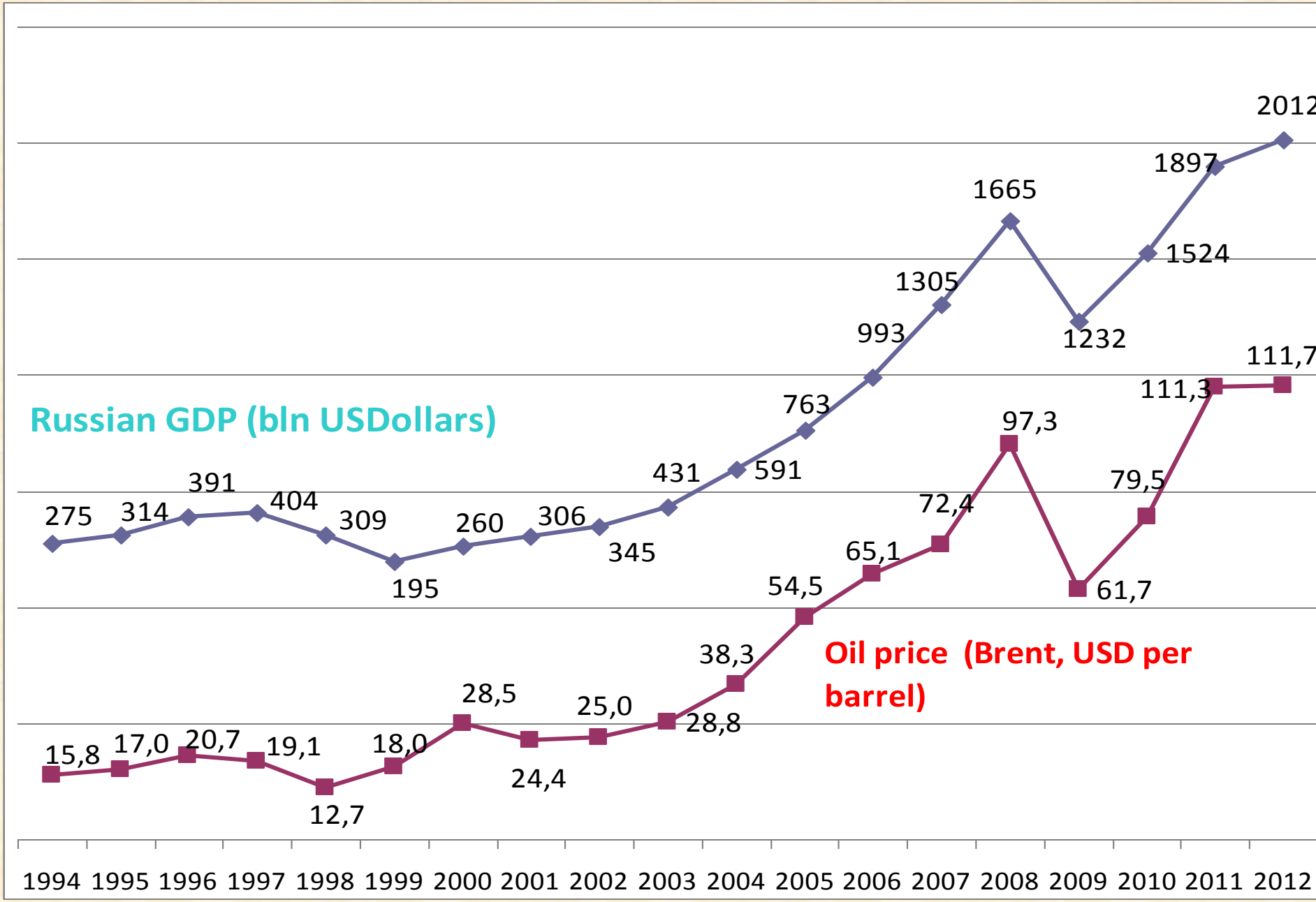
3. Scenarios description

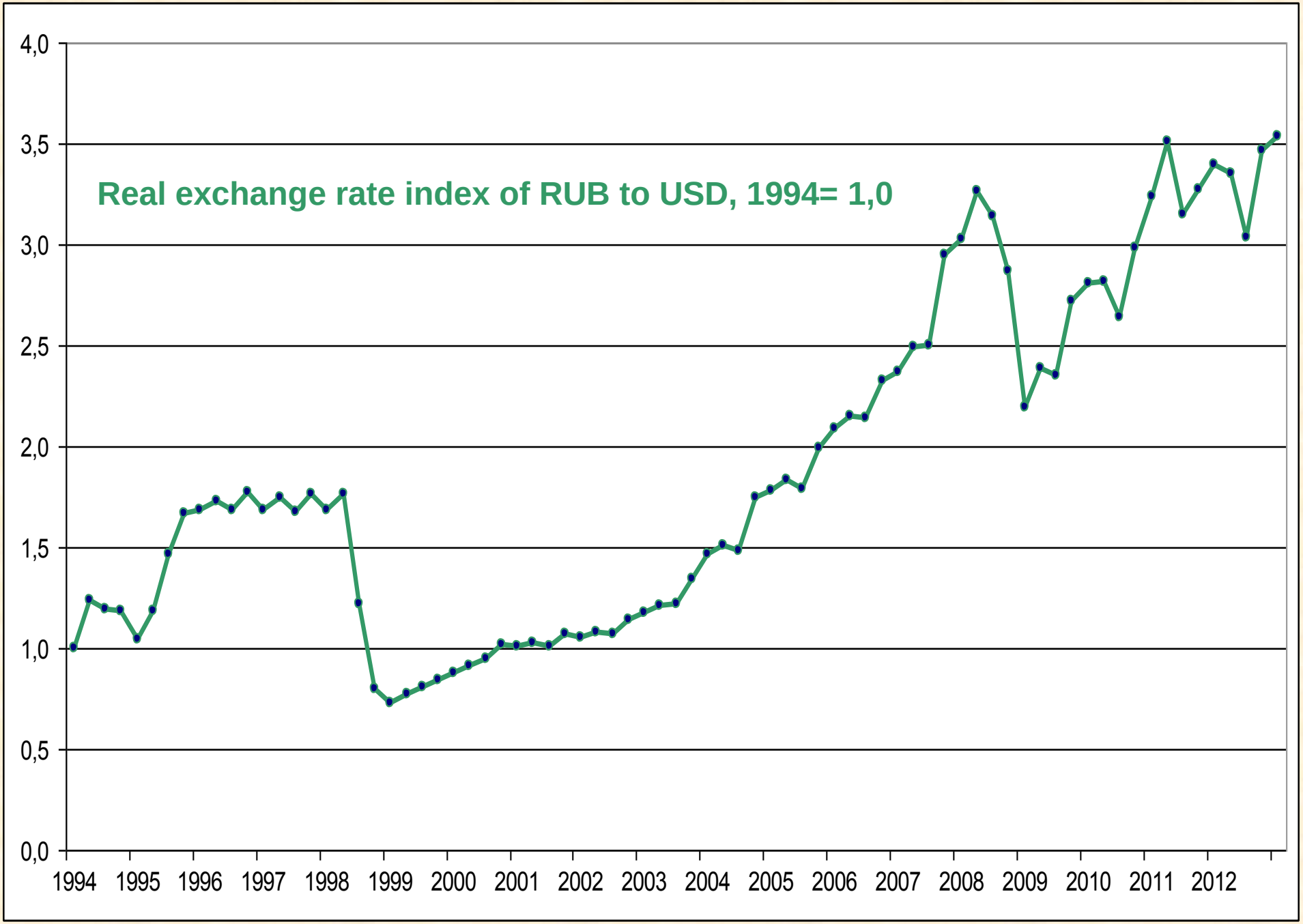
4. Results of Calculations

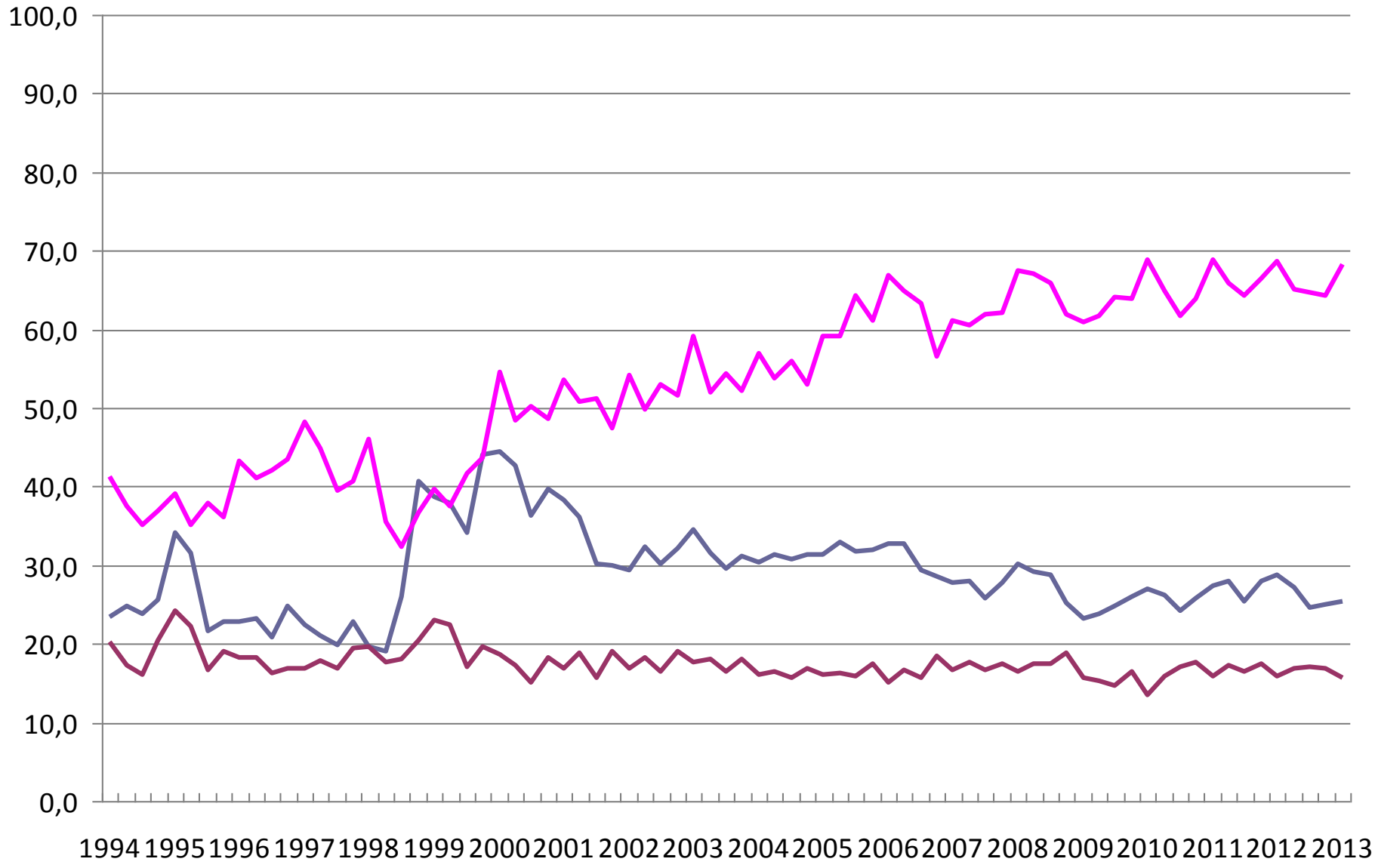
A problem under consideration

The high inflation rates are considered by Russian Authorities as one of the key economic problems, because of:

- it causes high nominal rates of interest by loans;
- it leads to fast strengthening of the real exchange rate of domestic currency, weakening competitiveness of domestic producers;
- it reduces social policy efficiency.


Russian GDP (bln USDollars)
275
314
391
404
309
195
260
306
345
431
591
763
993
1305
1665
1232
1524
1897
2012
Oil price (Brent, USD per barrel)
15,8
17,0
20,7
19,1
12,7
18,0
28,5
24,4
25,0
28,8
38,3
54,5
65,1
72,4
97,3
61,7
79,5
111,3
111,7
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012


Real exchange rate index of RUB to USD, 1994= 1,0
4,0
3,5
3,0
2,5
2,0
1,5
1,0
0,5
0,0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012


100,0
90,0
80,0
70,0
60,0
50,0
40,0
30,0
20,0
10,0
0,0
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Share of commodities export in GDP
Share of commodities Import in GDP
Share of Oil&Gas&OilRefinery in Total commodities export

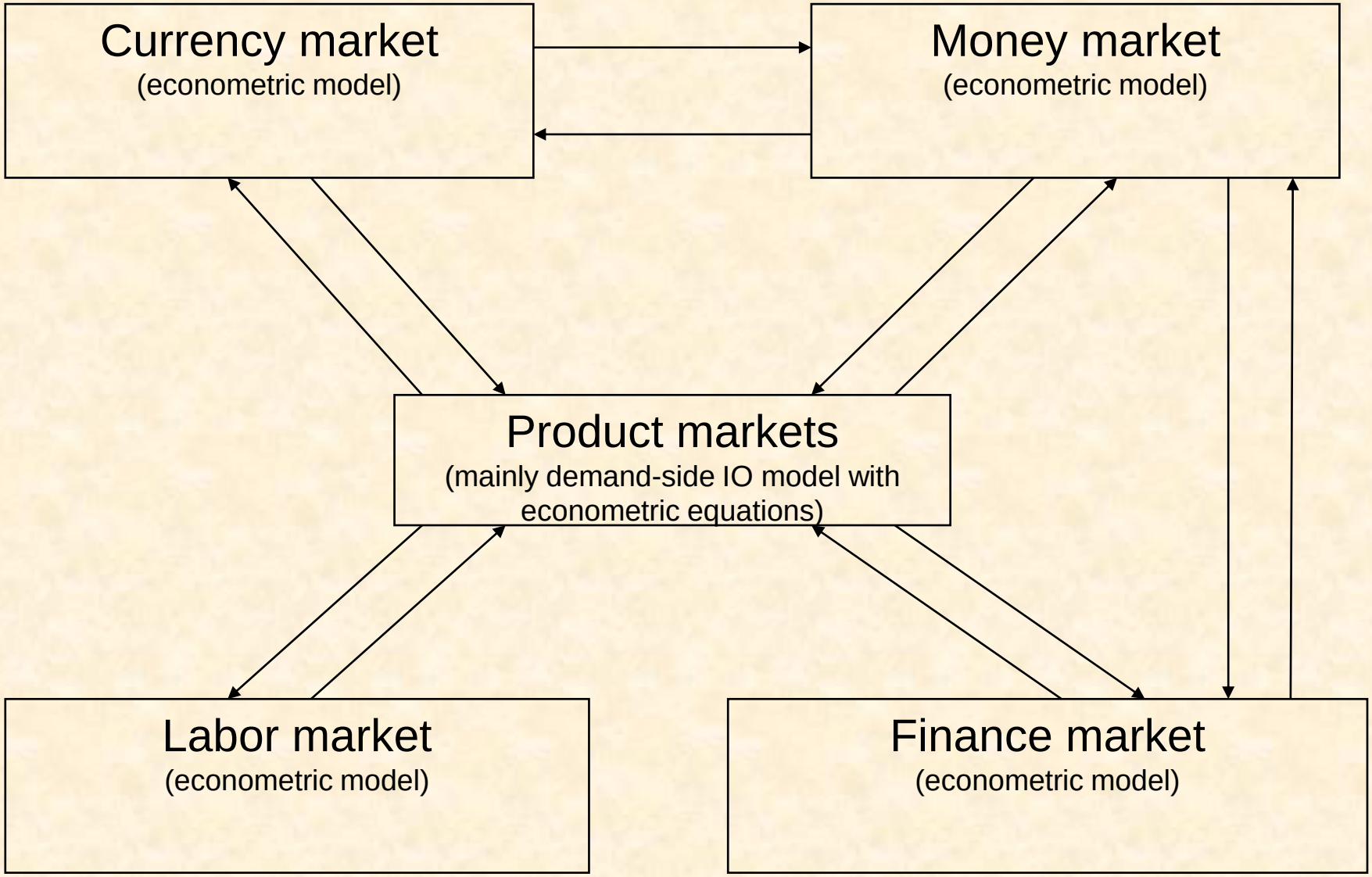

Change in Deflator of Russian GDP, %
30,0
25,0
20,0
15,0
10,0
5,0
0,0
-5,0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013

A Dynamic GE-IO model of Russia with aggregated money and currency markets

Theory of the Inter-branch Competition as a Paradigm of GE-IO Model Building

Key factors influenced on structure of a market economy are Inter-branch Competition and International Competition

Inter-branch competition is the competition of producers from various industries for aggregated demand and limited economic resources on aggregated markets.



Scheme of development of I-O Model in the General Equilibrium Concept

Key equations of product markets

$$dx_{i,t} = \sum_{k=1}^{K} e_{i,k} \cdot \varphi_{k,t}, \qquad i = 1,..,n$$

where

n – number of industries, n = 28;

K – number of aggregated markets' variables, influenced on industry outputs, K = 3;

$dx_{i,t}$ – change rate in real output of industry i in quarter t to the quarter t-4, i=1,..,n;

$\varphi_{k,t}$ – change rate in aggregated markets' variable k in quarter t to the quarter t-4, k = 1,…, K;

$e_{i,k}$ – elasticity of industry i output to aggregated markets' variable k.

Final product of industry i in quarter t ($y_{i,t}$) are defined by IO equations:

$$x_{i,t} = \sum_{j=1}^{n} a_{i,j} \cdot x_{j,t} + y_{i,t}, \qquad i = 1,...,n$$

$$x_{i,t} = (1 + dx_{i,t}) * x_{i,t-4}, \qquad i = 1,...,n$$

Estimations of industry output elasticities

		real exchange rate	real wage	real interest rate	R^2
1	Agriculture	-0,06 (1)	00	-0,19 (3)	0,20
2	Coal Production	-0,44	0,53	-0,28	0,63
3	Oil Production	00	0,26	0,30	0,17
4	Gas Production	-0,44 (4)	0,53	-0,28	0,78
5	Non-energy Raw Production	-0,25 (4)	00	-0,54	0,30
6	Food industry	-0,10 (4)	0,41	00	0,63
7	Light industry	-0,30 (4)	0,51	-0,26	0,65
8	Wood-working, pulp and paper industry	-0,31 (4)	-0,07	-0,58	0,83
9	Oil Refinery and Coke Production	00	00	-0,20	0,25
10	Chemical and Petrochemical Industry	-0,39 (4)	-0,06 (2)	-0,60	0,61
11	Building Materials Industry	-0,30 (4)	1,20	-0,67	0,79
12	Ferrous metallurgy	-1,10 (3)	0,36	-0,96	0,81
13	Non-ferrous metallurgy	-0,27 (4)	0,46	-0,47 (3)	0,68
14	Metal-working industry	-0,45 (4)	0,46	-0,50	0,65

Estimations of industry output elasticities

		real exchange rate	real wage	real interest rate	R^2
15	Machine-building	-0,57 (4)	0,79	-1,43	0,62
16	Other industries	-0,11 (4)	00	-0,56	0,71
17	Power engineering	-0,13 (4)	00	-0,34	0,49
18	Water Supply	-0,13 (4)	00	-0,34	0,49
19	Construction	0,15 (4)	0,75	-0,75	0,61
20	Trade	0,06 (3)	0,67	-0,43	0,92
21	Transport	00	0,41	-0,40 (1)	0,53
22	Communcations	00	0,41	-0,40 (1)	0,53
23	Finance and Assuarence	-0,27 (2)	1,28	-1,08 (2)	0,86
24	Rent	-0,30 (1)	1,02	-0,79 (1)	0,62
25	Science	0,08 (4)	0,47	-0,20	0,76
26	Education	00	0,14	00	0,59
27	Health, Sport, Culture	00	0,08	00	0,41
28	Other non-material services	0,06 (4)	0,30	-0,33	0,78

Key equations of money market

$$\mathrm{Ln}((1+IRN_t)/(1+IRN_{t-4})) = -0{,}02 + 0{,}16\cdot\mathrm{Ln}(P_{t-4}/P_{t-8}) -$$

$$-0{,}08\cdot\mathrm{Ln}(M_t/M_{t-4}) + 0{,}16\cdot\ \mathrm{Ln}(X_{t-5}/X_{t-9}),\ R^2 = 80{,}2\%,$$

where

IRN_t – nominal interest rate on loans to enterprises in quarter t;

P_t – GDP Deflator in quarter t;

M_t – Real money supply M_2 in quarter t;

X_t – Real Gross Output in quarter t.

Fisher equation modification

$$\pi_t = (1 + m_t)\cdot(1 + \pi_t^{nm}) / (1 + dX_t) - 1,$$

where

π_t – change rate in GDP Deflator in quarter t to the quarter t-4;

m_t – change rate in nominal money supply in quarter t to the quarter t-4;

dX_t – change rate in real total output in quarter t to the quarter t-4;

π_t^{nm} – contribution of non-monetary factors in change rate in GDP deflator in quarter t to the quarter t-4;

$\pi_t^{nm} = 4\%$.

Key equations of currency market

$$\mathrm{Ln}(ExR\$N_t/ExR\$N_{t-4}) = -0{,}04 + 1{,}20\cdot\mathrm{Ln}(1+dPrivateReserves_t/CurrenceInflows_t) -$$

$$-\ 0{,}49\cdot\mathrm{Ln}(1+dCurrenceInflows_t/CurrenceInflows_t),\ R^2 = 79{,}5\%,$$

where

$dPrivateReserves_t/CurrenceInflows_t$ – ratio of Change in Currency Reserves of Private Sector to Total Currency Inflows in Russia in quarter t;

$dCurrenceInflows_t/CurrenceInflows_t$ – ratio of change in currency inflows in Russia in quarter t to Total Currency Inflows in Russia in quarter t.

$$\mathrm{Ln}(1+Im_t/(P_t\cdot X_t)) = 0{,}125 + 0{,}025\cdot\mathrm{Ln}(ExRR_t / ExRR_{t-4}),\ P = 99{,}7\%,$$

where

Im_t – total commodities import in quarter t;

$ExRR_t$ – real exchange rate of Russian Ruble to USD in quarter t.

Key equations of currency market

$Ex_t = ExNonO\&G_t + OilPrice_t \cdot ExpOilVol_t / 0{,}522,$

where

$ExNonO\&G_t$ – total non-Oil&Gas&OilRefinery export of commodities and services in quarter *t*, in USD (exogenous);

$OilPrice_t$ – actual export Urals price in quarter *t*, in USD;

$ExpOilVol_t$ – total export volume of Oil in quarter *t* (endogenous);

0,522 – average share of oil in total export of Oil&Gas&Oil Refinery in 2010-2012.

Scenarios Description

Two scenarios: Basic and Inflation Targeting

Assumptions similar to both scenarios

Base year for calculations: 2010

Calculation period: 2011-2015

2011-2012 – key endogenous variables of the model except GDP are determined by official statistics, GDP is endogenous.

2013-2015 – all endogenous variables except real wage keep endogenous

Contribution of non-monetary factors to GDP Deflator will keep 4%

Urals prices will increase by 2% each year

Real wage will increase by 6% each year

Scenarios Description

Differences in Scenarios Assumptions

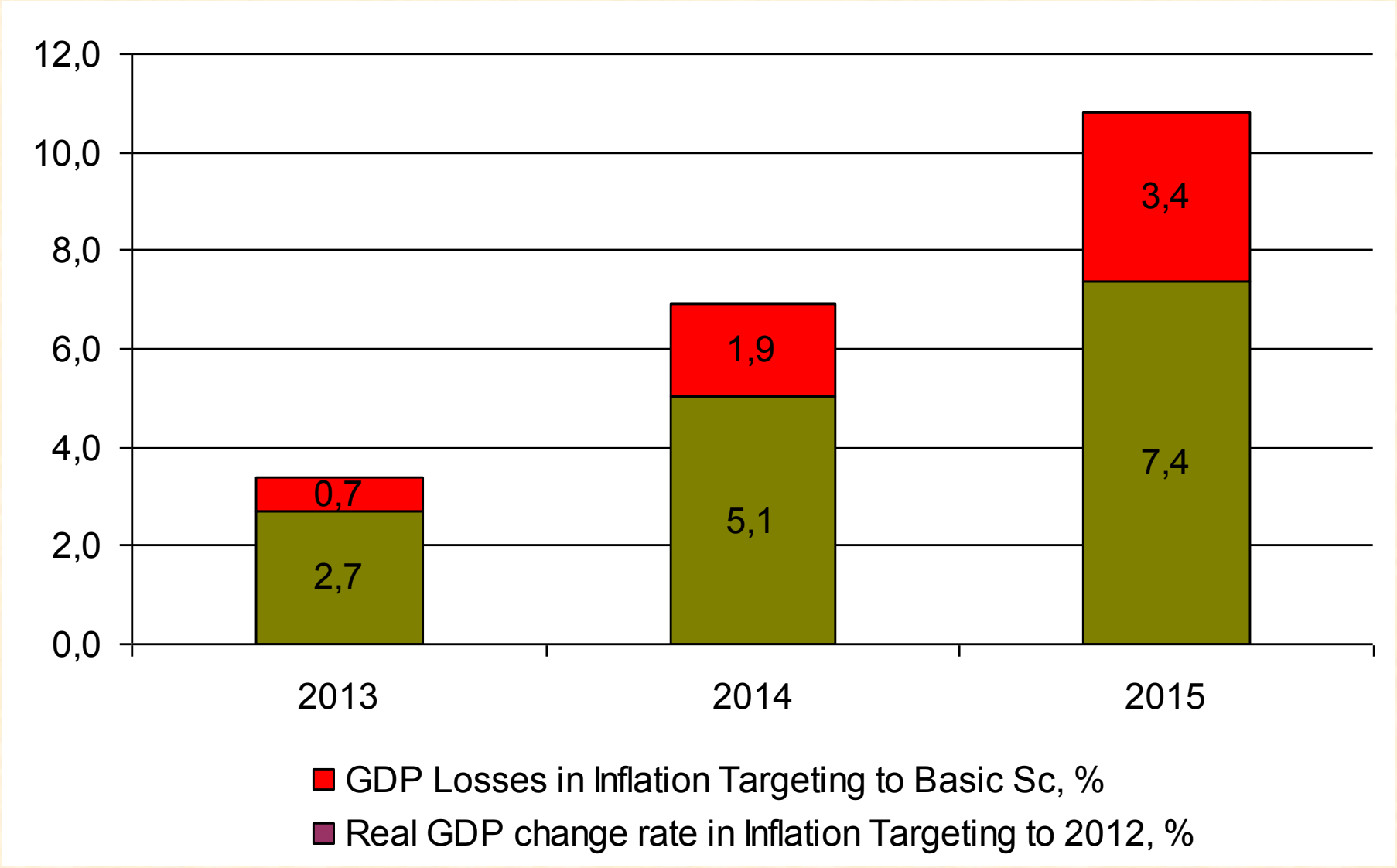
Basic Scenario

Change rate of nominal Money Supply is exogenous and it will decrease from 11,9% in 2012 to 11,3% in 2015.

Inflation Targeting Scenario

Change rate of nominal Money Supply becomes endogenous with a goal to decrease change rate of GDP Deflator to 4,0% in 2015.

The Results of Calculations



Results of Calculations

Basic scenario

	2010	2011	2012	2013	2014	2015	2015/ 2012
Urals price, USD per barrel	74,0	102,1	102,5	104,5	106,6	108,8	106,1
Nominal money supply growth rates, in %	131,1	122,3	111,9	111,9	111,4	111,3	138,7
GDP Deflator, in %	114,2	115,5	108,5	108,0	107,6	107,2	124,7
Real GDP growth rates, in %	104,5	104,0	103,7	103,4	103,4	103,6	110,8
Exchange rate, Rub/USD	30,37	29,39	31,09	32,17	33,67	35,66	114,7
Real Exchange rate of Rub to USD growth rate, in %	113,2	116,5	100,0	101,9	100,3	98,8	101,0
Nominal interest							

Results of Calculations

Inflation Targeting scenario

	2010	2011	2012	2013	2014	2015	2015/ 2012
Urals price, USD per barrel	74,0	102,1	102,5	104,5	106,6	108,8	106,1
Nominal money supply growth rates, in %	131,1	122,3	111,9	105,3	103,4	102,2	111,4
GDP Deflator, in %	114,2	115,5	108,5	106,6	105,1	104,0	116,4
Real GDP growth rates, in %	104,5	104,0	103,7	102,7	102,3	102,2	107,4
Exchange rate, Rub/USD	30,37	29,39	31,09	32,00	33,06	34,26	110,2
Real Exchange rate of Rub to USD growth rate, in %	113,2	116,5	100,0	101,0	99,2	97,9	98,1
Nominal interest							

Results of Calculations

Basic scenario

Structure of GO, %

	2010	2011	2012	2013	2014	2015	2015/2012 growth rate, %
Agriculture	3,8	3,7	3,8	3,8	3,7	3,7	109,3
Raw extraction	8,1	7,9	7,7	7,6	7,4	7,3	105,3
Manufacturing	27,5	27,3	26,5	26,8	26,9	27,0	113,5
Machine-building	5,1	5,2	5,0	5,1	5,2	5,3	119,3
Power energy	5,6	5,6	5,4	5,4	5,3	5,3	108,2
Construction	6,5	6,5	6,5	6,3	6,1	5,9	99,6
Trade	15,1	15,5	15,9	16,1	16,2	16,3	113,7
Transport and Communicatios	9,4	9,6	9,7	9,7	9,7	9,7	111,9
Non-material services	24,0	23,9	24,4	24,5	24,6	24,8	113,2

Results of Calculations

Inflation Targeting scenario

Structure of GO, %

	2010	2011	2012	2013	2014	2015	2015/2012 growth rate, %
Agriculture	3,8	3,7	3,8	3,8	3,8	3,8	108,6
Raw extraction	8,1	7,9	7,7	7,6	7,6	7,5	104,6
Manufacturing	27,5	27,3	26,5	26,7	26,8	26,9	109,3
Machine-building	5,1	5,2	5,0	5,0	5,0	5,0	107,8
Power energy	5,6	5,6	5,4	5,4	5,4	5,3	105,6
Construction	6,5	6,5	6,5	6,3	6,0	5,7	93,4
Trade	15,1	15,5	15,9	16,1	16,2	16,3	109,8
Transport and Communicatios	9,4	9,6	9,7	9,7	9,7	9,8	108,4
Non-material services	24,0	23,9	24,4	24,5	24,6	24,7	109,0

Thank You

For Your Attention!