Macro-Econometric Modelling of Medium-term Sustainable Fiscal Positions

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A. Backdrop

Economic Growth

India's overall economy grew at an annual average rate of 7.5 per cent (Gross Domestic Product, GDP at factor cost, 2004–5 prices) during the 10th Five Year Plan (2002–03 to 2006–07), a substantial improvement over five to six per cent growth rate during the 1990s. The average annual growth rate during the Eleventh Five Year Plan (2007–08 to 2011–12) was eight per cent. However, this period is marked by the significant event of the Lehman Financial Crisis of 2008, which slowed the economy down in that particular financial year 2008–09 (6.7% in 2008–09 from 9.32% of 2007–08). However, India posited a quick recovery and grew close to nine per cent for two consecutive years before slowing down again in 2011–12 (6.7%). The slowdown has only worsened with India growing below five per cent for two consecutive years in 2012–13 (4.5%) and 2013–14 (4.7%). Therefore, the first two years of the Twelfth Five Year Plan have been worse than even what was experienced in the 1990s.

Therefore, what does this roller-coaster ride of the growth rate imply for the fiscal balances of India? And more important of all, with the Indian economy forecasted to recover in an overall weak and uncertain internal and external economic environment and with greater demands for investments in human and physical capital, the challenge is to identify a fiscal position which would simultaneously encourage economic growth and development while ensuring fiscal sustainability. The overarching goal of this analysis is to generate medium-term scenarios for revenues and expenditures which would generate sustainable fiscal positions.

Indian Fiscal Structure

The Indian fiscal structure is based on federalism. The revenue raising authority and expenditure responsibilities of the Central Government of India and the State Governments are defined in

the Constitution of India. The legislative powers and responsibilities, (which denote expenditures in the budget) are specified in Union, Concurrent and State Lists. In practice, federal fiscal system is evolving towards increasing devolution of responsibilities to state governments. While the Central Government handles issues pertaining to macroeconomic stability, international trade and investment and national security, the States undertake the developmental activities like public health, agriculture, local law and order, etc. The states also play a major role in education and social security, which are technically in the concurrent list.

The authority to tax is also clearly assigned between the Centre and State (Rao and Singh 2004). The central government has control over the taxes on income, wealth, corporation profits and custom duties that are highly revenue generating. The States earn revenues from taxes on sales and purchases of goods and other minor taxes. As a result, the States have more expenditures than revenues and this causes a vertical fiscal imbalance. Rao and Singh (2004) point out that in 2002–2003, the states on average raised about 38 percent of government revenues, but incurred about 58 percent of expenditures and the balance was made up by transfers from the Centre.[1]

Since the developmental responsibilities and expenditures of states are high and continue to increase, intergovernmental transfers have become an integral part of India's fiscal system. This is a complex system that involves formal institutional mechanisms of resource transfers as well as a variety of special purpose transfers that are made on the basis of demands and needs of states. The resource transfers may take place via finance commission transfers, Planning Commission transfers; conditional grant transfers; and loans and advances for deficit financing (Singh 2004).

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[1] The share of states in the net tax revenues of the Centre was raised from 29.5 per cent to 30.5 per cent from XIth Finance Commission to XIIth Finance Commission. However, the actual shares were 29.36,

Fiscal Balances

The benchmark for fiscal sustainability in India is the gross fiscal deficit at the Centre. As per the Fiscal Responsibility and Budget Management Act (FRBMA) 2003, the fiscal deficit as a percentage share of GDP was to be reduced to three per cent by March, 2008. The literature has documented that the FRBM Act 2003 was enacted to reduce the large fiscal deficits experienced in the 1990s (Simone and Topalova, 2009 and Lalvani, 2009). "The FRBMA's stated objective is to ensure inter-generational equity in fiscal management and the fiscal sustainability necessary for long-term macro-economic stability. The FRBM Act was implemented at the Centre and Indian states were given incentives by the Twelfth Finance Commission (TFC) to implement their own fiscal responsibility laws (FRLs) in the form of conditional debt restructuring and interest rate relief" (Simone and Topalova, 2009).

Figure 1 shows that the combined fiscal deficit as a percentage of GDP fell from 9.5 per cent in 2001–02 to 4.6 per cent in 2007–08. This was primarily driven by the fall in the central fiscal deficit by about 1.8 per cent of GDP between its introduction in 2004–05 and 2007–08 Simone and Topalova, 2009). The period between 2004–05 and 2007–08 also overlapped with historically high economic growth rates (Figure 1). However, with the Lehman Financial Crisis of 2008, the FRBM targets were laid aside. The combined fiscal deficit as a per cent of GDP shot up to 9.3 per cent in 2009–10, mainly driven by the rise in the Centre's fiscal deficit. The average combined fiscal deficit and the fiscal deficit of the Centre has averaged at 7.5 per cent and 5.2 per cent, respectively between 2010–11 and 2013–14.

28.95 and 29.64, in 2005-06, 2006-07, 2007-08 respectively. There is a demand by the states to increase the share to 50% that is under consideration (Finance Commission 2009).

Figure 1: Gross Domestic Product Factor Cost (2004–prices, % yoy) and Fiscal Deficit as a percentage of GDP, 1980–81 to 2015–16)
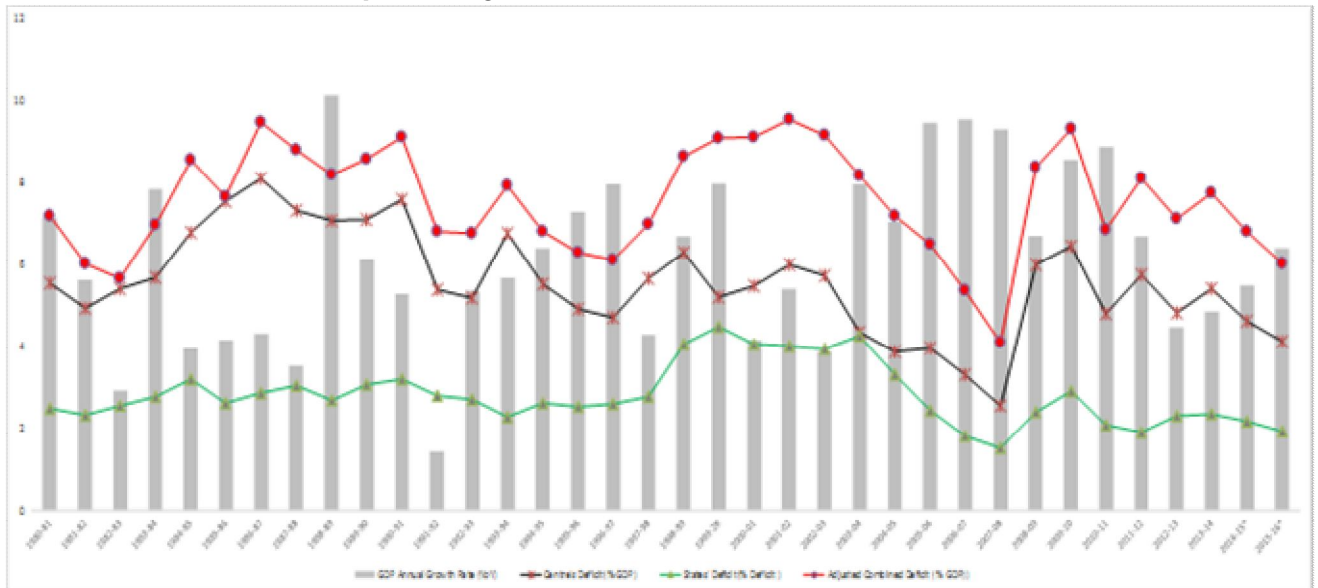
Note: 2014-15 and 2015-16 are forecasted values. The GDP value for 2014-15 is from the RBI and 2015-16 is from the IMF. The forecasted values for the fiscal indicators are from the Planning Commission.
Sources: Planning Commission, Reserve Bank of India and International Monetary Fund.

Lalwani (2009) comments on the worsening composition of the improving fiscal balance. The author points out that the structure of expenditure at the Central level has worsened in the post-FRBM phase with a rising share of revenue expenditure and a falling share of capital expenditure. The states show similar trends at least till 2008–09. Expenditure on developmental parts as defined by the RBI had improved at the state level but it was nowhere near the levels reached in the 1990s. Lalwani (2009) concluded that the "correction and consolidation which has occurred at the central and state levels could be largely attributed to robust economic growth and macroeconomic stability coupled with a tax structure based on reasonable rates, fewer exemptions and better compliance. The focus on expenditure restructuring has clearly lagged behind".

B. Objectives and Scope of the Proposed Analysis

The overall objective of this analysis is to generate medium-term scenarios for revenues and expenditures which would generate sustainable fiscal positions while maintaining high rates of growth and development.

There have been some analyses on the implication of the federal fiscal structure of India on developmental issues such as growth, regional inequality and efficiency of state governments, etc. (for example, see Singh and Srinivasan (2006)). However, there is a need to develop an understanding of the inter-linkages of this structure with the rest of the economy using the framework of an aggregate macroeconomic modelling.

The major challenge ahead for the country is to revive investment and economic growth in the next five years. Gross Fixed Capital Formation (Investment) growth has barely grown in the last two fiscal years (0.8% in 2012–13 and –0.1% in 2013–14) but showed improvement in the first quarter of the current fiscal. However, there is no guarantee that there will be improvement in the rest of the year given the volatile movement of the Index of Industrial Production (IIP). For an emerging and transitioning country like India, the importance of investment cannot be overemphasized. Further, post the Lehman Crisis of 2008, the world has become increasingly uncertain. World economy is fraught with uncertainties and the recovery looks weak and uneven. Monsoon has been playing hide and seek in India with uneven spatial and temporal patterns. Industrial growth has been weak and the services sector also has slowed down. The recovery looks uneven in that sector too. There is an increasing chance of the US tapering off in the next five years. And the oil prices have dramatically fallen in the last three months of the current fiscal. However, fiscal deficit after ballooning up in 2008, has been progressively lowered.

The future growth of both India and the world looks uncertain because of a variety of factors – US tapering off, oil prices (also because of Middle East geo-politics), introduction of structural reforms in India like the Goods and Services Tax, implementation of the Pay Commission, rationalization of subsidies, disinvestment and revenues from auctioning of various national assets like the telecom spectrum, coal etc. All these factors directly and indirectly affect the fiscal scenario of the country and in turn have implications for economic growth. A variety of factors may affect the economy simultaneously.

Therefore, the current report develops three scenarios: 'Baseline', 'Optimistic' and 'Pessimistic'.

(a) Scenario 1: Baseline

This is the scenario where the economy is running on 'business-as-usual' mode based on past and present trends. There is no government spending shock.

(b) Scenario 2: Optimistic

This is the scenario where we have the pay commission recommendations implemented, oil prices have fallen, external economy has recovered and disinvestment receipts have been higher than predicted. Further the reforms to improve the 'ease of doing business' and therefore the investment scenario have been implemented. Business sentiments have risen and remain at elevated levels for the next five years.

(b) Scenario 3: Pessimistic

This is the scenario where the pay commission recommendations have been implemented but oil prices have risen, disinvestment receipts have been below expectations (baseline), and the external economy recovery has been weak.

These three scenarios help to generate a range of predictions for economic growth and fiscal balances of both the Centre and the Combined Centre plus state finances. The NCAER Macro-econometric model has integrated the federal structure of India into its model and uses that to generate the three medium-term fiscal scenarios.

C. Key Features of the NCAER Macroeconometric Model

The present analysis is based on incorporating additional features into the macroeconometric model developed at the NCAER in previous years and updating the model for more recent data (the detailed structure of the model, estimated equations and list of variables are given in the Appendices).

The important key features of the model are:

- At the sectoral level, output is determined by capital stock and demand conditions. Investment adds to capital stock; productivity improvements affect output from a given level of capital stock; and demand influences capacity utilisation and therefore output. Labour does not appear in the output determination, essentially reflecting expansion in labour supply and productivity to produce more output.

- Improvement in productivity is captured through: (i) physical infrastructure development and (ii) human capital development (health and education). It is important to note here that total factor of productivity is not directly estimated in the model, but it is captured indirectly through improvement in both physical and human capital infrastructure. Government expenditure, which drives both physical and human capital, is exogenously specified in nominal terms in the model. Productivity improvement varies from sector to sector. The estimated relationships in this work show that productivity improvement through physical infrastructure is greater in the case of manufacturing than services other than transport, storage and communication; it is the other way round in the case of human capital improvement. These two sources of productivity improvement have been specified in the output determination of the manufacturing sector and in the sector "services other than infrastructure". Infrastructure includes two NAS sectors: (i) transport, storage and communication, and (ii) electricity, gas and water supply.

- Prices are estimated at the sectoral level, which are then aggregated to provide overall inflation measures. In the case of agriculture, prices are estimated at further disaggregated levels, and then aggregated to get the overall agricultural price. Sectoral prices are influenced by administered prices, international prices and monetary variables.

- The model has an exogenously specified exchange rate. The interest rate is sensitive to exchange rate depreciation, external interest rate and domestic inflation.

- High inflation will have an impact on interest rate, which will, in turn, affect interest payments and sustainability of the fiscal position. A higher fiscal deficit to GDP ratio would negatively affect private investment and growth.

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- One aspect of inclusive growth dimension has been characterised by the link between the sectoral composition of overall output growth and the incidence of poverty. However, the model has no feedback from poverty incidence to growth.

- The model captures the impact of reduction in petroleum sector subsidies on overall GDP and inflation through two channels: removing the price subsidy burden on the oil industry will improve investment by the oil industry and, hence, growth. On the other hand, higher/lower oil prices will lead to higher/lower inflation if there is no further investment.

- The estimated equations for private investment were not able to capture the impact of the global crisis of 2008/2009 and the more recent slowdown in the economy in 2012-13. In order to reflect the actual growth conditions in the model, we have adjusted the estimated intercept in the private investment equation in 2012-13 and 2013-14. This adjustment has been retained in all three scenarios.

The schematic view of the sectoral links among the variables is depicted in Figure 2 below.

Figure 2: Schematic View of the Macroeconometric Model
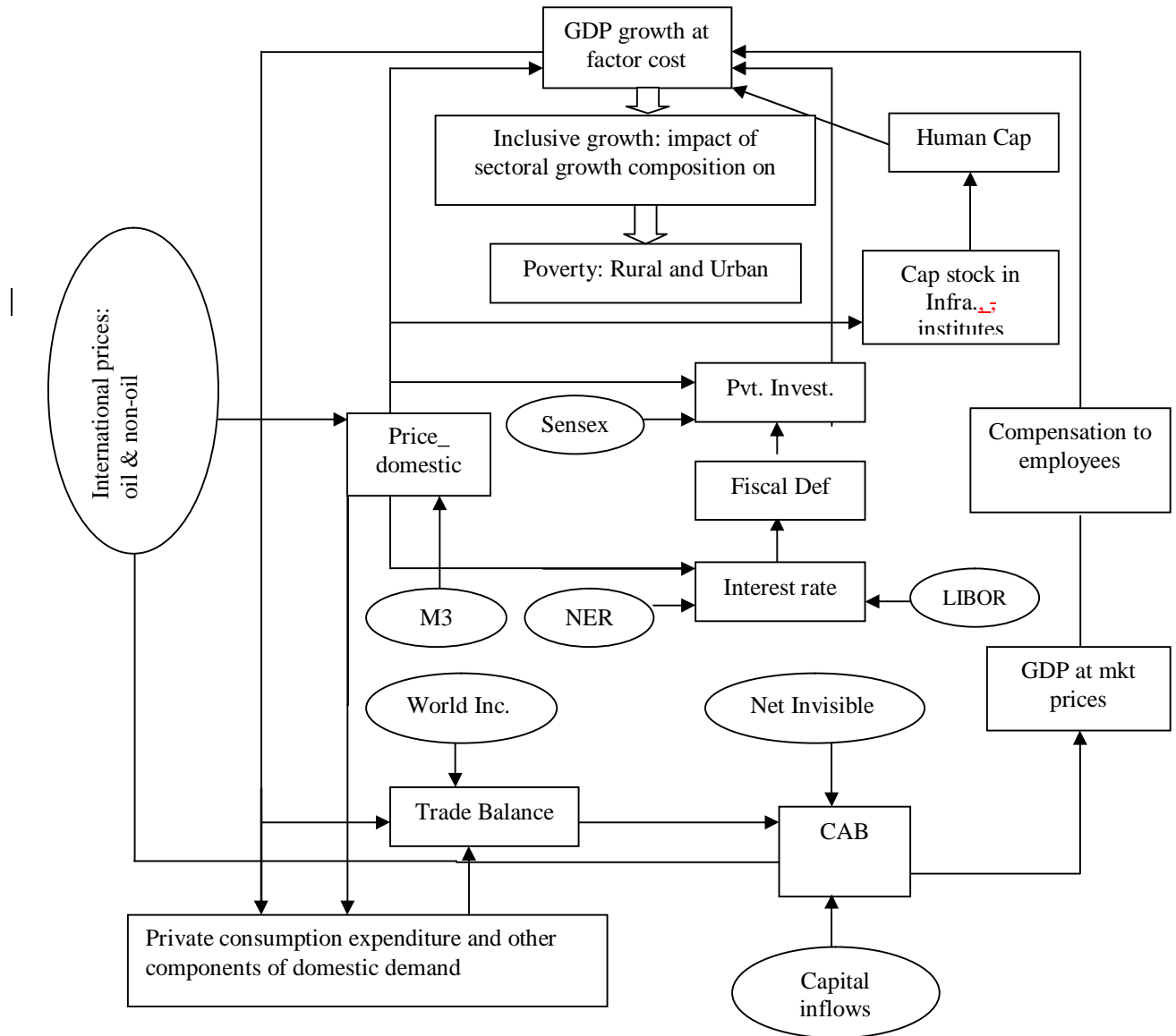
Note: Variables in the circles are exogenous.

D. Scenario Analysis Using Quantitative Economic Models

In this section, we present the results of each scenario separately. These results are based on the specification of exogenous/policy variables (determined outside the model). The exogenous variables have been specified to derive the outcome of endogenous variables (determined by the system). The future values of exogenous variables are usually determined from their past trends and judgement of the alternative paths for these variables. The forecasts are made for the period 2014–15 to 2019–20. The three scenarios are:

a) Baseline

Under this scenario, assumptions about the exogenous variables are made based on past and current trends (Table 1). There is no government spending shocks in the baseline model.

- Agriculture Related
    - Rainfall: Except for the current fiscal, rainfall is assumed to be normal.
    - Gross Irrigated Area is assumed to grow at two per cent per annum. This assumption is based on the literature.
    - Minimum Support Prices for Rice, Wheat and Sugarcane: From the Reserve Bank of India, we make the assumptions about the current fiscal and the next five years' assumptions are taken from the averages of 2003–2013, removing the outliers. The assumption for the y-o-y change for the MSP of sugar cane is significantly lower than the average of the past five years. This is because the growth rate of the previous five years was deemed as unsustainable and could not have continued for the next five years given the actions taken by the current government to rationalize food prices.
- Global Conditions
    - World GDP: From the IMF World Economic October Outlook, it is forecasted that world GDP will grow at 3.3 per cent in 2014–15 and 3.8 per cent in 2015–16. The long-run average growth rate for the World between 1970 and 2013 is three per cent and that is used as a baseline assumption for the period 2016–17 to 2019–20.

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- International Crude Oil Price Index: This is the UK Brent Price Index taken from the IMF with the index 1995=100. The forecasts i.e. the year-on-year (y-o-y) changes are formed using the World Bank Commodity Price Prospects. This translates to the average price of the UK Brent Crude Oil for the period 2014–15 to 2019–20 is $99.4 a barrel.

- International Non-fuel Price Index: This is the price index taken from the IMF with the index 1995=100. The assumptions are formed using the World Bank Commodity Price Prospects.

- LIBOR is assumed to remain at 0.2 per cent for the forecasting period.

- Exchange Rate: Exchange rate is assumed to remain at Rs 60 per dollar for the forecasting period except for 2014–15 when it is assumed to be Rs 60.3 per dollar.

- BSE Sensex: It is assumed that in 2014–15 it will grow at 29 per cent year. This assumption is based on the trends of the past half year when positive sentiments about the investment and political climate have prevailed. And positive perceptions about India have attracted substantial foreign institutional inflows to the country, which have only boosted the BSE. For the rest of the forecasting period, we assume a ten per cent y-o-y change.

- Investment Climate:
  - FDI: It is assumed that a positive investment climate prevails in the economy. Based on April–August numbers, the y-o-y change was 47 per cent in rupee terms. However, the FDI y-o-y growth has dramatically fallen to 16 per cent in rupee terms during April–September. This only helps highlight the prevailing uncertainties in the Indian economy. For the next two years we assume that FDI grows at 30 per cent in 2015–16 and 2016–17. And for the rest of the forecasting period, FDI grows at 20 per cent on a y-o-y basis. These assumptions are based on the current government's emphasis on forging trade agreements, attracting FDI, opening up previously closed sectors to FDI and the emphasis on 'Make in India' initiative.

- o Net Invisibles (Netinv): This is assumed to grow at five per cent for 2014–15. This is because there is negative y-o-y growth of net services in dollar terms (–6.6%) during the period April to September. Further uneven growth of the rest of the world indicates that this trend may only continue. For the rest of the forecasting period, net invisibles are assumed to grow at 15 per cent. Foreign Institutional Investment is assumed to grow at 100 per cent on a y-o-y basis in 2014–15 and thereafter it grows at ten per cent.

- o Public Gross Fixed Capital Formation in agriculture and non-agriculture sectors are assumed to grow at 12 and 10 per cent, respectively for the period 2014–15 to 2019–20. This assumption is based on previous literature review.

- Fiscal Account

  - o Centre Subsidies: Total subsidies were at 2.3 per cent of GDP in 2013–14 and are budgeted to be at two per cent of GDP in 2014–15. Over the projection period, major subsidies are estimated to reduce to 1.7 and 1.6 per cent of GDP respectively as per the Medium Term Fiscal Policy Statement of the Union Budget 2014–15. Based on these numbers, we assume that subsidies are growing at two per cent on a y-o-y basis for the period 2014–15 to 2019–20.

  - o General Government Expenditure on Health and Family Welfare and Education, Art and Culture: Based on the Economic Survey's emphasis on inclusive development agenda, both are assumed to grow by 13.3 per cent during the forecasting period.

  - o Direct Tax Rate (Centre): Statistical evidence suggests that direct taxes between 2008–09 and 2011–12 are not buoyant but they are for longer time periods. This period also coincided with volatile economic growth (Figure 1). The direct tax collection rate was 5.9 per cent in 2008–09 and the average rate of growth between 2008–09 and 2013–14 was –3.3 per cent. If one looks at the ten year average the growth of the direct tax rate is 4.4 per cent. The 2013–14 budget assumed that direct taxes will grow at 18 per cent. In 2013–14, the actual direct taxes grew only by 13.5 per cent. Further, given the lower than expected direct tax revenue collection in the current fiscal, it is assumed that the direct tax rate

will grow at one per cent in the current fiscal and at two per cent thereafter. The direct tax rate for the combined Centre and State is assumed to grow at the same rate as the Centre.

- o Indirect Tax Rate (Centre): Indirect taxes are not as buoyant as direct taxes except for the period 2008–09 to 2011–12. The 2013–14 budget assumed that indirect taxes will grow at 20 per cent. In 2013–14, the actual indirect taxes grew only by 11 per cent. In the current fiscal year, the budget estimates for the y-o-y for indirect taxes are 19 per cent. Therefore, it is assumed that the indirect tax rate at the Centre will experience no growth in the current fiscal but will grow by one per cent for the rest of the forecasting period. The indirect tax rate for the combined Centre and state is assumed to grow at a slightly higher rate than the Centre because it forms a higher proportion of the total tax revenue.

- o Disinvestment (Rs crore): Disinvestment is assumed to be at the budget estimate of Rs 63,425 for the current fiscal year. However, only Rs 121 crore has been collected between the period April to September for the current fiscal. For the rest of the forecasting period, it is assumed that a constant stream of Rs 55,000 crore will come in the form of disinvestment receipts. This seems reasonable given the telecom auctions scheduled for next year and the possibility of coal auctions. Disinvestment is assumed to be the same for the Centre and the State.

- Other Variables
  - o WPI Energy: Given the weakening of price of crude oil, it is assumed that WPI Energy will grow by five per cent in the current fiscal and 6.5 per cent thereafter for the forecasting period.
  - o M3: The assumption for the current fiscal is based on the growth rate available based on current trends for the last six months (13%). The ten-year average growth rate is assumed for the rest of the forecasting period.

Table 1: Assumptions of Exogenous/policy variables for Baseline

Variables	Unit	2004/05 to 2008/09	2009/10 to 2013/14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Agriculture related									
Rainfall	Relative to normal			12% Deficient	Normal	Normal	Normal	Normal	Normal
Gross Irrigated Area (million hectares)	%YOY	2.5	0.4*	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Support Price for Rice	%YOY	9.7	8.1	3.8	7.0	7.0	7.0	7.0	7.0
Minimum Support Price for Wheat	%YOY	12.0	5.4	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Support Price for Sugarcane	%YOY	2.2	22.4	4.8	7.0	7.0	7.0	7.0	7.0
Global conditions									
World GDP (at constant prices)	%YOY	3.5	1.9	3.3	3.8	3	3	3	3
International Crude oil price Index (US$)	%YOY	25	6.5	−2.7	−6.1	−0.6	−0.4	−0.6	−0.6
International Non-fuel price index (US$)	%YOY	10.8	3.6	−3.0	−4.1	−0.5	0.2	0.3	0.2
LIBOR	%	3.5	0.4	0.2	0.2	0.2	0.2	0.2	0.2
NEER	%YOY	−1.1	−4.9	1.5	0.1	0	0	0	0
NER (Rs/ US$)	%YOY	0.0	5.9	−0.3	−0.5	0.0	0.0	0.0	0.0
BSE Sensex	%YOY	26.0	11.3	29	10	10	10	10	10
Investment Climate									
FDI (Rs crore)	%YOY	73.9	10.7	40.0	20.0	20.0	20.0	20.0	20.0
NETINV (Rs crore)	%YOY	27.3	12.5	10.0	30.0	30.0	30.0	30.0	30.0
FII (Rs crore)	%YOY	11.9	−79.0	100	10	10	10	10	10
Public Gross Fixed capital Formation in agriculture and allied sectors	%YOY	17.2	12.5†	12	12	12	12	12	12
Public Gross Fixed Capital Formation in Non-agricultural Sectors	%YOY	21.2	7.2†	10	10	10	10	10	10
Fiscal Account									
Subsidies (Centre)	%YOY	26.9	14.9	2	2	2	2	2	2
General Government Expenditure on Health and Family Welfare	%YOY	7.4	9.7†	13.3	13.3	13.3	13.3	13.3	13.3
General Government Expenditure on Education, art and culture	%YOY	9.2	9.0†	13.3	13.3	13.3	13.3	13.3	13.3
Direct Tax Rate (Centre)	%YOY	9.6	−2.2	1	2	2	2	2	2
Indirect Tax Collection Rate (Centre)	%YOY	−2.9	0.1	0	1	1	1	1	1
Disinvestment (Centre)	Rs crore	9,180.0	23,499.2	63,425	55,000	55,000	55,000	55,000	55,000
Other Variables									
Domestic energy price (WPI)	%YOY	6.7	8.9	5	6.5	6.5	6.5	6.5	6.5
M3	%YOY	18.5	15.7	13	17	17	17	17	17

Notes: * This is for the period 2009–10 and 2010–11. † This is for the period 2009–10 to 2011–12.

The results of the baseline are summarized in Table 2. The overall GDP at constant 2004–05 prices is projected to grow by an average of 6.8 per cent during the period 2014–15 to 2019–20. The GDP rises at the faster rate in the beginning of the forecasting period but then shows signs of tapering down especially in 2019–20, growth rate actually falls. Across production sectors, the services sector is expected to register higher growth of 8.3 per cent, followed by industry around 5.1 per cent and agriculture by 3.1 per cent. WPI Inflation rate stays around 5.1 per cent. This is because of moderating and weak crude oil prices. The average current account deficit will be around 2.3 per cent of GDP. It shows an increase due to fall in growth rates of FDI and FII flows. Over time, current account deficit moderates as exports of goods and services improve over time. Fiscal deficit shows signs of falling over time but it never really reaches the Medium term Fiscal Policy Targets as laid out in Budget 2014–15.

Table 2: Results for the Baseline on Major Macroeconomic Parameters during 2014–15 to 2019–20

Variables	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
% yoy change											
Real GDP											
- Agriculture	0.8	8.6	5.0	1.4	4.7	1.9	3.7	3.1	3.3	3.2	3.3
- Industry	9.2	7.6	7.8	1.0	0.2	2.0	3.1	6.1	6.7	6.9	5.9
- Services	10.5	9.7	6.6	7.0	6.8	7.4	8.2	8.2	8.6	9.0	8.4
Total GDP	8.6	8.9	6.7	4.5	4.7	5.3	6.3	7.0	7.5	7.8	7.2
Exports ($-term)	-2.6	40.6	22.0	-1.9	1.7	5.4	6.5	7.2	6.2	7.4	8.4
Imports ($-term)	-3.9	28.4	32.5	0.9	-15.0	9.9	15.2	10.6	10.8	12.4	7.9
Inflation (WPI)	3.8	9.6	8.9	6.1	6.7	4.2	4.9	5.3	5.4	5.4	5.4
As Percentage of GDPmp											
Current Account_RBI*	-2.8	-2.8	-4.2	-4.8	-1.7	-1.3	-2.6	-2.7	-2.7	-2.5	-2.0
Fiscal Deficit_Centre	6.7	5.0	5.7	5.0	4.6	4.4	3.9	3.6	3.5	3.3	3.4
Fiscal Deficit_Total	9.6	7.2	7.6	7.4	6.9	6.7	6.1	5.8	5.5	5.4	5.4

Notes: The shaded columns are actual numbers. * Surplus (+)/deficit (–).

b) Optimistic

In this scenario, all economic conditions improve for the better. The two key changes are that crude price of oil falls to $90 a barrel and the Pay Commission implements its recommendations in 2016–17. As a result, the government wage bill increases by 15.3 per cent in the same year and that increase slowly tapers off. The assumptions are shown in Table 3.

Table 3: Assumptions of Exogenous/policy variables for Baseline

Variables	Unit	2004/05 to 2008/09	2009/10 to 2013/14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Agriculture related									
Rainfall	Relative to normal			12% Deficient	Normal	Normal	Normal	Normal	Normal
Gross Irrigated Area (million hectares)	%YOY	2.5	0.4*	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Support Price for Rice	%YOY	9.7	8.1	3.8	7.0	7.0	7.0	7.0	7.0
Minimum Support Price for Wheat	%YOY	12.0	5.4	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Support Price for Sugarcane	%YOY	2.2	22.4	4.8	7.0	7.0	7.0	7.0	7.0
Global conditions									
World GDP (at constant prices)	%YOY	3.5	1.9	3.3	4	4	4	4	4
International Crude oil price Index (US$)	%YOY	25	6.5	−2.7	−19.6	1	1	1	1
International Non-fuel price index (US$)	%YOY	10.8	3.6	−3.0	−4.1	−0.5	0.2	0.3	0.2
LIBOR	%	3.5	0.4	0.2	0.2	0.2	0.2	0.2	0.2
NEER	%YOY	−1.1	−4.9	1.5	3.0	3.0	3.0	3.0	3.0
NER (Rs/ US$)	%YOY	0.0	5.9	-0.3	−3.0	−3.0	−3.0	−3.0	−3.0
BSE Sensex	%YOY	26.0	11.3	29	20	20	20	20	20
Investment Climate									
FDI (Rs crore)	%YOY	73.9	10.7	47	30	30	30	30	30
NETINV (Rs crore)	%YOY	27.3	12.5	5	20	20	20	20	20
FII (Rs crore)	%YOY	11.9	−79.0	100	50	30	30	30	30
Public Gross Fixed capital Formation in agriculture and allied sectors	%YOY	17.2	12.5†	15	15	15	15	15	15
Public Gross Fixed Capital Formation in Non-agricultural Sectors	%YOY	21.2	7.2†	14	14	14	14	14	14
Fiscal Account									
Subsidies (Centre)	%YOY	26.9	14.9	−5	−5	0	0	0	0
General Government Expenditure on Health and Family Welfare	%YOY	7.4	9.7†	20	20	20	20	20	20
General Government Expenditure on Education, art and culture	%YOY	9.2	9.0†	20	20	20	20	20	20
Direct Tax Rate (Centre)	%YOY	9.6	−2.2	2	5	5	5	5	5
Indirect Tax Collection Rate (Centre)	%YOY	−2.9	0.1	2	3	3	3	3	3
Disinvestment (Centre)	Rs crore	9,180.0	23,499.2	63,425	55,000	55,000	55,000	55,000	55,000
Other Variables									
Domestic energy price (WPI)	%YOY	6.7	8.9	5	4	4	4	4	4
M3	%YOY	18.5	15.7	13	17	20	20	20	20

Notes: * This is for the period 2009–10 and 2010–11. † This is for the period 2009–10 to 2011–12.

The assumptions that have been changed from the Baseline are discussed below and the rationale provided for them.

- Agriculture Related: All the assumptions remain the same as in the Baseline.
- Global Conditions
    - World GDP: After the 3.3 per cent growth in 2014–15 world GDP grows at four per cent between 2015–16 and 2019–20.
    - International Crude Oil Price Index: The 2014–15 assumption of –2.7 per cent fall in price of crude oil is retained. In 2015–16, it is assumed that Crude Price of Oil falls by 19.6 per cent to $85.6 a barrel. Thereafter price of oil increases by one per cent on a y-o-y basis.
    - International Non-fuel Price Index: This assumption is retained from the baseline.
    - LIBOR is assumed to remain at 0.2 per cent for the forecasting period, same as the baseline.
    - Exchange Rate: Exchange rate is assumed to be Rs 60.3 per dollar for 2014–15. For the rest of the period it is assumed to be appreciating by three per cent on a y-o-y basis. This may be linked to improving economic conditions, thereby attracting higher capital inflows like FDI and FII, which put an upward pressure on the rupee.
    - BSE Sensex: It is assumed that in 2014–15 it will grow at 29 per cent year. However, it increases at a higher rate of 20 per cent than the baseline of 10 per cent for the years between 2015–16 and 2019–20.
- Investment Climate:
    - FDI: It is assumed that a positive investment climate prevails in the economy. Based on April–August numbers, the y-o-y change was 47 per cent in rupee terms. For the rest of the forecasting period, we assume that FDI grows at 30 per cent. FII is forecasted to grow at 100 per cent in 2014–15, 50 per cent in 2015–16 and 30 per thereafter.
    - Net Invisibles (Netinv): This is assumed to grow at five per cent for 2014–15. For the rest of the forecasting period, net invisibles are assumed to grow at 20 per cent. With the improvement in the external economy, service exports should

revive. Further with improving investment, both industry and services (which may be linked with industry) will revive.

- o Public Gross Fixed Capital Formation in agriculture and non-agriculture sectors are assumed to grow at 15 and 14 per cent, respectively for the period 2014–15 to 2019–20.

- Fiscal Account

  - o Centre Subsidies: Subsidies is forecasted to decline by five per cent on a y-o-y basis for the first two years of 2014–15 and 2015–16 and thereafter the growth rate of subsidies is retained at zero. Therefore it is assumed that the government is able to rationalise the subsidies and the reforms are carried over the next two years. After that, subsidies are maintained at a certain level.

  - o General Government Expenditure on Health and Family Welfare and Education, Art and Culture: This is increased to 20 per cent during the forecasting period. The idea is that the government in spending on the human capital component of the economy.

  - o Direct Tax Rate (Centre): With improving economy, one would expect direct tax to increase. It is assumed to grow at two per cent in 2014–15 and five per cent thereafter. The direct tax rate for Centre plus states is the same as the Centre.

  - o Indirect Tax Rate (Centre): The indirect tax rate is also expected to improve but because it is less buoyant than the direct tax rate, it is assumed to grow at two per cent in 2014–15 but thereafter grow at three per cent. The Centre plus states indirect tax rate is assumed to be half a percent larger than the Centre's. Therefore it is 2.5 per cent in 2014–15 and 3.5 after that.

  - o Disinvestment (Rs crore): We retain the same assumption as in the baseline.

- Other Variables

  - o WPI Energy: Given the weakening of price of crude oil, it is assumed that WPI Energy will grow by five per cent in the current fiscal and four per cent thereafter for the forecasting period. Essentially it is assumed that prices of energy remain weak in the world. There may be a conflict with increased world growth and weak energy prices. However, one may rationalize that the supply side effects

dominate with the US production of shale gas changing the discourse the energy prices.

- o M3: The assumption for the current fiscal is based on the growth rate available based on current trends for the last six months (13%). In 2015–16 growth rate of M3 picks up to 17 per cent and thereafter it grows by 20 per cent signaling improvement in the economy.

Table 4: Results for the Optimistic on Major Macroeconomic Parameters during 2014–15 to 2019–20 with the Central Pay Commission

Variables	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
% yoy change											
Real GDP											
- Agriculture	0.8	8.6	5.0	1.4	4.7	1.9	3.8	3.2	3.4	3.4	3.4
- Industry	9.2	7.6	7.8	1.0	0.2	2.1	3.9	7.0	8.0	8.7	8.5
- Services	10.5	9.7	6.6	7.0	6.8	7.6	9.2	9.5	9.8	9.8	9.4
Total GDP	8.6	8.9	6.7	4.5	4.7	5.7	7.1	8.1	8.5	8.8	8.5
Exports ($-term)	-2.6	40.6	22.0	-1.9	1.7	5.4	5.3	10.5	9.3	8.3	7.5
Imports ($-term)	-3.9	28.4	32.5	0.9	-15.0	10.5	12.8	13.2	13.3	8.9	8.7
Inflation (WPI)	3.8	9.6	8.9	6.1	6.7	4.2	3.7	4.0	4.1	4.2	4.2
As Percentage of GDPmp											
Current Account_RBI*	-2.8	-2.8	-4.2	-4.8	-1.7	-1.4	-1.9	-1.6	-1.0	0.6	1.3
Fiscal Deficit_Centre	6.7	5.0	5.7	5.0	4.6	4.2	3.4	3.7	3.3	3.0	2.8
Fiscal Deficit_Total	9.6	7.2	7.6	7.4	6.9	6.4	5.4	6.0	5.5	5.2	5.0

Notes: The shaded columns are actual numbers. * Surplus (+)/deficit (–).

Table 4 reports the results. The overall GDP at constant 2004-05 prices is projected to grow by an average of 7.7 per cent during the Plan period. Across production sectors, the services sector is expected to register higher growth of 9.2 per cent, followed by industry around 6.4 per cent and agriculture by 3.2 per cent. Average inflation is at 4.1 per cent during the forecasting period. This is lower than the base line and this is because of lower crude oil prices. Current account deficit as a ratio to GDP is also low and later turns to surplus. This is not surprising given the higher anticipated net invisibles growth and the improvement in the exports scenario. The improved world economic conditions are responsible for that.

The most important result is the fiscal deficit. In 2014–15, the fiscal deficit is lower than the baseline. However, in 2015–16, with a fiscal deficit of 3.4 per cent, it not only meets the target

laid out in the Medium Term Fiscal Policy Statement but is actually lower. In 2016–17, because of the implement of the Pay Commission recommendations, fiscal deficit increases but it tapers off again to sustainable levels.

c) Pessimistic

This is a scenario when things take for a worse. External economic growth rate falters. As a result, India attracts lower FDI and FII inflows. Net invisibles grows at a lower rate. However, because of geo-political shocks, price of oil increases back. Meanwhile the recommendations of the Central Pay Commission are implemented. The government is unable to rationalize subsidies and they grow at a faster rate than the baseline. The allocation of resources in health and education sectors would decline due to resource constraints. Public sector investment, both in the agriculture and non-agriculture sectors, would decline substantially compared with the baseline. The details of the exogenous/policy assumptions under the Falling Apart scenario are given in Table 5.

The assumptions that have been changed from the Baseline are discussed below and the rationale provided for them.

- Agriculture Related: All the assumptions remain the same as in the Baseline.
- Global Conditions
  - World GDP: After the 3.3 per cent growth in 2014–15 world GDP is forecasted to grow at two per cent between 2015–16 and 2019–20.
  - International Crude Oil Price Index: The 2014–15 assumption of –2.7 per cent fall in price of crude oil is retained. In 2015–16, it is assumed that Crude Price of Oil increases by 10.5 per cent to $117.1 a barrel. Thereafter price of oil increases by two per cent on a y-o-y basis.
  - International Non-fuel Price Index: After declining by 1.7 per cent in 2014–15, it increases by 2.8 per cent in 2015–16 and two per cent thereafter. This is a reversal of the trend from the baseline.
  - LIBOR is assumed to remain at 0.2 per cent for the forecasting period, same as the baseline.

- o Exchange Rate: Exchange rate is assumed to be Rs 60.3 per dollar for 2014–15. For the rest of the period it is assumed to be depreciating by three per cent on a y-o-y basis.

- o BSE Sensex: It is assumed that in 2014–15 it will grow at 29 per cent year. However, it increases at the rate of five per cent, which is lower than the baseline of 10 per cent for the years between 2015–16 and 2019–20.

- Investment Climate:

  - o FDI: It is assumed that a positive investment climate prevails in the economy. Based on April–August numbers, the y-o-y change was 47 per cent in rupee terms.   For the rest of the forecasting period, we assume that FDI grows at ten per cent. FII grows at 100 per cent in 2014–15, 10 per cent in 2015–16 and five per cent thereafter.

  - o Net Invisibles (Netinv): This is assumed to grow at five per cent throughout the forecasting period. This is due to low growth of the external world.

  - o Public Gross Fixed Capital Formation in agriculture and non-agriculture sectors are assumed to grow at eight and five per cent, respectively for the period 2014–15 to 2019–20.

- Fiscal Account

  - o Centre Subsidies: Subsidies is forecasted to increase by 2.01 per cent in 2014–15 and 2015–16 and thereafter it will grow at five per cent.

  - o General Government Expenditure on Health and Family Welfare and Education, Art and Culture: This is decreased to 5.1 per cent during the forecasting period. In the baseline this was 13.3 per cent.

  - o Direct Tax Rate (Centre):   The direct tax rate is 0.5 per cent in 2014–15 and one per cent thereafter.

  - o Indirect Tax Rate (Centre): The indirect tax rate is the same as the baseline except in 2014–15 it is 0.5 per cent.

  - o Disinvestment (Rs crore): Disinvestment falls to Rs 1,000 crore in 2014–15 and Rs, 5,000 crore thereafter. As mentioned before, this is not a completely unrealistic

phenomenon because as of September, 2014, disinvestment receipts has been barely Rs 121 crore as opposed to the budgeted Rs 63,425 crore.

- Other Variables
  - o WPI Energy: Given the strengthening of price of crude oil, it is assumed that WPI Energy will grow by five per cent in the current fiscal and ten per cent thereafter for the forecasting period.
  - o M3: The assumption for the current fiscal is based on the growth rate available based on current trends for the last six months (13%). Given the gloomy investment rate scenario, M3 grows at ten per cent per annum between 2015–16 and 2019–20.

Table 5: Assumptions of Exogenous/policy variables for Pessimistic scenario

Variables	Unit	2004/05 to 2008/09	2009/10 to 2013/14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Agriculture related									
Rainfall	Relative to normal			12% Deficient	Normal	Normal	Normal	Normal	Normal
Gross Irrigated Area (million hectares)	%YOY	2.5	0.4*	2.0	2.0	2.0	2.0	2.0	2.0
Minimum Support Price for Rice	%YOY	9.7	8.1	3.8	7.0	7.0	7.0	7.0	7.0
Minimum Support Price for Wheat	%YOY	12.0	5.4	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Support Price for Sugarcane	%YOY	2.2	22.4	4.8	7.0	7.0	7.0	7.0	7.0
Global conditions									
World GDP (at constant prices)	%YOY	3.5	1.9	3.3	2	2	2	2	2
International Crude oil price Index (US$)	%YOY	25	6.5	-2.7	10.5	2	2	2	2
International Non-fuel price index (US$)	%YOY	10.8	3.6	-1.7	2.8	2	2	2	2
LIBOR	%	3.5	0.4	0.2	0.2	0.2	0.2	0.2	0.2
NEER	%YOY	−1.1	−4.9	1.5	-3.0	-3.0	-3.0	-3.0	-3.0
NER (Rs/ US$)	%YOY	0.0	5.9	-0.3	3.0	3.0	3.0	3.0	3.0
BSE Sensex	%YOY	26.0	11.3	29	5	5	5	5	5
Investment Climate									
FDI (Rs crore)	%YOY	73.9	10.7	47.0	10.0	10.0	10.0	10.0	10.0
NETINV (Rs crore)	%YOY	27.3	12.5	5	5	5	5	5	5
FII (Rs crore)	%YOY	11.9	−79.0	100	5	5	5	5	5
Public Gross Fixed capital Formation in agriculture and allied sectors	%YOY	17.2	12.5†	8	8	8	8	8	8
Public Gross Fixed Capital Formation in Non-agricultural Sectors	%YOY	21.2	7.2†	5	5	5	5	5	5
Fiscal Account									
Subsidies (Centre)	%YOY	26.9	14.9	2.01	5	5	5	5	5
General Government Expenditure on Health and Family Welfare	%YOY	7.4	9.7†	5.1	5.1	5.1	5.1	5.1	5.1
General Government Expenditure on Education, art and culture	%YOY	9.2	9.0†	5.1	5.1	5.1	5.1	5.1	5.1
Direct Tax Rate (Centre)	%YOY	9.6	−2.2	0.5	1	1	1	1	1
Indirect Tax Collection Rate (Centre)	%YOY	−2.9	0.1	0	0.5	0.5	0.5	0.5	0.5
Disinvestment (Centre)	Rs crore	9,180.0	23,499.2	1,000	5,000	5,000	5,000	5,000	5,000
Other Variables									
Domestic energy price (WPI)	%YOY	6.7	8.9	5	10	10	10	10	10
M3	%YOY	18.5	15.7	13	10	10	10	10	10

Notes: * This is for the period 2009–10 and 2010–11. † This is for the period 2009–10 to 2011–12.

In Table 6, we summarise the estimates of key macroeconomic parameters for the pessimistic scenario. The overall annual GDP growth period 2014–15 to 2019–20 is estimated at six per cent, a decline of 0.8 percentage points over the baseline scenario. The GDP growth rate declines across all sectors because of a significant fall in investment (both private and public), rising fiscal deficit and worsening external conditions. The results also show high fiscal deficit, which is unsustainable. The one conclusion that is coming out from the above analyses is that without economic growth, implementation of the Pay Commission recommendations would seriously jeopardize the fiscal deficit.

Table 6: Falling Apart Scenario of Major Macroeconomic Parameters during 2014–15 to 2019–20

Variables	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
% yoy change											
Real GDP											
- Agriculture	0.8	8.6	5.0	1.4	4.7	1.8	3.7	3.0	3.1	3.1	3.0
- Industry	9.2	7.6	7.8	1.0	0.2	1.9	2.4	5.2	5.6	5.6	3.1
- Services	10.5	9.7	6.6	7.0	6.8	7.2	7.6	7.3	6.9	7.9	7.7
Total GDP	8.6	8.9	6.7	4.5	4.7	5.1	5.8	6.2	6.1	6.8	6.0
Exports ($-term)	-2.6	40.6	22.0	-1.9	1.7	5.4	5.3	5.0	4.0	5.2	4.9
Imports ($-term)	-3.9	28.4	32.5	0.9	-15.0	9.1	9.2	10.0	10.4	2.3	-4.1
Inflation (WPI)	3.8	9.6	8.9	6.1	6.7	4.3	6.9	6.7	6.8	6.8	6.8
As Percentage of GDPmp											
Current Account_RBI*	-2.8	-2.8	-4.2	-4.8	-1.7	-1.1	-2.1	-3.2	-4.2	-2.8	-1.7
Fiscal Deficit_Centre	6.7	5.0	5.7	5.0	4.6	5.3	4.4	4.8	4.6	4.3	4.1
Fiscal Deficit_Total	9.6	7.2	7.6	7.4	6.9	7.6	6.6	7.3	7.1	6.7	6.4

Notes: The shaded columns are actual numbers. * Surplus (+)/deficit (–).

d) Summary of the Three Scenarios

The results of key macroeconomic variables under the three alternative scenarios are summarised in Table 7 and Figures 3-5. The main point of the summary table is that fiscal scenarios are precarious. In a base line scenario with a weak and uncertain economy, it will be difficult to achieve fiscal policy targets as laid out in the Medium term Fiscal Policy Statement. If the economy takes a turn for the worse or economic growth stays muted, any additional government spending shock in the form of Pay Recommendations may only worsen the fiscal scenario. Therefore, the main policy conclusion is that government needs to focus on reviving investment and economic growth. The government should focus on invigorating public investment which improve the productivity of human and physical capital and therefore the productivity of the country.

Table 7: Summary Results of the Three Alternative Scenarios during 2014–15 to 2019–20

Variables		2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
GDP	Baseline (No 7CPC)	8.59	8.91	6.69	4.50	4.69	5.31	6.34	7.00	7.47	7.77	7.22
	Optimistic (with 7CPC)	8.59	8.91	6.69	4.50	4.69	5.68	7.14	8.06	8.54	8.77	8.49
	Pessimistic (with 7CPC)	8.59	8.91	6.69	4.50	4.69	5.09	5.75	6.20	6.11	6.76	6.04
Inflation (WPI)	Baseline (No 7CPC)	3.81	9.55	8.94	6.08	6.68	4.21	4.94	5.26	5.36	5.40	5.43
	Optimistic (with 7CPC)	3.81	9.55	8.94	6.08	6.68	4.21	3.70	4.02	4.12	4.18	4.23
	Pessimistic (with 7CPC)	3.81	9.55	8.94	6.08	6.68	4.34	6.87	6.75	6.78	6.81	6.85
Current Account	Baseline (No 7CPC)	-2.77	-2.82	-4.17	-4.83	-1.73	-1.29	-2.57	-2.74	-2.70	-2.48	-1.97
	Optimistic (with 7CPC)	-2.77	-2.82	-4.17	-4.83	-1.73	-1.40	-1.85	-1.57	-1.04	0.56	1.35
	Pessimistic (with 7CPC)	-2.77	-2.82	-4.17	-4.83	-1.73	-1.11	-2.10	-3.23	-4.18	-2.81	-1.69
Fiscal Deficit-Center	Baseline (No 7CPC)	6.67	5.01	5.73	4.97	4.60	4.43	3.89	3.63	3.49	3.32	3.37
	Optimistic (with 7CPC)	6.67	5.01	5.73	4.97	4.60	4.16	3.35	3.73	3.34	3.02	2.85
	Pessimistic (with 7CPC)	6.67	5.01	5.73	4.97	4.60	5.31	4.41	4.82	4.56	4.33	4.09
Fiscal Deficit-Total	Baseline (No 7CPC)	9.64	7.16	7.60	7.40	6.85	6.72	6.07	5.81	5.49	5.40	5.38
	Optimistic (with 7CPC)	9.64	7.16	7.60	7.40	6.85	6.41	5.39	5.95	5.53	5.22	4.96
	Pessimistic (with 7CPC)	9.64	7.16	7.60	7.40	6.85	7.64	6.59	7.34	7.06	6.73	6.40

Note: The shaded columns represent actual numbers.

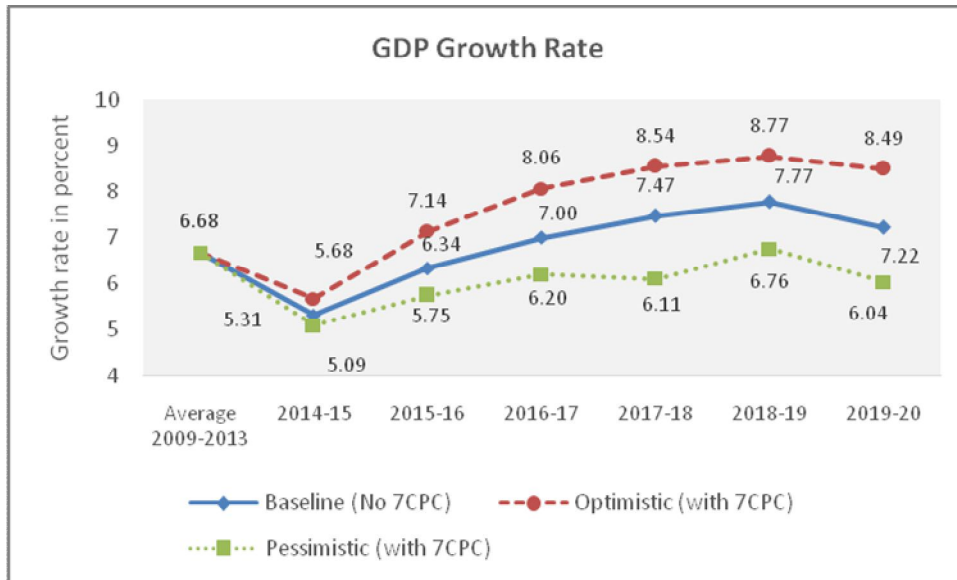**Figure 3: The growth rate of GDP under three scenarios for 2014–15 to 2019–20**

GDP Growth Rate

Figure 4: Fiscal Defcit (% of GDP) of the Central government under three scenarios for 2014–15
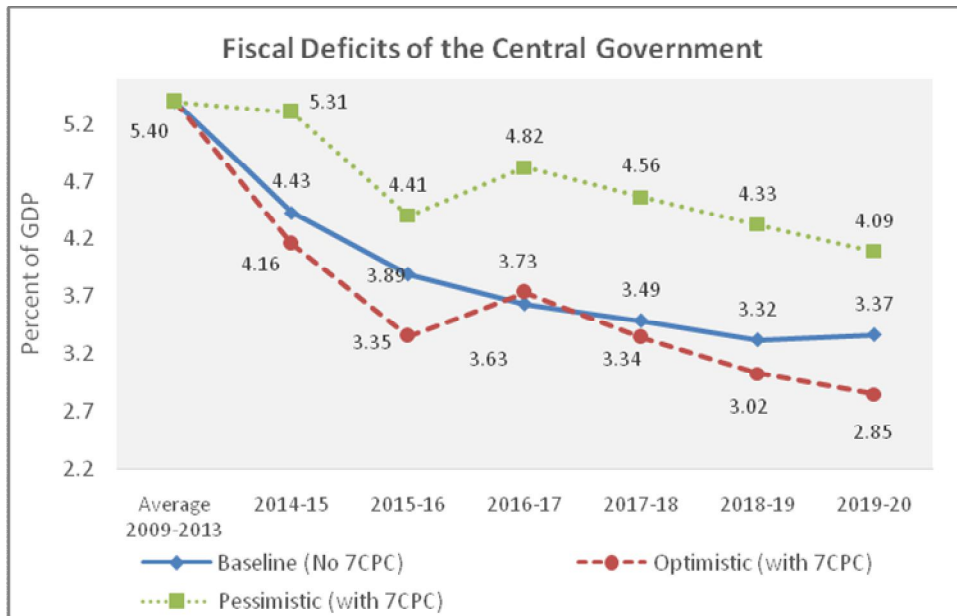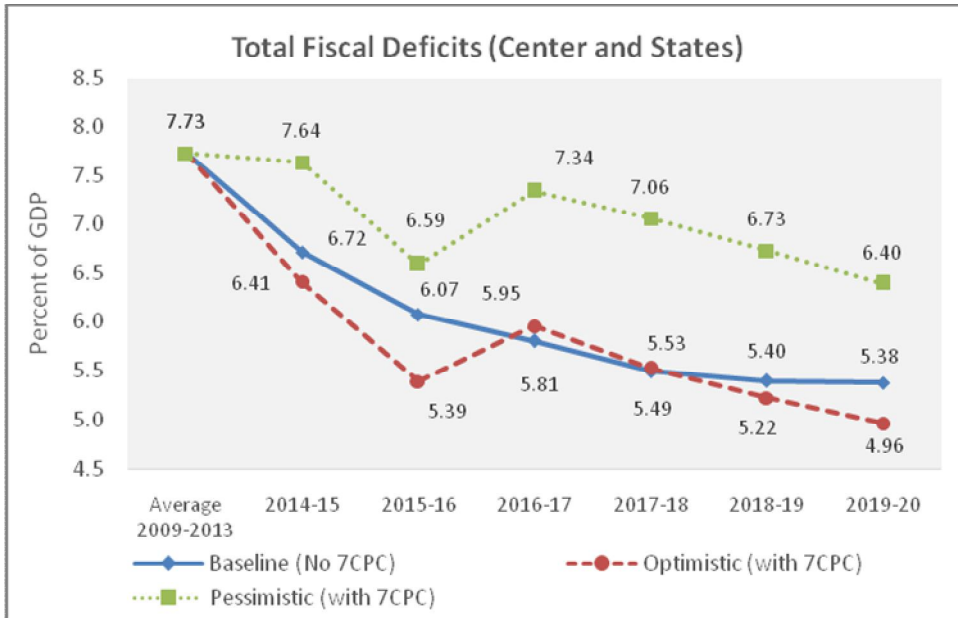

Fiscal Deficits of the Central Government

Figure 5: Fiscal Defcit (% of GDP) of the Central plus State government under three scenarios for 2014–15 to 2019–20

Total Fiscal Deficits (Center and States)

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Appendix 1: <u>Model Structure and Estimated Equations</u>

A1.1 Model Structure

Output sectors:
- Agriculture & allied sector with further disaggregation into rice, wheat, other foodgrains, cotton, sugarcane, oilseeds, other non-foodgrain crops sub-sector
- Mining, Quarrying & Manufacturing
- Construction
- Electricity, Gas and Water supply
- Transport, Storage and Communication
- Other Services

Determinants of Sectoral output:
- capital stock, demand conditions, infrastructure, human capital (rainfall in the case of agriculture)
- Capital stock and hence investment plays a prominent role in determining output
- Demand conditions have short-term impact
- Sectoral prices: energy prices, other administered prices, import prices, liquidity

Components of aggregate demand:
- Private final consumption expenditure (real) (sectors corresponding to production sectors); function of real disposable income; relative prices
- Government final consumption expenditure: exogenous
- Private investment: sectoral investment is determined by output, real interest rate, fiscal deficit to GDP ratio, public investment in infrastructure, external factor like stock market
- Public investment: exogenous
- Exports (Goods): external factors (World GDP, international prices)
- Imports (Goods): crude oil, edible oils and others; driven by domestic demand, prices and exchange rate
- Net invisibles: exogenous

Fiscal Block:
- Central government expenditure: wage bill, interest payments, subsidies, capital expenditure (Government support to infrastructure explicit)
- Central government tax revenue: indirect tax (petroleum sector and others); direct taxes
- Central government non-tax revenue (current and non-debt capital)
- Deficit measures
- General government (Centre + States) accounts more aggregated than central accounts

Monetary block:
- Money supply exogenous
- Interest rate adjusts to exchange rate depreciation, external interest rate and domestic inflation
- Interest rate also affects fiscal position which in turn affects investment
- Exchange rate exogenous

A1.2 Estimated Equations

A1.2.1 *Agricultural Output*

In the case of agriculture and allied sectors, there is further disaggregation in terms of crop categories, viz. rice, wheat, cotton, sugarcane, oilseeds, other foodgrains and non-foodgrains. Although production of all the allied sectors is not strictly related to the production of crop sector, in some ways agricultural production is 'land based' and depends on the utilization of land. With this in view output of non-crop sectors is linked to the production of crop sectors. The basic relationships are defined below

The crop output is defined based on crop area and crop yield per area. The total gross cropped area is first determined based on the gross irrigated area and rain fall during the monsoon season. This specification reflects the emergence of higher cropping intensity as the main source of growth in gross cropped are now. This in turn is mainly influenced by availability of irrigation. The gross cropped area is then allocated among the aforesaid categories of crop and area for other non-foodgrains is taken as residual. The gross cropped area for each crop is estimated then on irrigated area under these respective crops, expected price of the crop relative to other crops and rain fall during the monsoon season. The gross irrigated area is specified as an exogenous variable.

The irrigated area under each crop is related to the gross cropped area under all crops. In some the cases, we allow the allocation of gross cropped area to the individual crop groups to be determined by the past trend.

Crop yield is estimated as a function of the extent of irrigation in the total area under the crop, price of inputs relative to the expected crop price and rain fall during the monsoon season. Common form of the estimated equations is specified below for crop area, irrigated area and crop yield.

Crop Area Equations
Gross cropped area
1) $\text{Log}(A) = 3.901488 + 0.201323 * \text{Log}(AI) + 0.069357 * \text{Log}(RAIN) - 0.028507 * D87 - 0.056464 * D2002$
(42.17)   (5.39)   (-3.24)   (-6.47)
$R^2 = 0.98$ DW=2.28

Area under specific crops
2) $\text{Log}(ARICE) = 2.130436 + 0.12940 * \text{Log}(RAIN) + 0.248773 * \text{Log}(AIRICE)$
 (6.34)   (26.53)
  $-0.001793 * \text{Log}(WPIRICE_{-1}/WPIOTFOOD_{-1})$
    (-2.78)
$R^2 = 0.98$ DW=1.87

3) Log (AWHEAT) = -1.498187 + 0.534375*Log (AWHEAT$_{-1}$) + 0.460161*Log (A)

                                      (5.08)   (1.83)

+ 0.087163*Log (RAIN) -0.075113*Log (WPIWHEAT$_{-1}$/WPIOTFOOD$_{-1}$)- 0.111380*D7374

(2.71)   (-2.45)   (-4.78)

R^2 = 0.95   Dh=0.70

4) Log (ACOTTON) =1.361592 + 0.75056*Log (AICOTTON) - 0.015892*Log (WPICOTTON / WPIOTNFG)

                                    (10.51)   (-0.50)

R^2 = 0.95   DW=2.173

5) Log (ASUGAR) = 0.151470 + 0.942247*Log (AISUGAR) - 0.211144*Log (WPISUGAR / WPIOTNFG)

                                    (11.87)   (-2.82)

 - 0.068058*D0308

 (-2.51)

R^2 = 0.95   DW=1.67

6) Log (AOILS) = 2.486496 + 0.388452*Log (AIOILS) - 0.025868*Log (WPIOILS / WPIOTNFG)

                               (8.28)   (-0.37)

R^2 = 0.94   DW=2.148

7) Log (AOTNFG) = 2.856581 + 0.162075*Log (AIOTNFG) - 0.397909*Log (WPIOTNFG / WPIAGR)

                                   (4.44)   (-2.31)

 - 0.099525*D2002 + 0.014729*@TREND

      (-3.48)   (22.55)

R^2 = 0.94   DW=2.148

8) Log (ANFG) = 0.096335 + 0.508326*Log (AINFG) + 0.479582*Log (A)

(9.23)   (3.04)

 -0.045779*Log (WPINFG$_{-1}$/WPIFG$_{-1}$) + 0.791592*AR (1)

                  (1.91)   (8.66)

R^2 = 0.97   DW=1.70

9) Total area under non-foodgrains

ANFG =ACOTTON +ASUGAR +AOILS + AOTNFG

10) Area under other foodgrains

AOTFD = A – (ARICE + AWHEAT + ANFG)

Irrigated Area under Crops

Area under rice, wheat, cotton, sugarcane, oilseeds and other non-foodgrains and other foodgrains is determined based on crop specific equations such as,

11) Log (AIRICE) = -0.218870 + 0.774575*Log (AI)
(15.77)
R^2 = 0.98   DW=2.24

12) Log (AIWHEAT) = -1.001649 + 0.956271*Log (AI)
                                                    (7.74)
R^2 = 0.97   DW=2.44

13) Log (AICOTTON) = - 3.017719 + 0.953968*LOG(AI) -0.282822*D0203
(13.697)   (-4.265)
R^2 = 0.91   DW=2.043

14) Log (AISUGAR) = - 1.703298 + 0.450136*Log (AISUGAR(-1)) + 0.562917*LOG(AI)
(3.14)(3.51)
+ 0.088210*D0506
(1.88)
R^2 = 0.96   Dh=2.44

15) Log (AIOILS) = - 5.112749 + 0.341401*Log (AIOILS(-1)) + 1.459559*Log (AI)
(2.23)   (3.95)
+ 0.129765*D90123456
(1.90)
R^2 = 0.97   Dh=2.54

16) Irrigated area of non-foodgrains (AINFG) = AICOTTON + AISUGAR + AIOILS + AIOTNFG

17) Irrigated area of other foodgrains (AIOTFOOD) = AI -AIRICE -AIWHEAT - AINFG

Crop Yields

Crop yield which suggests output per hectare of crop area is determined from an equation that incorporates the impact of monsoon rainfall besides extent of irrigation and expected relative prices. Crop yields in the case of rice, wheat, cotton, sugarcane, oilseeds and other foodgrains and non-foodgrains are estimated using following generic type of specification:

Crop yield per hectare (Rice)
$\text{Ln YLD\_R} = a_0 + a_1 \text{ Ln RAIN} + a_2 \text{ Ln (AI\_R/ A\_R)} + a_3 \text{ Ln (WPI\_INP/ WPI\_R)}$

The estimated equations are:

18)Log (YRICE) =1.474196 + 0.437514*Log (YRICE (-1)) + 0.490176*Log (RAIN)
                        (3.41)   (5.38)
+ 0.839480*Log (AIRICE / ARICE) - 0.051582*Log (WPIINPUT (-1) / WPIRICE (-1))
(3.71)   (-0.64)
R^2 = 0.95   Dh=2.34

19)Log (YWHEAT) =7.509118 + 0.146987*Log (RAIN) +0.527787*Log (AIWHEAT / A)
                          (3.02)   (4.17)
- 0.261189*Log (WPIINPUT / WPIWHEAT) + 0.016801*@TREND
(-2.58)   (5.57)
R^2 = 0.97   DW=1.94

20)Log (YCOTTON) = 1.777380+ 0.418777*Log (RAIN) - 0.068597*Log (WPIINPUT (-1) / WPICOTTON (-1))
                            (2.22)   (-0.41)
+ 0.035759*@TREND
(5.38)
R^2 = 0.84   DW=1.88

21)Log (YSUGAR) = 10.763467 + 0.263605*Log (AISUGAR) - 0.169390*Log (WPIINPUT / WPISUGAR)
                            (5.19)(-1.95)
R^2 = 0.75   DW=1.85

22)Log (YOILS) = 1.946489+ 0.612606*Log (RAIN) - 0.189256*Log (WPIINPUT / WPIOILS)
                          (6.47)   (-4.36)
+ 0.023938*@TREND
(17.80)
R^2 = 0.93   DW=1.67

23)Log (YOTNFG) = 4.6930837 + 0.246639 * Log (RAIN) + 0.424008* Log (AIOTNFG / AOTNFG)
                            (2.31)(3.49)
- 0.622558* Log (WPIINPUT / WPIOTNFG) - 0.229782 * D93
(-3.21)(-4.79)
R^2 = 0.92   DW=1.80

24) Log (YOTFOOD) = 3.570832 + 0.392386 * Log (RAIN) - 0.020290*Log (WPIINPUT / WPIOTFOOD)
                            (2.86)(-0.18)
+ 0.018404*@TREND
(11.16)
R^2 = 0.86   DW=2.12

Crop Output

Output is determined as a product of area and yield. Crop output is aggregated to food grains
and non-foodgrains. The specification is,

33

25) QRICE = (ARICE * YRICE)

26) QWHEAT = (AWHEAT * YWHEAT)

27) QOTFOOD = (AOTFOOD * YOTFOOD)

28) QFG = QRICE + QWHEAT + QOTFOOD

In the case of non-foodgrains the output is estimated through a link equation rather than as a definitional identity

29) Log (QCOTTONI) = - 2.758277+ 0.950747*Log (ACOTTON) + 0.994039*Log (YCOTTON)

$\qquad\qquad\qquad\qquad\qquad$ (33.52) $\qquad\qquad\qquad$ (98.16)

R^2 = 0.99 $\qquad$ DW=1.78

30) Log (QSUGARI) = - 8.292565 + 0.977570 *Log (ASUGAR) + 1.049750 * Log (YSUGAR)

$\qquad\qquad\qquad\qquad\qquad$ (75.59) $\qquad\qquad\qquad$ (34.94)

R^2 = 0.99 $\qquad$ DW=2.08

31) Log (QOILSI) = - 4.2976013+ 1.078082*Log (AOILS) + 0.845133 * Log (YOILS)

$\qquad\qquad\qquad\qquad\qquad$ (17.14) $\qquad\qquad$ (19.55)

R^2 = 0.99 $\qquad$ DW=2.42

32) Log (QOTNFGI) = - 3.348577 + 1.671829*Log (AOTNFG) + 0.452619 * Log (YOTNFG)

$\qquad\qquad\qquad\qquad\qquad$ (7.34) $\qquad\qquad\qquad$ (2.63)

R^2 = 0.92 $\qquad$ DW=1.80

33) Log (QNFGI) = - 0.1485105 + 0.128932*Log (QCOTTONI) + 0.124091*Log (QSUGARI)

$\qquad\qquad\qquad\qquad\qquad$ (2.58) $\qquad\qquad\qquad$ (4.12)

+ 0.367276*Log (QOILSI) + 0.410462*Log (QOTNFGI)

(2.65) $\qquad\qquad\qquad$ (3.15)

R^2 = 0.93 $\qquad$ DW=1.95

The gross output is transformed into value added using a link equation. In this equation we also incorporate the potential for improvements in varieties and higher value added composition of crop output by including capital stock per hectare of crop area as an independent variable.

One way to specify the total value added from agriculture and allied sectors is,

Log (RVAAG/ A) = a_0 + a_1 Log {(RK + RK)/2} + a_2 Log(QFG) + a_3Log (QNFG)

The estimated equation is

34) Log (RVAAGR / A) = 0.469164+ 0.529067*Log ((RKAGR (-1) +RKAGR)/ (2*A))

$\qquad\qquad\qquad\qquad\qquad$ (8.37)

+ 0.477254*Log (QFG) + 0.077389*Log (QNFGI) - 0.041231*D97+0.057660*D2002

(10.80) $\qquad\qquad\qquad$ (1.62)(-2.08)(4.07)

$R^2 = 0.99$ DW=2.08

The capital formation and capital stock in agriculture are linked to each other through the standard linear specification in which capital stock at the beginning of each year is updated taking into account capital stock at the beginning of the previous year, depreciation of this capital stock and capital formation during the previous period

RKAGR = $RKAGR_{-1}$ + RGFCFAGR – RCFCAGR

Real consumption of fixed capital in agriculture (RCFCAGR) = (depreciation of capital stock in agriculture (DRATAGR) * $RKAGR_{-1}$)/100

Real gross fixed capital formation in agriculture (RGFCFAGR) = real private gross fixed capital formation in agriculture (RGCFPAGR) + real public gross fixed capital formation in agriculture (RGCFGAGR)

A1.2.2 *Non- agricultural Output*:

In the case of non-agricultural output five main sub-sectors are identified. The sub-sectors are (1) Mining, Quarrying and Manufacturing (2) Construction (3) Electricity, Gas and Water Supply (EGW) (4) Transport, Storage and Communication (TSC) and (5) Other Services (excluding TSC).

The specification of production or output equations reflects the impact of both supply side 'production capacity' and the 'demand pressures'. On the supply side, the capital stock in the respective sectors influences output. The demand pressure is captured by the real value of 'compensation to employees'. The general form of output equation adopted in each sub-sector that reflects the impact of capital stock and demand pressures is described by the case of mining, quarrying and manufacturing as follows

Ln RVAMQM = a_0 + a_1 Ln {($RKMQM_{-1}$ + RKMQM)/2} + a_2 Ln (CETOT/ PALL)

However, this specification does not reflect the impact of various sources of productivity growth.

Modification of the Standard Specification

The specification of output in the standard specification does not capture the potential improvements in productivity that may come about through improvements in complementary inputs such as infrastructure. Although some of the non-agricultural sectors themselves constitute infrastructure industries, the impact of development of one infrastructure sector such as electricity on the other infrastructure sector such as communication can be significant. A second source of improvement in productivity can be the impact of growing integration of the economy with the international markets. This integration is likely to influence adoption of technology and practices which would improve value addition per unit of capital. Foreign direct investment is the most direct influence globalization may have on productivity. The third source of productivity improvement is human capital. According to the endogenous growth theory[2], positive externalities from knowledge creation can generate increasing

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[2]Lucas, R (1988), 'On the mechanics of economic development', *Journal of Monetary Economics* 22(1):3-42.
Romer, P. (1986), 'Increasing returns and long-run growth', *Journal of Political Economy,* 94:1002-37.
Romer, P. (1990), 'Endogenous technological change', *Journal of Political Economy,* 89(5) part 2:71-102.

returns to scale which affect the decreasing returns to scale from other factors accumulation. This leads to sustainable long run growth. All these three sources of productivity growth is captured in mining, quarrying and manufacturing sector and services other than transport, storage and communication sector. In case of the remaining sectors, the productivity improvement is captures via

Taking into account these potential sources of improvement in productivity, the output equations for non-agricultural sectors have been modified and estimated as follows:

Mining, quarrying and manufacturing

35) Log (RVAMQM) = - - 0.3595+ 0.048298*Log ((RKMQM +RKMQM (-1))/2)
$\qquad$ (0.2878)
+0.33602*Log (CETOT_T * 100/PALL) + 0.18695* Log (EDNHINDEX15) +
(2.392) $\qquad$ (0.746)
0.51374*Log((RK_INFRA + RK_INFRA(-1)) / 2)
 (3.242)
R^2 = 0.99 $\qquad$ DW = 1.80

Construction

36) Log (RVACON) = - 0.741161 + 0.184436*Log ((RKCON (-1) + RKCON) / 2)
$\qquad$ (1.82)
+ 0.779290*Log (CETOT_T *100 / PALL)
(4.54)
R^2 = 0.99 $\qquad$ DW = 1.80

Electricity, gas and water

37) Log (RVAEGW) = - 4.688643 + 0.849052 * Log ((RKEGW + RKEGW (-1)) / 2)
$\qquad$ (16.41)
+ 0.321292* LOG (CETOT_T*100/PALL)
 (5.81)
R^2 = 0.99 $\qquad$ DW = 1.66

Transport, storage and communication

38) LOG (RVATSC) =- 6.063838 + 0.851690* Log ((RKTSC + RKTSC (-1)) / 2)
$\qquad$ (16.41)
+ 0.529190* Log (CETOT_T*100/PALL)
 (8.01)
R^2 = 0.99 $\qquad$ DW = 1.88

Other Services

39) Log (RVASER) = - 2.05342+ 0.08604*Log ((RKSER + RKSER(-1)) / 2)
$\qquad$ (0.533)

+ 0.29213*Log (CETOT_T *100/ PALL) + 1.27189*Log (EDNHINDEX15)
 (4.279) $\qquad$ (2.191)

+ 0.33071* Log((RK_INFRA + RK_INFRA(-1)) / 2)
  (1.980)
R^2 = 0.99   DW = 1.64

Human Capital

For human capital, we use an index consisting years of schooling (15 years and above) and inverse of infant mortality rate (IMR). Data on years of schooling is taken from Barro and Lee (2013)[3]. Infant mortality rate is taken from the report on health information of India (various issues). The human capital index is estimated as a function of total expenditure of General government on health and education (% of GDP), number of education institutes, capital stock in infrastructure.

The estimated equation is

40) Log (EDNHINDEX15) =

- 0.88087 + 0.05968*Log (((REVEXPEDN_T + REVEXPH_T + CAPEXPEDN_T + CAPEXPH_T)/ WPI) / RVATOT)
          (1.973)
+ 0.2647*Log (INSTITUTES) + 0.1563* Log (RK_INFRA *10 /POPLN)
   (3.389)   (3.406)
R^2 = 0.99   DW = 1.655

A1.2.3 *Aggregation of Output and National Income Identities:*

The output from each of the production sectors is aggregated to the overall economy level output by first transforming gross output to value added wherever relevant. Value added or sectoral GDP is then aggregated to the overall GDP as follows

Real GDP at factor cost = RVAAGR +RVACON +RVAMQM +RVAEGW +RVATSC + RVASER

Nominal GDP is defined at the sectoral by multiplying real GDP with a price index relevant for each sector. The overall GDP at factor cost in current prices is an aggregation of the nominal GDP at the sectoral level.

GDPFC = RVAAGR * PAG + RVAMQM* PMQM + RVACON* PCON + RVAEGW* PEGW + RVATSC* PTSC + RVAOSER* PSER

Gross domestic product at market price is defined as the sum of private consumption (CP), government final consumption expenditure (GFCE), investment expenditure or gross capital formation (GCFTOT) and net exports of goods and services (NXGSNAS)

GDPMP = CP + GFCE + GCFTOT + NXGSNAS

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[3] 2013 09 April update (version 1.3). Please visit http://www.barrolee.com/ for details.

Gross national product at market prices is defined as gross domestic product at market prices plus net factor income from abroad.

GNPMP =GDPMP + NFIAB

The values of GDP aggregates in constant prices are defined by deflating the nominal values by their respective price deflators.

Private Income (Real)

41) Log (RPVTINCOME) = - 0.424622+ 0.390213*Log (RPVTINCOME (-1)) + 0.641239*Log (RVATOT)

$\qquad$ (2.17) $\qquad$ (3.52)

$R^2 = 0.99$ $\qquad$ Dh= 3.29

Compensation to Employees (Nominal)

42) Log (CETOT_T) = 4.100154+ 0.491937 * Log (WRATE_T) + 0.364398* Log (RGNPMP)

$\qquad$ (9.90) $\qquad$ (2.95)

$R^2 = 0.99$ $\qquad$ DW= 1.95

Personal Disposable Income (Real)

43) Log (RPDI) = 7.444965+ 0.512979*Log (RPVTINCOME - DTAX_T *100 / PGNPMP)

$\qquad$ (3.87)

$R^2 = 0.99$ $\qquad$ DW= 2.12

A1.2.4 *Price and Monetary Block*:

Prices need to be distinguished at different levels. In the present model, we have essentially two sets of prices. One is the set of commodity prices and the other is the GDP deflators. The commodity prices are defined in terms of whole sale price indices. The GDP deflators are defined for both commodity sectors and service sectors. In the case of commodity prices, there are three categories - agricultural prices, manufactured product prices and the price index for fuel, power, light and lubricants (FPLL). The price of FPLL is assumed to be exogenous and in the other sectors, price variables are estimated as described below.

Agricultural Prices

In the case of agricultural sectors, the production was estimated primarily from the supply side. The previous year's prices are taken as an indicator of expected demand side pressures and the resources are allocated accordingly. Therefore, the prices in these sectors would have to bring the markets to clear. The demand side is also influenced by the government operations in foodgrains. The government purchases foodgrain, mainly rice and wheat, and distributes the grain through Public Distribution System.

Taking into account these demand side factors, the general form of the price equation has been tailored for each case

WPI for rice

44) $\text{Log (WPIRICE)} = -1.6355 - 0.2929 * \text{Log ((QRICE-GPR+ SFR}_{-1})/\text{POPLN)}$
                                          (2.00)
$+ 0.1484 * \text{Log ((GDR+GDW)/POPLN)} + 1.0012 * \text{Log (PPR)}$
(2.35)   (48.37)
$R^2 = 0.99$ DW= 1.74

WPI for wheat
45) $\text{Log (WPIWHEAT)} = -1.7045 - 0.2645 * \text{Log (QWHEAT/POPLN)}$
                                          (2.88)
$+ 0.1866 * \text{Log ((GDR+GDW)/POPLN)} + 1.0911 * \text{Log (PPW)}$
(2.79)   (26.22)
                        $-0.1167 * \text{D89929798}$
                                (3.45)
$R^2 = 0.99$ DW= 1.77

WPI for other foodgrains
46) $\text{Log (WPIOTFOOD)} = -0.9409 - 0.4995 * \text{Log (QOTFOOD/POPLN)}$
                                          (1.99)
                    $+ 0.8919 * \text{Log (WPIOTFOOD}_{-1})$
                          (17.68)
$R^2 = 0.98$ Dh= -0.12

WPI for cotton
47) $\text{Log (WPICOTTON)} = - 6.578420 - 0.216729 * \text{Log (((QCOTTONI + QCOTTONI (-1)) / 2) / POPLN)}$
                                          (-1.76)

$+ 1.079738 * \text{Log (PPC)} + 0.665903 * \text{Log (US\_COTTONI)}$
  (14.4)   (4.68)
$R^2 = 0.97$ Dh= 1.92

WPI for sugarcane
48) $\text{Log (WPISUGAR)} = 0.235279 - 0.293667 * \text{Log (QSUGARI / POPLN)}$
                                          (-2.24)

$+ 1.056188 * \text{Log (PPS)} - 0.141221 * \text{D050607} + 0.238788 * \text{D09}$
  (58.6)   (-3.35)   (4.24)

$R^2 = 0.99$ DW= 2.2

WPI for oilseeds
49) $\text{Log (WPIOILS)} = - 0.836266 - 0.146833 * \text{Log ((((QOILSI + QOILSI (-1)) / 2) / POPLN)}$
                                          (-0.47)
$+ 0.65772127802 * \text{Log (SOYABEAN\_US * NER)}$
  (8.77)

$R^2 = 0.95$ DW= 1.9

WPI for non-foodgrains is exogenously determined

Overall WPI for foodgrains
50) WPIFG = (2.44907 * WPIRICE + 1.38408 * WPIWHEAT + 1.17634 * WPIOTFOOD) / 5.00949

Overall WPI for agriculture
51) (5.00949 * WPIFG + 1.35674 * WPICOTTON + 1.30493 * WPISUGAR + 2.66617 * WPIOILS + 11.68792 * WPIOTNFG) / 22.02525

The price index for foodgrain is defined as a weighted average of the price indices for rice, wheat and other foodgrains. The price index of for agricultural sector as a whole is defined as a weighted average of the price indices for foodgrain and non-foodgrains. The weights for aggregation are based on the weights of the Wholesale Price Index.

Non-agricultural Commodity Prices

WPI of manufacturing sector is specified as function of unit value prices of non-petroleum imports, domestic energy prices and real supply of money,

52) Log (WPIMQM) = 1.039973 + 0.202448* Log (UVIIMPNONPOLOIL)
                                  (9.76)
+ 0.231101* Log (KENERGY * WPIENERGY) + 0.096290* Log (M3 * 100 / PGNPMP)
  (2.97)   (1.38)

- 0.022404 * D050607
  (-1.84)
$R^2 = 0.99$ DW= 1.9

The agricultural prices, manufacturing sector prices and the wholesale price index for fuel, power, light and lubricants is aggregated to obtain overall wholesale price index using the same weights as in the wholesale price index.

53) (21.54057 * WPIAGR + 14.23319 * kenergy * WPIENERGY + 64.23319 * WPIMQM) / 100

GDP deflators and Overall price indices

The basic approach here is to define link equation between the commodity prices and the respective GDP deflators. The general form used is illustrated below for agricultural sector

Ln PAG = a_0 + a_1 PAG$_{-1}$ + a_2 WPIAGR

The deflators are defined in the case of

Agriculture (2) mining, quarrying and manufacturing (3) Electricity, gas and water supply (4) construction (5) Transport, storage and communication and (6) Other services.

The estimated equations are presented below.

Agriculture

54) $\text{Log (PAG)} = -0.2594 + 0.1270 \times \text{Log (PAG}_{-1}) + 0.9263 \times \text{Log (WPIAGR)}$

$\qquad\qquad\qquad\qquad\quad (2.03) \qquad\qquad\quad (7.14)$

$R^2 = 0.99 \qquad \text{Dh}= 1.07 \qquad \text{OLS}$

Construction

55) $\text{Log (PCON)} = -0.1097 + 0.8164 \times \text{Log (PCON}_{-1}) + 0.2251 \times \text{Log (WPI)}$

$\qquad\qquad\qquad\qquad\qquad (15.23) \qquad\qquad\quad (3.36)$

$R^2 = 0.99 \qquad \text{Dh}= 0.98 \qquad \text{OLS}$

Manufacturing

56) $\text{Log (PMQM)} = -0.0365 + 0.3616 \times \text{Log (PMQM}_{-1}) + 0.6539 \times \text{Log (WPIMQM)}$

$\qquad\qquad\qquad\qquad\qquad (4.96) \qquad\qquad\qquad (8.49)$

$R^2 = 0.99 \qquad \text{Dh}= 1.14 \qquad \text{OLS}$

Electricity, gas and water supply

56) $\text{Log (PEGW)} = -0.1680 + 0.5995 \times \text{Log (PEGW}_{-1}) + 0.4462 \times \text{Log (WPI)}$

$(6.38) \qquad\qquad\qquad (4.17)$

$R^2 = 0.99 \qquad \text{Dh}= 0.85 \qquad \text{OLS}$

Transport, storage and communication

58) $\text{Log (PTSC)} = -0.087735 + 0.8497 \times \text{Log (PTSC}_{-1}) + 0.1849 \times \text{Log (WPI)}$

$(13.13) \qquad\qquad\quad (2.49)$

$- 0.0935 \times \text{D9901}$

$\quad (4.03)$

$R^2 = 0.99 \qquad \text{Dh}= 0.84 \qquad \text{OLS}$

59) $\text{Log (PSER)} = 0.0319 + 0.4851 \times \text{Log (PSER}_{-1}) + 0.5169 \times \text{Log (WPI)}$

$(12.57) \qquad\qquad\quad (13.12)$

$+ 0.030015 \times \text{D91}$

$\;(2.43)$

$R^2 = 0.99 \qquad \text{Dh}= 1.71 \qquad \text{OLS}$

The overall GDP deflator

PALL = GDPFC/ RVATOT

Note that the GDPFC itself is calculated as the sum-product of real GDP at the sectoral level and their respective deflator values.

Consumer Price Index for agricultural labour

60) $\text{Log (CPIAGL)} = 1.0240 + 0.5210 \times \text{Log (WPIAGR)} + 0.4019 \times \text{Log (WPIMQM)}$

$\qquad\qquad\qquad\qquad\qquad (2.63) \qquad\qquad\qquad (2.78)$

$+ 0.626861 \times \text{AR (1)}$

(3.95)

$R^2 = 0.99$ DW= 1.85

Consumer Price Index for industrial workers
61) Log (CPIIW) = 0.8794 + 0.6440*Log (WPIAGR) + 0.1956*Log (WPIMQM)
$$(7.33) \qquad\qquad (2.65)$$
$$+ 0.1775* \text{ Log (WPIENERGY)} + 0.7340*AR (1)$$
$$(2.96) \qquad\qquad (5.92)$$
$R^2 = 0.99$ DW= 1.77

Deflators for Capital Formation

The deflators are differentiated for public and private sector capital formation as these two components of capital formation are estimated separately. The equation used for estimation of the price index of capital formation links the wholesale price index either at the sectoral level or at the overall level with the price index of capital formation. For an illustration, we consider the price deflator for gross capital formation in agriculture by the government sector as

Ln PGCFGAG = a_0 + a_1 Ln PGCFGAG$_{-1}$ + a_2 Ln WPI

In the other sectors, the WPI may be replaced by WPI for the respective sector, overall WPI or the GDP deflator for the sector.

The estimated equations are
62) Log (PGCFGAG) = -0.1707 + 0.7432*Log (PGCFGAG$_{-1}$)
$$(11.29)$$
+ 0.3092*Log (WPIAGR)
$$(3.88)$$
$R^2 = 0.99$ Dh= 1.29

63) Log (PGCFGCON) = -0.3342 + 0.2357*Log (PGCFGCON$_{-1}$) + 0.8496*Log (WPI)
$$(2.34) \qquad\qquad (4.19)$$
$R^2 = 0.97$ Dh= -1.20

64) Log (PGCFGMQMF) = -0.2342 + 0.4471*Log (PGCFGMQMF$_{-1}$)
$$(6.99)$$
+ 0.6132*Log (WPIMQM) + 0.0569*D91
$$(8.41) \qquad\qquad (2.40)$$
$R^2 = 0.99$ Dh= 1.42

65) Log (PGCFGEGW) = 0.1217 + 0.9724*Log (PGCFGEGW$_{-1}$)
$$(9.12)$$
+ 0.0175*Log (PEGW)
$$(2.17)$$
$R^2 = 0.99$ Dh= 1.82

66) Log (PGCFGTSC) = 0.0510 + 0.8655*Log (PGCFGTSC$_{-1}$)
(8.47)

+ 0.1383*Log (WPI)
    (2.18)
$R^2 = 0.99$ Dh= 1.57

67) Log (PGCFGSER) = -0.3831 + 0.3179*Log (PGCFGSER$_{-1}$) + 0.7730*Log (WPI)
(2.22)   (4.69)
$R^2 = 0.98$ Dh= -0.03

The same formulation has been used in the case of capital formation by the private sector at the aggregate level.

$Ln\ PGCFPTOT = a_0 + a_1\ Ln\ PGCFPTOT_{-1} + a_2\ Ln\ PALL$

The estimated equation is
68) Log (PGCFPTOT) = 0.0579 + 0.8027*Log (PGCFPTOT$_{-1}$) + 0.1957*Log (PALL)
                              (6.63)   (2.42)

$R^2 = 0.99$ Dh= 0.98

Overall Price Deflators

The deflators for consumption expenditures, GNP and GDP at market prices are linked to one of the aggregate price indices such as WPI or GDP deflator. These are link equations estimated to enable conversion of real variables into nominal and *vice-versa*.

Price index for GNP at factor cost
69) Log (PGNPFC) = -0.0325 + 0.5418*Log (PGNPFC$_{-1}$) + 0.4739*Log (WPI)
                              (7.85)   (6.49)

– 0.0856*D75 +0.0596*D73
   (-4.34)   (3.05)
$R^2 = 0.99$ Dh= 1.92

Price index for GNP at market price
70) Log (PGNPMP) = -0.0961 + 0.4170*Log (PGNPMP$_{-1}$) + 0.6107*Log (WPI) + 0.0621*D73
                              (4.91)   (6.81)   (2.70)

$R^2 = 0.99$ Dh= 1.63

Price index for GDP at market price
71) Log (PGDPMP) = -0.0432 + 0.4983*Log (PGDPMP$_{-1}$) + 0.5188*Log (WPI)
                              (7.52)   (7.38)

- 0.0748*D75 + 0.0465*D7391
 (-4.32)   (3.82)
$R^2 = 0.99$ Dh= 1.64   OLS

Supply of Money and Interest Rates

The supply of money is exogenous in the model. The supply of money in real terms is simply the nominal money supply deflated by an aggregate price level.

RMS = M3/ PGNPMP

We have selected a key benchmark rate which is the yield rate (10 years and above) on government of India securities as long term interest rate (LINT10). We have selected yield rate in place of Prime Lending Rate (PLR) because of the latter was discontinued since July 01, 2010. This bench mark rate is modeled as a function of a short-term lending rate (SI), such as the 91-day treasury bill rate. In other words, the longer-term interest rate is affected by the movements in the short-term rate. The short-term rate (SI91) is a function of exchange rate depreciation (Rupee against Us dollar), external interest rate (LIBOR) and domestic WPI inflation.

72) Log (LINT10) = 1.7868+ 0.14832*Log (SI91) - 0.12493*D2003
                              (2.404)   (-3.063)
R^2 = 0.93   DW= 1.76

73) Log (SI91)[4] = 0.71055 + 0.28984 * (Log (NER) – Log (NER(-1))) + 0.2396 * Log (LIBOR)
                                        (3.119)   (10.015)
 + 0.016978 * 100 * (WPI_0405 / WPI_0405 (-1) - 1) + 0.01066 * TREND
(3.575)   (8.665)
R^2 = 0.94   DW= 1.61

RRINT =LINT10 – INFL

The interest rate on domestic borrowing by the government, central or total government, is linked to the short-term interest rate.

74) LOG (IRATEDOM_C) = -0.0040 + 0.7596*LOG (IRATEDOM_C_{-1}) + 0.2336*LOG (SI91)
                                            (18.33)   (3.67)
R^2 = 0.97   Dh= 0.07

75) Log (IRATEDOM_C) = 0.05508 + 0.862154 * Log (IRATEDOM_C(-1)) + 0.113868 * LOG(SI91)
                                            (12.576)   (3.097)
R^2 = 0.95   Dh= -0.04

The interest rate on external borrowing is a function of the rate in the international financial market, in the present case interest rate on 3 month US dollar deposits is taken as the international benchmark rate.

76) LOG (IRATEEXT) = 0.0138 + 0.9634*LOG (IRATEEXT_-1) + 0.0165*LOG (LIBOR)
                                      (9.10)   (2.28)
- 0.1952*D7692 + 0.4802*D01
(-2.88)   (4.70)
R^2 = 0.86   Dh= 0.16

A1.2.5 *Private Consumption Expenditure and Private Investment*:

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[4] Estimated using the monthly data from April 2006 to March 2013.

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Private final consumption expenditure on each of the various sectors is estimated as a function of its own lagged value, real personal disposable income and its price relative to the overall price level. As an illustration, we present the equation for real private consumption expenditure on food and food products

Ln REXPFOOD = a_0 + a_1 Ln REXPFOOD$_{-1}$ + a_2 Ln RPDI + a_3 Ln (WPIAGR/WPI)

The estimated equations are presented below.

77) Log (REXPFOOD) = 3.7439 + 0.2751*Log (REXPFOOD$_{-1}$) + 0.4928*Log (RPDI)
$\qquad\qquad\qquad\qquad\qquad$ (2.02) $\qquad\qquad\qquad\qquad$ (5.44)
$\quad$ – 0.2585*Log (WPIAGR*100/WPI)
$\qquad$ (-2.18)
R^2 = 0.99 $\qquad$ Dh= 0.81

78) Log (REXPMQM) = -0.0365 + 0.7902 * Log (REXPMQM$_{-1}$) + 0.1742*Log (RPDI)
$\qquad\qquad\qquad\qquad\qquad\qquad$ (7.87) $\qquad\qquad\qquad\qquad$ (1.99)
R^2 = 0.99 $\qquad$ Dh= -0.53

79) Log (REXPEGW) = 1.2987 + 0.8212*Log (REXPEGW$_{-1}$) + 0.0393*Log (RPDI)
$\qquad\qquad\qquad\qquad\qquad\qquad$ (9.10) $\qquad\qquad\qquad\qquad$ (1.93)
$\quad$ + 0.042170*Log (WPIENERGY)
$\qquad$ (1.98)
R^2 = 0.99 $\qquad$ Dh= -0.46

80) Log (REXPTSC) = 5.9905 + 0.2077*Log (RPDI) + 0.1926*Log (PTSC) + 0.0588*@Trend
$\qquad\qquad\qquad\qquad\qquad\qquad$ (2.51) $\qquad\qquad\qquad$ (2.91) $\qquad\qquad$ (4.56)
R^2 = 0.99 $\qquad$ DW= 1.77

81) Log (REXPSER) = -0.7754 + 0.9208*Log (REXPSER$_{-1}$) + 0.1288*Log (RPDI)
$\qquad\qquad\qquad\qquad\qquad\qquad$ (9.03) $\qquad\qquad\qquad\qquad$ (2.16)
R^2 = 0.99 $\qquad$ Dh= 0.19

The total final consumption expenditure is the sum of expenditures at the sectoral level,

CP = (REXPFOOD + REXPMQM + REXPEGW + REXPTSC + REXPOSER)* PEXPTOT

<u>Private Investment or Capital Formation</u>

There is significant difference in the manner in which construction by using industries has been specified in model and therefore, we describe each case separately.

In the case of agriculture, both price and non-price factors have been found to be important determinants of private investment. The price factors include variables such as lagged relative prices and cost of capital. The non-price factors include government investment in agriculture or infrastructure and credit. Even when the government investment in agriculture takes place, the constraining factor on private investment is availability of finances, either own funds or credit. In the present case, we have estimated real capital formation in agriculture as a function of income (value added) and institutional

credit to agriculture. It is important to note here that we have taken gross fixed capital formation (GFCF) (at constant prices) to estimate investment

82) Log (RGFCFPAGR) = - 3.741575 + 0.675916 * Log ((RVAAGR + RVAAGR (-1)) / 2)

$$(1.84)$$

+ 0.565586 * Log (INSCRAG * 100 / WPI) + 0.317955* D87909201

    (4.64)   (6.00)

$R^2 = 0.97$ DW= 1.90

Private gross capital formation in construction is specified as a function of sector's own GDP, inflation and interest rate

83) RGFCFPCON = 474.004917 + 0.089195* RVACON - 211.291932*LINT10 - 152.251458* INFL

                                      (64.6)   (-3.6)   (-3.0)

 - 1473.397337* D9396 + 1431.286548* D957890102

(-3.2)   (4.7)

$R^2 = 0.99$ DW= 1.81

In the case of mining, quarrying and manufacturing, the estimated equation incorporates the effect of public sector investment in the sector, General government's borrowings from the market (explained by fiscal deficit to GDP ratio), sentiments in capital market (captures the external condition). The specification is,

84) RGFCFPMQM = 2883.331988 + 0.588000* RVAMQM

                                            (8.14)

- 12758.266892*(FDEF_T * 100 / GDPMP_0405) - 4603.983447* INFL

 (-3.01)   (-2.37)

+ 3.317503* RGFCFGMQM + 3.543290* BSE_AVG * 100 / WPI_0405

 (4.62)   (1.80)

+ 40910.526374* D0405 - 30308.551684* D9456

 (2.88)   (-2.51)

$R^2 = 0.99$ DW= 2.05

Private gross capital formation in electricity, gas and water supply

85) RGFCFPEGW = 3661.307080 + 0.308946* RVAEGW$_{-1}$ - 623.263172* LINT10

                                              (22.71)   (-4.40)

- 158.765241* INFL - 2942.985521* D0204

    (-1.88)   (-4.82)

$R^2 = 0.97$ DW= 1.85

Private gross capital formation in transportation, storage and communication

86) RGFCFPTSC = 19946.307643 + 0.251700* RVATSC$_{-1}$ + 0.771151* RGFCFGTSC - 3089.400095* LINT10

                                              (5.10)   (1.14)   (-1.81)

- 487.404128681 * INFL

(-0.87)

$R^2 = 0.97$ DW= 1.81

Private gross capital formation in other services

87) RGFCFPSER = 28031.415645 + 0.1324055* RVASER$_{-1}$ - 2529.0897834 * LINT 10
                                          (7.84)   (-1.84)
- 594.607642* INFL + 9931.650079 *D8701 - 11025.696817*D910002
   (-1.75)   (2.79)   (-5.76)

R^2 = 0.99   DW= 2.03

In the other sectors, besides real interest rate, the lagged value of GDP from the respective sectors was found to be a significant independent variable in the equation for private investment. In other words, access to finance for investment is a crucial variable in the non-agricultural sectors also. The access to capital is reflected by its own earnings whether for use directly for investment or by leveraging it to borrow capital.

Total private investment is the sum of private investment in specific sectors,

RGFCFPTOT = RGFCFPAGR + RGFCFPCON + RGFCFPMQM + RGFCFPEGW + RGFCFPTSC + RGFCFPSER
The nominal value of private investment is calculated by multiplying the real value of private investment by the price deflator.

GFCFPTOT = (RGFCFPAGR + RGFCFPCON + RGFCFPMQM + RGFCFPEGW + RGFCFPTSC + RGFCFPSER) * PGFCFPTOT / 100

Sector-wise public Gross fixed capital formation (exogenous)

GFCFGTOT = GFCFGAGR + GFCFGCON + GFCFGMQM + GFCFGEGW + GFCFGTSC + GFCFGSER

RGFCFGAGR = (GFCFGAGR * 100) / PGFCFGAGR

RGFCFGCON = (GFCFGCON * 100) / PGFCFGCON

RGFCFGMQM = (GFCFGMQM * 100) / PGFCFGMQM

RGFCFGEGW = (GFCFGEGW * 100) / PGFCFGEGW

RGFCFGTSC = (GFCFGTSC * 100) / PGFCFGTSC

RGFCFGSER = (GFCFGSER * 100) / PGFCFGSER

RGFCFGTOT = RGFCFGAGR + RGFCFGCON + RGFCFGMQM + RGFCFGEGW + RGFCFGTSC + RGFCFGSER

Total Gross fixed capital formation

GFCFTOT = GFCFPTOT + GFCFGTOT

A1.2.6 _Fiscal Block_:

We have incorporated fiscal accounts of the Central government as well as Centre plus States and Union Territories. However, these accounts are not integrated to account for the transfers from Centre to States endogenously. This is a major limitation of the specification that would require further development of the model in the future.

We have identified the main components of revenue and expenditures of the budget and they have been linked to overall economic activity, prices and some policy variables.

a. General Government (Centre, States and Union Territories)

Expenditure

The expenditure of the General government is defined as a sum of expenditure on current account and on capital account. The current expenditures are wage bill, budgetary subsidies, interest payment, expenditure on education and health, and others.

REVEXP_T = INTPAY_T + REVEXPEDN_T + REVEXPH_T + SUBSIDY_T + GWBILL_T + REVOEXP_T

The wage rate is estimated based on an implicit relationship with the consumer price index

88) Log (WRATE_T) = 0.248226 + 0.756717*Log (WRATE_T (-1)) + 0.4342089* Log (CPIIW)
$\qquad\qquad\qquad\qquad\qquad\qquad$ (9.30) $\qquad\qquad\qquad\qquad\qquad$ (3.01)

$R^2 = 0.99 \qquad$ Dh= 1.62

Wage bill is defined as employment in public sector multiplied with wage rate

GWBILL_T = WRTAE_T * EMPPUB_T

Subsidies for the General government is specified as a function of Central government subsidies and past trend

89) Log (SUBSIDY_T) = 2.947999 + 0.608893 * Log (SUBSIDY_C) + 0.0614594 * @TREND
$\qquad\qquad\qquad\qquad\qquad\qquad$ (7.49) $\qquad\qquad\qquad\qquad\qquad$ (3.30)

$R^2 = 0.99 \qquad$ DW= 1.86

Interest payment is calculated from domestic and external liabilities

INTPAY_T = (IRATEDOM_T * DLIB_T$_{-1}$ + IRATEEXT * ELIB_T$_{-1}$)

Capital expenditure is the sum of capital expenditure on education, health and other capital expenditure. While capital expenditure on education and health are exogenously specified as percentage of GDP, other expenditure is function of Central government's capital expenditure.

CAPEXP_T = CAPEXPEDN_T + CAPEXPH_T + CAPEXPOTH_T

90) $\text{Log (CAPEXPOTH\_T)} = -1.329063 + 1.160757*\text{Log (CEXP2\_C)}$

<div align="center">(17.13)</div>

$R^2 = 0.99 \qquad \text{DW} = 1.96$

Revenue

The tax revenues are specified as a function of the tax rate and the tax base, essentially the GDP from non-agricultural sectors. The rates are the collection rates relative to the specified base.

Direct tax collection is specified as a function of direct tax rate and GDP from non-agricultural sectors

91) $\text{Log (DTAX\_T)} = -3.403642 + 1.020760* \text{Log (DTRATE\_T)} + 0.240544*\text{Log (GDPMQM)}$

<div align="center">(15.63)   (12.48)</div>

$+ 0.080395* \text{Log (GDPCON)} + 0.031565* \text{Log (GDPEGW)} + 0.077565* \text{Log (GDPTSC)}$
(9.76)   (4.76)   (5.86)
$+ 0.568374* \text{Log (GDPSER)}$
(18.98)
$R^2 = 0.99 \qquad \text{DW} = 1.85$

Indirect tax collection is a function of indirect tax rate and GDP at factor cost

92) $\text{Log (INDTAX\_T)} = -6.084849 + 1.058475* \text{Log (INDTRATE\_T)} + 1.075091*\text{Log (GDPFC)}$

<div align="center">(13.77)   (15.48)</div>

Total tax revenue is the sum of direct and indirect tax revenue

$\text{TREV\_T} = \text{DTAX\_T} + \text{INDTAX\_T}$

Total revenue receipts is the sum of direct tax, indirect tax and non-tax revenue

$\text{TOTREV\_T} = \text{DTAX\_T} + \text{INDTAX\_T} + \text{NTREV\_T}$

Capital account includes revenues from disinvestment of public sector assets and other capital receipts

$\text{CAPRCPT\_T} = \text{DISINV\_T} + \text{OCAPRECPT\_T}$

Fiscal deficit is the difference between all expenditures of the government (current and capital) and the revenues on revenue account and non-debt capital receipts (disinvestment)

$\text{FDEF\_T} = \text{TOTEXP\_T} - \text{TOTREV\_T} - \text{DISINV\_T}$

The revenue deficit is the balance of accounts on the current expenditures and revenues and the primary deficit is fiscal deficit plus interest payments.

$\text{PDEF\_T} = \text{FDEF\_T} - \text{INTPAY\_T}$

RDEF_T = GTCEX_T – TREV_T

The deficits give rise to liabilities which may arise through financing in the domestic financial market or in external market

DLIB_T = DLIB_T$_{-1}$ + DBORW_T
ELIB_T = ELIB_T$_{-1}$ + EBORW_T

b. Central Government Accounts

The specification of accounts for the Central government follows the same approach as in the case of 'General government sector'.

<u>Expenditures</u>

The total expenditure of the Central government is defined as a sum of expenditure on current account and on capital account. The current expenditures are wage bill, budgetary subsidies, interest payment, expenditure on education and health, and others. Revenue expenditure on health and education is exogenously specified in terms of percentage of GDP.

REXP_C = GWBILL_C + SUBSIDY_C + INTPAY_C + REVEXPEDN_C + REVEXPH_C + GOCEX_C

INTPAY_C = (IRATEDOM_C * DLIB_C$_{-1}$ + IRATEEXT * ELIB_C$_{-1}$) / 100

The wage rate of the central government employees is again estimated based on its relationship with the consumer price index

93) Log (WRATE_C) = 1.456649 + 0.350486 * Log (WRATE_C (-1)) + 1.000852 * Log (CPIIW)
$\qquad\qquad\qquad\qquad\qquad\qquad$ (1.81) $\qquad\qquad\qquad\qquad$ (3.28)
R^2 = 0.99 $\qquad$ Dh= 2.82

GWBILL_C = WRATE_C * EMPUB_C

We specify capital expenditure as sum of twenty percent of government spending on infrastructure sector; twenty percent of government spending on sectors other than infrastructure and thirty percent of capital expenditure, which is specified exogenously.

CEXP_C = (GFCFG_infra * 0.20 + (GFCFGTOT - GFCFG_infra) * 0.20 + CEXP_C * 0.30)

<u>Revenues</u>

94) Log (DTAX_C) = - 3.449171+ 1.008187* Log (DTRATE_C) + 0.251882*Log (GDPMQM)
$\qquad\qquad\qquad\qquad\qquad\qquad$ (15.03) $\qquad\qquad\qquad\qquad$ (13.48)
+ 0.072525* Log (GDPCON) + 0.017631* Log (GDPEGW) + 0.083719* Log (GDPTSC)
(9.76) $\qquad\qquad\qquad\qquad\qquad$ (4.76) $\qquad\qquad\qquad\qquad$ (5.86)
+ 0.575098* Log (GDPSER)
(19.98)
R2 = 0.99 $\qquad$ DW= 1.65

Indirect tax collection is specified as sum of excise duty collection on petroleum products, custom duty on petroleum products and indirect tax collection from non-petroleum products,

INDTAX_C = EX_PETRO_C + CD_PETRO_C + INDTAX_NPETRO_C

95) Log (EX_PETRO_C) = - 4.605301+ 0.996540* Log (EXRPETRO_C) + 0.999892 * Log (GDPFC)

$$(14.03) \qquad\qquad\qquad (18.48)$$

$R^2 = 0.99$ DW= 2.3

96) Log (CD_PETRO_C) = - 4.599961 + 0.999627*Log (CDR_PETRO_C) + 0.999619* Log (IMPCRUDE)

$$(16.03) \qquad\qquad\qquad (15.48)$$

$R^2 = 0.99$ DW= 2.4

97) Log (INDTAX_NPETRO_C) = - 5.496706 + 1.135128*Log (INDTRATE_C) + 1.00221 * Log (GDPFC)

$$(20.03) \qquad\qquad\qquad (19.48)$$

$R^2 = 0.99$ DW= 2.3

Non-Tax Revenue (Central Government)

98) NTREV_C = - 4576.17047 + 0.023378 * GDPNONAGR + 689.066136* @TREND

$$(14.19) \qquad\qquad (3.26)$$

$R^2 = 0.92$ DW= 1.9

Total tax revenue of the centre

TREV_C = DTAX_C + INDTAX_C

Accounting relationships

Total revenues on current account,

TOTREV_C = TREV_C + NTREV_C

Revenues on capital account

CAPRCPT_C= RECLOAN_C + DISINV_C

Deficits (Fiscal, revenue and primary) and liabilities (domestic and external)

FDEF_C = REXP_C + CEXP_C - TOTREV_C - CAPRCPT_C

PDEF_C = FDEF_C – INTPAY_C
RDEF_C = REXP_C – TREV_C

DLIB_C = DLIB_C$_{-1}$ + DBORW_C
ELIB_C = ELIB_C$_{-1}$ + EBORW_C

A1.2.7 External Sector:

The external trade is modeled at an aggregate level. The merchandise trade has been estimated as total exports and total imports. Net invisibles inflow on current account is specified exogenously.

The unit values of merchandise trade are linked essentially to domestic prices and exchange rate. In the case of exports the domestic prices influence production costs and therefore would also have an impact on the price at which the exports may take place. In the case of imports, the specification essentially captures the interdependence of exchange rate and the international prices. The exchange rate also reflects a similar competitive effect as rupee depreciates with respect to the other currencies, the price of imports increases. As rupee appreciates, the import prices decrease.

Exports

Merchandise exports are divided into two segments: petroleum exports and non-petroleum exports. Non-petroleum exports are linked to global demand, reflected in the estimated world GDP, UVI of exports and exchange rate. World income is expected to be related to exports positively and the other two variables, viz. UVI of exports and the nominal effective exchange rate are expected to be related to exports inversely. As UVIs rise, demand for exports would decrease. Similarly, an appreciating rupee would make India's exports more expensive and therefore, would imply a negative impact on exports.

Merchandise Exports

Ln RXNONPETRO = a_0 + a_1 Ln RWINC + a_2 Ln (UVIEXP/WPI) + a_3 Ln NEER

Real non-petroleum exports

99) Log (RXNONPETRO) = - 0.960427 + 2.824623 * Log (RWINC) - 0.321941 * Log (UVIEXP / WPI)
$$\qquad\qquad\qquad\qquad\qquad\qquad (8.02) \qquad\qquad\qquad\quad (-1.75)$$

 - 0.373840257179 * Log (NEER)
     (-2.01)
R^2 = 0.99 \qquad DW= 1.74

Value of petroleum exports

XPETRO_V = XPETRO_Q * Brent oil

Brentoil_Rs = Brentoil * NER

XNONPETRO = (RXNONPETRO * UVIEXP) / 100

XTOTAL = XNONPETRO + XPETRO_V

XTOTAL$ = XTOTAL / NER

Unit Vale Index of Exports (UVIEXP)

The unit value of exports would be influenced by domestic price conditions directly and by the exchange rate of the rupee.

100) $Log (UVIEXP) = 1.577908 + 0.594935* Log (UVIEXP_{-1}) - 0.408743* Log (NEER)$
$$(5.73) \qquad (-3.30)$$
$+ 0.668415 * Log (PPI\_USA)$
(4.00)
$R^2 = 0.99 \qquad DW= 1.70$

Merchandise Imports

The historical data of India's import basket suggests that, petroleum imports are a major chunk of India's import basket. Another important component of India's import basket is edible oil. Therefore, we have disaggregated total imports into three parts: non-petroleum imports, petroleum imports and import of edible oils.

Non-petroleum imports are related to real income or output of the domestic economy in terms of demand for goods both for final consumption as well as for intermediate production requirements. The UVI of imports have an adverse impact on imports as higher UVI would make imports expensive. The exchange rate, similarly affects imports by making them either cheaper, when appreciating, or more expensive when depreciating.

101) $Log (MNONPOLOIL * 100 / WPI) = - 14.076570 - 0.264100*Log (UVIIMPNONPOLOIL / UVIEXP\_W)$
$$(-1.97)$$
$- 0.620604*Log (NEER) + 2.019141 * Log (RVATOT)$
$(-1.80) \qquad (16.29)$
$R^2 = 0.99 \qquad DW= 1.81$

Import of crude oil is the difference between domestic crude consumption and production

$MCRUDE = CRUDECON - CRUDEPROD$

$IMPCRUDE = (UVICRUDE * MCRUDE) / 10000$

Import of edible oil

102) $Log (MEDOIL) = - 25.974 + 2.152* Log (RVATOT) + 0.935* Log (NER * (SOYABEAN\_US / WPIOILS))$
$$(4.37) \qquad (1.98)$$
$R^2 = 0.91 \quad DW= 2.2$

$MTOTAL = MNONPOLOIL + IMPCRUDE + MEDOIL$
$MTOTAL\$ = MTOTAL / NER$

Unit Vale Index of Non-Petroleum Imports (UVIIMPNONPOLOIL)

The UVI for non-petroleum imports may not be completely insulated by the price conditions of internal markets. Higher domestic prices may imply that international prices are also on the rise. The exchange

rate influences import prices directly appreciating rupee makes imports cheaper and a depreciating rupee makes imports costlier.

103) Log (UVIIMPNONPOLOIL) = Log (PSTAR * 10) - Log (NEER / 100)

In order to calculate current account balance (as per the RBI definition), we have converted DGCI&S exports and imports value into

XTOTRBI = 597.074135017 + 1.01453712386 * XTOTAL

MTOTRBI = 7163.30651544 + 1.02502381425 * MTOTAL

Current Account Balance is defined from trade balance and net invisibles inflow on current account as,

CABRBI = XTOTRBI - MTOTRBI + NETINV

Current account balance ratio

CABRBIRATIO = (CABRBI / GDPMP* 100)

A1.2.8 Poverty:

In order to capture the inclusiveness of growth, we have estimated the mean and distribution impact of GDP on poverty. This has been estimated for rural, urban and national poverty. However, there is no feedback from poverty incidence to growth.

Rural poverty ratio

104) Log (HCR_R) = 10.8222- 0.8189* Log (RVAAGR_0405 * 10 / POPLN)
$\qquad$ (-2.0018)
- 0.11344*Log (RVAAGR_0405 / RVATOT_0405* 100)
(-0.4604)

$R^2 = 0.85$ $\qquad$ DW= 2.198

Urban poverty ratio

105) Log (HCR_U) = 3.8637 - 0.503385 * Log (RVANONAGR_0405*10 /POPLN) + 0.092727 * Dummy
$\qquad$ (-5.5136) $\qquad$ (2.1264)
$R^2 = 0.93$ $\qquad$ DW= 1.99

National poverty ratio

Weighted average of rural and urban poverty:

HCR_N = ((POPLN_Rural * HCR_R) / 100 + (POPLN_Urban * HCR_U) / 100) / POPLN * 100

Appendix 2: Glossary of Variables

Sl.No.	Variable List	Description	Type
1	A	Gross Cropped Area (Million Hectares)	Endogenous
2	ACOTTON	Gross Area under Cotton (Million Hectares)	Endogenous
3	AI	Gross Irrigated Area (Million hectares)	Exogenous
4	AICOTTON	Gross Irrigated Area under Cotton (Million hectares)	Endogenous
5	AINFG	Gross Irrigated Area under Non-Foodgrain (Million Hectares)	Endogenous
6	AIOILS	Gross Irrigated Area under Oilseeds (Million Hectares)	Endogenous
7	AIOTFOOD	Gross Irrigated Area under Other food (Million Hectares)	Endogenous
8	AIOTNFG	Gross Irrigated Area under Other Non-foodgrains(Million Hectares)	Endogenous
9	AIRICE	Gross Irrigated Area under Rice (Million Hectares)	Endogenous
10	AISUGAR	Gross Irrigated Area under Sugar (Million Hectares)	Endogenous
11	AIWHEAT	Gross Irrigated Area under Wheat (Million Hectares)	Endogenous
12	ANFG	Gross Cropped Area under Non-Foodgrain (Million Hectares)	Endogenous
13	AOILS	Gross Cropped Area under Oilseeds (Million Hectares)	Endogenous
14	AOTFOOD	Gross Cropped Area under Other food (Million Hectares)	Endogenous
15	AOTNFG	Gross Cropped Area under Other Non-Foodgrains (Million Hectares)	Endogenous
16	ARICE	Gross Cropped Area under Rice (Million Hectares)	Endogenous
17	ASUGAR	Gross Cropped Area under Sugar (Million Hectares)	Endogenous
18	AWHEAT	Gross Cropped Area under Wheat (Million Hectares)	Endogenous
19	Brent oil	UK Brent oil ($/bbl)	Exogenous
20	BSE_AVG	Sensex (average of months)	Exogenous
21	CABRBI	Current Account Balance (RBI definition) (Rs. Crore)	Endogenous
22	CABRBIRATIO	Current Balance (%GDPmp)	Endogenous
23	CAPEXP_T	Capital expenditure of General government (Rs. Crore)	Endogenous
24	CAPEXPEDN_T	Capital expenditure on Education (% of GDPmp)	Exogenous
25	CAPEXPH_T	Capital expenditure on Health (% of GDPmp)	Exogenous
26	CAPEXPOTH_T	Capital expenditure other than health and education (Rs. Crore)	Exogenous
27	CAPRCPT_T	Non-Debt Capital Receipts (Rs. crore)	Endogenous
28	CARRCPT_C	Non-Debt Capital Receipts -Centre (Rs. Crore)	Endogenous
29	CD_PETRO_C	Custom duty from Petroleum sector - Centre (Rs. Crore)	Endogenous
30	CDR_PETRO_C	Custom Duty Rate from Petroleum Sector - All India (%)	Endogenous
31	CETOT_T	Compensation to Employees - Total (Rs. Crore)	Exogenous
32	CEXP_T	Capital Expenditure – All India (Rs. crore)	Exogenous
33	CEXP_C	Capital Expenditure - Centre (Rs. crore)	Exogenous
34	CP	Private final Consumption Expenditure (Rs Crore)	Endogenous
35	CPIAGL	Consumer Price Index of Agricultural Labour (1993-94=100)	Endogenous
36	CPIIW	Consumer Price Index of Industrial Worker (1993-94=100)	Endogenous
37	CRUDECON	Crude Oil Consumption ('000 Tonnes)	Endogenous
38	CRUDEPROD	Crude Oil Production ('000 Tonnes)	Exogenous
39	CSTAR	International crude oil price index (2005=100)	Exogenous
40	DBORW_C	Domestic Borrowing - Centre (Rs. Crore)	Exogenous
41	DBORW_T	Domestic Borrowing -Total (Rs. Crore)	Exogenous
42	DISINV_C	Disinvestment - Centre (Rs. Crore)	Exogenous
43	DISINV_T	Disinvestment Receipts - All India (Rs. Crore)	Exogenous
44	DLIB_C	Domestic Liabilities -Centre (Rs. Crore)	Endogenous
45	DLIB_T	Domestic Liabilities - All India (Rs. Crore)	Endogenous
46	DRATAGR	Depreciation Rate of Gross Capital Formation – Agriculture (Per Cent)	Exogenous
47	DRATCON	Depreciation Rate of Gross Capital Formation – Construction (Per Cent)	Exogenous
48	DRATEGW	Depreciation Rate of Gross Capital Formation – Electricity, Gas and Water Supply (per cent)	Exogenous
49	DRATMQM	Depreciation Rate of Gross Capital Formation – Mining, Quarrying and Manufacturing (Per cent)	Exogenous

Sl.No.	Variable List	Description	Type
50	DRATSER	Depreciation Rate of Gross Capital Formation – Services (Per Cent)	Exogenous
51	DRATTSC	Depreciation Rate of Gross Capital Formation – Transport, Storage and Communication (Per Cent)	Exogenous
52	DTAX_C	Domestic Tax Collection – Center (Rs Crore)	Endogenous
53	DTAX_T	Domestic Tax Collection – All India (Rs Crore)	Endogenous
54	DTRATE_C	Direct Tax Collection Rate – Centre (Per Cent)	Exogenous
55	DTRATE_T	Direct Tax Collection Rate – All India (Per Cent)	Exogenous
56	EBORW_T	External Borrowing - Centre (Rs. Crore)	Exogenous
57	EDNHINDEX15	Education and health index	Endogenous
58	EBORW_T	External Borrowing - All India (Rs. Crore)	Exogenous
59	ELIB_C	External Liabilities – Center (Rs Crore)	Endogenous
60	ELIB_T	External Liabilities – All India (Rs Crore)	Endogenous
61	EMPPUB_T	Employment in Public Sector – All India (Crore)	Exogenous
62	EMPUB_C	Employment in Public Sector – Central (Crore)	Exogenous
63	EX_PETRO_C	Excise Duty on Petroleum - Centre (Rs. Crore)	Endogenous
64	FDEF_C	Gross Fiscal Deficit - Centre (Rs. Crore)	Endogenous
65	FDEF_T	Gross Fiscal Deficit - All India (Rs. Crore)	Endogenous
66	GCFTOT	Gross Capital Formation Total (Rs Crore)	Endogenous
67	GDPAGR	Gross Domestic Product at Factor Cost – Agriculture and allied (Rs Crore)	Endogenous
68	GDPCON	Gross Domestic Product at Factor Cost – Construction (Rs Crore)	Endogenous
69	GDPEGW	Gross Domestic Product at Factor Cost – Electricity, Gas and Water Supply (Rs Crore)	Endogenous
70	GDPFC	Gross Domestic Product at Factor Cost – Total (Rs Crore)	Endogenous
71	GDPMP	Gross Domestic Product at Market Price – Total (Rs Crore)	Endogenous
72	GDPMQM	Gross Domestic Product at Factor Cost – Mining, Quarrying and Manufacturing (Rs Crore)	Endogenous
73	GDPNONAGR	Gross Domestic Product at Factor Cost – Non-Agriculture (Rs Crore)	Endogenous
74	GDPSER	Gross Domestic Product at Factor Cost – Services (Rs Crore)	Endogenous
75	GDPTSC	Gross Domestic Product at Factor Cost – Transport, Storage and Communication (Rs Crore)	Endogenous
76	GDR	Public Distribution of Rice (Million Tonne)	Exogenous
77	GDW	Public Distribution of Wheat (Million Tonne)	Exogenous
78	GFCE	Government Final Consumption Expenditure (Rs. Crore)	Endogenous
79	GFCFG_infra	Gorss Fixed Capital Formation in Infrastructure (Rs. Crore)	Endogenous
80	GFCFG_INFRA	Gross Fixed Capital Formation in Infrastructure-Public (Rs. Crore)	Endogenous
81	GFCFGAGR	Gross Fixed Capital Formation in Agriculture-Public (Rs. Crore)	Endogenous
82	GFCFGCON	Gross Fixed Capital Formation in Construction-Public (Rs. Crore)	Endogenous
83	GFCFGEGW	Gross Fixed Capital Formation in Electricity, Gas and Water Supply -Public (Rs. Crore)	Endogenous
84	GFCFGMQM	Gross Fixed Capital Formation in Mining, Quarrying and Manufacturing-Public (Rs. Crore)	Endogenous
85	GFCFGSER	Gross Fixed Capital Formation in Other Services-Public (Rs. Crore)	Endogenous
86	GFCFGTOT	Gross Fixed Capital Formation-Public (Rs. Crore)	Endogenous
87	GFCFGTSC	Gross Fixed Capital Formation in Transport, Storage and Communication-Public (Rs. Crore)	Endogenous
88	GFCFP_INFRA	Gross Fixed Capital Formation in Infrastructure-Private (Rs. Crore)	Endogenous
89	GFCFPTOT	Gross Fixed Capital Formation-Private (Rs. Crore)	Endogenous
90	GFCFTOT	Gross Fixed Capital Formation -Total (Rs. Crore)	Endogenous
91	GNPFC	Gross National Product at Factor Cost (Rs Crore)	Endogenous

Sl.No.	Variable List	Description	Type
92	GNPMP	Gross National Product at Market Price (Rs Crore)	Endogenous
93	GOCEX_C	Government Current Expenditure excluding Wage Bill, Interest Payment and Subsidies – Center (Rs Crore)	Exogenous
94	GOCEX_T	Government Current Expenditure excluding Wage Bill, Interest Payment and Subsidies – All India (Rs Crore)	Exogenous
95	GPR	Procurement of Rice (Rs/Qtl.)	Exogenous
96	GRVAAGR	Growth rate of agricultural sector output (in Percent)	Endogenous
97	GRVANONAGR	Growth rate of non-agricultural sector output (in Percent)	Endogenous
98	GTCEX_T	Government Current Expenditure – All India (Rs Crore)	Endogenous
99	GWBILL_C	Government Wage Bill – Center (Rs Crore)	Endogenous
100	GWBILL_T	Government Wage Bill – All India (Rs Crore)	Endogenous
101	HCR_N	Head count ratio of poverty_All India (in percent)	Endogenous
102	HCR_R	Head count ratio of poverty_Rural (in percent)	Endogenous
103	HCR_U	Head count ratio of poverty_Urban (in percent)	Endogenous
104	IMPCRUDE	Imports of Crude Oil (Rs. Crore)	Endogenous
105	INDTAX_C	Indirect Tax Collection – Center (Rs Crore)	Endogenous
106	INDTAX_NPETRO_C	Indirect Tax on Non-Petroleum - Centre (Rs. Crore)	Endogenous
107	INDTAX_T	Indirect Tax Collection – All India (Rs Crore)	Endogenous
108	INDTRATE_C	Indirect Tax Rate – Center (Per Cent)	Exogenous
109	INDTRATE_T	Indirect Tax Rate – All India (Per Cent)	Exogenous
110	INFL	Inflation Rate (Per Cent)	Endogenous
111	INSCRAG	Institutional credit to agriculture sector (Rs. Crore)	Exogenous
112	INSTITUTES	No. of educational institutes in India	Exogenous
113	INTPAY_C	Interest Payment – Center (Rs Crore)	Endogenous
114	INTPAY_T	Interest Payment – All India (Rs Crore)	Endogenous
115	IRATEDOM_C	Interest Rate on Domestic Debt – Center (Per Cent)	Endogenous
116	IRATEDOM_T	Interest Rate on Domestic Debt – All India (Per Cent)	Endogenous
117	IRATEEXT	Interest Rate on External Debt (Per Cent)	Endogenous
118	LIBOR	International interest rate (Percent)	Exogenous
119	LINT10	Long-term interest rate (10-year government securities)	Endogenous
120	M3	Money Supply (Rs Crore)	Endogenous
121	MCRUDE	Imports of Crude Oil (Rs. Crore)	Endogenous
122	MEDOIL	Imports of Edible Oil (Rs. Crore)	Endogenous
123	MNONPOLOIL	Imports Non Petroleum Oil (Rs. Crore)	Endogenous
124	MTOTAL	Total Imports (Rs Crore) DGCI&S	Endogenous
125	MTOTAL$	Total Imports (US$) DGCI&S	Endogenous
126	MTOTRBI	Total Imports (Rs Crore) RBI	Endogenous
127	NEER	Nominal Effective Exchange Rate (Index, 1985=100)	Exogenous
128	NER	Nominal Exchange Rate (Rs./$US)	Exogenous
129	NETINV	Net Invisible Receipts (Rs Crore)	Exogenous
130	NFIAB	Net Factor Income from Abroad (Rs Crore)	Exogenous
131	NTREV_C	Non-tax Revenue – Center (Rs Crore)	Endogenous
132	NTREV_T	Non-tax Revenue – All India (Rs Crore)	Endogenous
133	OCAPRECPT_T	Other capital receipts (Rs. Crore)	Exogenous

Sl.No.	Variable List	Description	Type
134	PAG	Implicit Price Deflator for Gross Domestic Product from Agriculture (Index, 1993-94=100)	Endogenous
135	PALL	Implicit Price Deflator for over all Gross Domestic Product at Factor Cost (Index, 1993-94=100)	Endogenous
136	PCON	Implicit Price Deflator for Gross Domestic Product from Construction (Index, 1993-94=100)	Endogenous
137	PDEF_C	Primary deficit – Center (Rs Crore)	Endogenous
138	PDEF_T	Primary deficit – All India (Rs Crore)	Endogenous
139	PEGW	Implicit Price Deflator for Gross Domestic Product from Electricity, Gas and Water Supply (Index, 1993-94=100)	Endogenous
140	PEXPTOT	Implicit Price Deflator for over all Private Final Consumption Expenditure (Index, 1993-94=100)	Endogenous
141	PGDPMP	Implicit Price Deflator for Gross Domestic Product at Market Price (Index, 1993-94=100)	Endogenous
142	PGCFGAG	Implicit Price Deflator for Public Investment in Agriculture (Index, 1993-94=100)	Endogenous
143	PGCFGCON	Implicit Price Deflator for Public Investment in Construction (Index, 1993-94=100)	Endogenous
144	PGCFGEGW	Implicit Price Deflator for Public Investment in Electricity, Gas and Water Supply (Index, 2004-05=100)	Endogenous
145	PGCFGMQM	Implicit Price Deflator for Public Investment in Mining, Quarrying and Manufacturing (Index, 2004-05=100)	Endogenous
146	PGCFGSER	Implicit Price Deflator for Public Investment in Other Services (Index, 2004-05=100)	Endogenous
147	PGCFGTSC	Implicit Price Deflator for Public Investment in Transport, Storage and Communication (Index, 2004-05=100)	Endogenous
148	PGCFPTOT	Implicit Price Deflator for Overall Private Investment (Index, 2004-05=100)	Endogenous
149	PGDPMP	Implicit Price Deflator for GDPmp (Index, 2004-05=100)	Endogenous
150	PGFCFGAGR	Implicit Price Deflator for government Investment in agriculture (Index, 2004-05=100)	Endogenous
151	PGFCFGCON	Implicit Price Deflator for government Investment in construction (Index, 2004-05=100)	Endogenous
152	PGFCFGEGW	Implicit Price Deflator for government Investment in EGW (Index, 2004-05=100)	Endogenous
153	PGFCFGMQM	Implicit Price Deflator for government Investment MQM (Index, 2004-05=100)	Endogenous
154	PGFCFGSER	Implicit Price Deflator for government Investment in services other than TSC (Index, 2004-05=100)	Endogenous
155	PGFCFGTSC	Implicit Price Deflator for government Investment in TSC (Index, 2004-05=100)	Endogenous
156	PGFCFPTOT	Overall Implicit Price Deflator for private Investment (Index, 2004-05=100)	Endogenous
157	PGNPFC	Implicit Price Deflator for Gross National Product at Factor Cost (Index, 1993-94=100)	Endogenous
158	PGNPMP	Implicit Price Deflator for Gross National Product at Market Price (Index, 1993-94=100)	Endogenous
159	PMQM	Implicit Price Deflator for Gross Domestic Product from Mining, Quarrying and Manufacturing (Index, 1993-94=100)	Endogenous
160	POPLN	Mid Year Population (Million)	Exogenous
161	PPC	Procurement Price of Rice (Rs/Qtl.)	Exogenous
162	PPI_USA	Producer Price Index -USA (2005=100)	Exogenous
163	PPR	Procurement Price of Rice (Rs/Qtl.)	Exogenous
164	PPS	Procurement Price of Sugarcane (Rs/Qtl.)	Exogenous
165	PPW	Procurement Price of Wheat (Rs/Qtl.)	Exogenous

Sl.No.	Variable List	Description	Type
166	PSER	Implicit Price Deflator for Gross Domestic Product from Services (Index, 1993-94=100)	Endogenous
167	PSTAR	Index of International Non-crude Oil Prices	Exogenous
168	PTSC	Implicit Price Deflator for Gross Domestic Product from Transport, Storage and Communication (Index, 1993-94=100)	Endogenous
169	QCOTTONI	Production of Cotton (Index, Triennium Ending 1993-94=100)	Endogenous
170	QFG	Production of Foodgrain (Million Tonne)	Endogenous
171	QNFGI	Production of Non-Foodgrain (Index, Triennium Ending 1993-94=100)	Endogenous
172	QOILSI	Production of Non-Foodgrain (Index, Triennium Ending 1993-94=100)	Endogenous
173	QOTFOOD	Production of Pulses and Coarse Cereals (Million Tonne)	Endogenous
174	QOTNFGI	Production of Other Non-Foodgrain (Index, Triennium Ending 1993-94=100)	Endogenous
175	QRICE	Production of Rice (Million Tonne)	Endogenous
176	QSUGARI	Production of Sugarcane (Million Tonne)	Endogenous
177	QWHEAT	Production of Wheat (Million Tonne)	Endogenous
178	RAIN	Rainfall during monsoon period (mm)	Exogenous
179	RBCC	Real Bank Credit to Commercial sector (Rs. Crore)	Endogenous
180	RBSE_avg	Index of Real Bombay stock Exchange	Endogenous
181	RCFCAGR	Real Consumption of Fixed Capital in Agriculture (Rs Crore)	Endogenous
182	RCFCCON	Real Consumption of Fixed Capital in Construction (Rs Crore)	Endogenous
183	RCFCEGW	Real Consumption of Fixed Capital in Electricity, Gas and Water Supply (Rs Crore)	Endogenous
184	RCFCMQM	Real Consumption of Fixed Capital in Mining, Quarrying and Manufacturing (Rs Crore)	Endogenous
185	RCFCSER	Real Consumption of Fixed Capital in Services (Rs Crore)	Endogenous
186	RCFCTSC	Real Consumption of Fixed Capital in Transport, Storage and Communication (Rs Crore)	Endogenous
187	RDEF_C	Revenue Deficit – Center (Rs Crore)	Endogenous
188	RDEF_T	Revenue Deficit – All India (Rs Crore)	Endogenous
189	RECLOAN_C	Recovery of Loans – Center (Rs Crore)	Exogenous
190	REVEXP_T	Revenue Expenditure – Center (Rs Crore)	Endogenous
191	REVEXPEDN_C	Public expenditure onEducation -Centre (Rs. Crore)	Exogenous
192	REVEXPEDN_T	Public expenditure on Education -All India (Rs. Crore)	Exogenous
193	REVEXPH_C	Public expenditure on Health -Centre (Rs. Crore)	Exogenous
194	REVEXPH_T	Public expenditure on Health -All India (Rs. Crore)	Exogenous
195	REVOEXP_T	Other current expenditure-All India (Rs. Crore)	Exogenous
196	REXP_C	Revenue Expenditure – Center (Rs Crore)	Endogenous
197	REXPEGW	Real Private Final Consumption Expenditure on Electricity, Gas and Water Supply (Rs Crore)	Endogenous
198	REXPFOOD	Real Private Final Consumption Expenditure on Food (Rs Crore)	Endogenous
199	REXPMQM	Real Private Final Consumption Expenditure on Mining, Quarrying and Manufacturing (Rs Crore)	Endogenous
200	REXPSER	Real Private Final Consumption Expenditure on Services (Rs Crore)	Endogenous
201	REXPTSC	Real Private Final Consumption Expenditure on Transport, Storage and Communication (Rs Crore)	Endogenous
202	RGFCFAGR	Real Fiscal Deficit (Rs. Crore)	Endogenous
203	RGFCFGAGR	Real Gross Fixed Capital formation in Infrastructure (Rs. Crore)	Endogenous
204	RGFCFG_INFRA	Real Gross Fixed Capital formation in Infrastructure - Public (Rs. Crore)	Endogenous
205	RGFCFGAGR	Real Gross Fixed Capital Formation on Agriculture-Pub Sector (Rs crore)	Endogenous
206	RGFCFGCON	Real Gross Fixed Capital Formation on Construction -Pub Sector (Rs Crore)	Endogenous
207	RGFCFGEGW	Real Gross Fixed Capital Formation on Eletricity gas & Water supply-Pvt Sector (Rs Crore)	Endogenous
208	RGFCFGMQM	Real Gross Fixed Capital formation on Mining, Quarrying & Manufacturing -Pvt Sector (Rs Crore)	Endogenous
209	RGFCFGSER	Real Gross Fixed Capital Formation on Services.-Pvt Sector (Rs Crore)	Endogenous

Sl.No.	Variable List	Description	Type
210	RGFCFGTOT	Real Gross Fixed Capital Formation Overall -Private Sector (Rs Crore)	Endogenous
211	RGFCFGTSC	Real Gross Fixed Capital Formation on Transport, Storage & Communication -Pvt Sector (Rs Crore)	Endogenous
212	RGFCFP_INFRA	Real Gross Fixed Capital formation in Infrastructure - Private (Rs. Crore)	Endogenous
213	RGFCFPAGR	Real Gross Fixed Capital formation in Agriculture - Private (Rs. Crore)	Endogenous
214	RGFCFPCON	Real Gross Fixed Capital formation in Construction - Private (Rs. Crore)	Endogenous
215	RGFCFPEGW	Real Gross Fixed Capital formation in Electricity, Gas and Water Supply - Private (Rs. Crore)	Endogenous
216	RGFCFPMQM	Real Gross Fixed Capital formation in Mining, Quaryying and Manufacturing - Private (Rs. Crore)	Endogenous
217	RGFCFPSER	Real Gross Fixed Capital formation in Other Services - Private (Rs. Crore)	Endogenous
218	RGFCFPTOT	Real Gross Fixed Capital formation - Private (Rs. Crore)	Endogenous
219	RGFCFPTSC	Real Gross Fixed Capital formation in Transport, storage and Communication- Private (Rs. Crore)	Endogenous
220	RGFCFTAGR	Real Gross Fixed Capital formation in Agriculture-Total (Rs. Crore)	Endogenous
221	RGFCFTCON	Real Gross Fixed Capital formation in Construction-Total (Rs. Crore)	Endogenous
222	RGFCFTEGW	Real Gross Fixed Capital formation in Electricity, Gas and Water Supply -Total (Rs. Crore)	Endogenous
223	RGFCFTMQM	Real Gross Fixed Capital Formation in Mining, Quarrying and Manufacturing-Total (Rs. Crore)	Endogenous
224	RGFCFTOT	Real Gross Fixed Capital Formation -Total (Rs. Crore)	Endogenous
225	RGFCFTOT_INFRA	Real Gross Fixed Capital formation in Infrastructure -Total (Rs. Crore)	Endogenous
226	RGFCFTSER	Real Gross Fixed Capital formation in Services- Total (Rs. Crore)	Endogenous
227	RGFCFTTSC	Real Gross Fixed Capital formation in Transport, storage and Communication-Total (Rs. Crore)	Endogenous
228	RGNPFC	Real Gross National Product at Factor Cost (Rs Crore)	Endogenous
229	RGNPMP	Real Gross National Product at Market Cost (Rs Crore)	Endogenous
230	RK_INFRA	Real Capital Stock in Infrastructure (Rs. Crore)	Endogenous
231	RKAGR	Real Capital Stock in Agriculture (Rs Crore)	Endogenous
232	RKCON	Real Capital Stock in Construction (Rs Crore)	Endogenous
233	RKEGW	Real Capital Stock in Electricity, Gas and Water Supply (Rs Crore)	Endogenous
234	RKMQM	Real Capital Stock in Mining, Quarrying and Manufacturing (Rs Crore)	Endogenous
235	RKSER	Real Capital Stock in Other Services (Rs Crore)	Endogenous
236	RKTOT	Real Capital Stock- Total (Rs Crore)	Endogenous
237	RKTSC	Real Capital Stock in Transport, Storage and Communication (Rs Crore)	Endogenous
238	RMD	Real money demand (high powered money) Rs. Crore	Endogenous
239	RMS	Reserve Money (Rs Crore)	Endogenous
240	RPDI	Real Personal Disposable Income (Rs Crore)	Endogenous
241	RPVTINCOME	Real Private Income (Rs Crore)	Endogenous
242	RRINT	Real Rate of Interest (Per Cent)	Endogenous
243	RVAAGR	Real Value Added at Factor cost in Agriculture (Rs Crore)	Endogenous
244	RVACON	Real Value Added at Factor cost in Construction (Rs Crore)	Endogenous
245	RVAEGW	Real Value Added at Factor cost in Electricity, Gas and Water Supply (Rs Crore)	Endogenous
246	RVAMQM	Real Value Added at Factor cost in Mining, Quarrying and Manufacturing (Rs Crore)	Endogenous
247	RVANAGR	Real Value Added at Factor cost in Non- Agriculture (Rs Crore)	Endogenous
248	RVASER	Real Value Added at Factor cost in Services (Rs Crore)	Endogenous
249	RVATOT	Real Value Added at Factor cost - Total (Rs Crore)	Endogenous
250	RVATSC	Real Value Added at Factor cost in Transport, Storage and Communication (Rs Crore)	Endogenous
251	RWINC	World Income (Index, 1995-96=100)	Exogenous
252	RXNONPETRO	Real Exports DGCI&S (Rs Crore)	Endogenous

Sl.No.	Variable List	Description	Type
253	SFR	Stock of Rice (Million Tonne)	Exogenous
254	SI91	Short–term Rate of Interest (91-day Treasury Bill rate, Per Cent)	Endogenous
255	SOYABEAN_US	Price Index of Soyabean - USA (2005=100)	Exogenous
256	SUBSIDY_C	Subsidies – Center (Rs Crore)	Exogenous
257	SUBSIDY_T	Subsidies – All India (Rs Crore)	Exogenous
258	TOTEXP_T	Total expenditure-All India (Rs. Crore)	Endogenous
259	TOTREV_C	Total Revenue – Center (Rs Crore)	Endogenous
260	TOTREV_T	Total Revenue – All India (Rs Crore)	Endogenous
261	TREV_C	Tax Revenue – Center (Rs Crore)	Endogenous
262	TREV_T	Tax Revenue – All India (Rs Crore)	Endogenous
263	US_COTTONI	Price index of Cotton-USA (2005=100)	Exogenous
264	UVICRUDE	Unit Value index of Crude Oil (1993-94=100)	Endogenous
265	UVIEXP	Unit Value Index for Exports (Index, 1978-79=100)	Endogenous
266	UVIEXP_W	Unit Value Index for Exports -World (2005=100)	Exogenous
267	UVIIMPNONPOLOIL	Unit value index of non Petroleum & edible oil (19963-94=100)	Endogenous
268	WPI	Wholesale Price Index – All Commodities (Index, 1993-94=100)	Endogenous
269	WPIAGR	Wholesale Price Index – Agricultural Commodities (Index, 1993-94=100)	Endogenous
270	WPICOTTON	Wholesale Price Index – Cotton (Index, 1993-94=100)	Endogenous
271	WPIENERGY	Wholesale Price Index of Fuel, Power, Light and Lubricants (Index, 1993-94=100)	Exogenous
272	WPIFG	Wholesale Price Index – Foodgrain (Index, 1993-94=100)	Endogenous
273	WPIINPUT	Wholesale Price Index of Inputs for Agriculture (Index, 1993-94=100)	Exogenous
274	WPIMQM	Wholesale Price Index – Mining, Quarrying and Manufacturing (Index, 1993-94=100)	Endogenous
275	WPIOILS	Wholesale Price Index – Oilseeds (Index, 1993-94=100)	Endogenous
276	WPIOTFOOD	Wholesale Price Index – Pulses and Coarse Cereals (Index, 1993-94=100)	Endogenous
277	WPIOTNFG	Wholesale Price Index – Other Non-Foodgrains (Index, 1993-94=100)	Exogenous
278	WPIRICE	Wholesale Price Index – Rice (Index, 1993-94=100)	Endogenous
279	WPISUGAR	Wholesale Price Index – Sugar (Index, 1993-94=100)	Endogenous
280	WPIWHEAT	Wholesale Price Index – Wheat (Index, 1993-94=100)	Endogenous
281	WRATE_C	Public Sector Wage Rate – Center (Rs)	Endogenous
282	WRTAE_T	Public Sector Wage Rate – All India (Rs)	Endogenous
283	XNONPETRO	Total Exports (Rs Crore) DGCI&S	Endogenous
284	XPETRO_Q	Quantity of oil imports ('000 tonnes)	Endogenous
285	XPETRO_V	Value of oil imports (Rs. Crore)	Endogenous
286	XTOTAL	Merchandise exports total (Rs. Crore)	Endogenous
287	XTOTAL$	Merchandise exports total (US $ million)	Endogenous
288	XTOTRBI	Total Exports (Rs Crore) RBI	Endogenous
289	YCOTTON	Yield Rate of Cotton (Kg/Hectare)	Endogenous
290	YOILS	Yield Rate of Oilseeds Cereals (Kg/Hectare)	Endogenous
291	YOTFOOD	Yield Rate of other food (Kg/Hectare)	Endogenous
292	YOTNFG	Yield Rate of Other Non-foodgrains (Kg/Hectare)	Endogenous
293	YRICE	Yield Rate of Rice (Kg/Hectare)	Endogenous
294	YSUGAR	Yield Rate of Sugar (Kg/Hectare)	Endogenous
295	YWHEAT	Yield Rate of Wheat (Kg/Hectare)	Endogenous