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**A Macro-Econometric Model of the Indian Economy**  
**Based on Quarterly Data**  
**(Version January 2013)**

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## **Preface**

This model is an updated version of the quarterly model of the Indian economy prepared earlier in 2012. It aims to prepare in general 5-quarters-ahead forecasts and inputs to the medium term model. Modelling the Indian economy based on quarterly data has been particularly challenging as the sample period, largely covering the previous decade and several quarters into the current decade, has been characterized by considerable volatility in economic growth and prices and India's growing exposure to global influences.

I take this opportunity to thank Chairman and members of the Advisory Committee and colleagues at RBI and MSE for insights provided in the extensive discussions in the course of the evolution of the modelling work at MSE. This effort continues.

I thank M. Divya for research assistance in preparing this version of the model.

D.K.Srivastava

## **CHAPTER 1**

## INTRODUCTION

In this work, we present a macro-econometric model of the Indian economy based on quarterly data. In India, work on structural macro-econometric models has a long history<sup>1</sup> but models on the basis of quarterly data have been limited<sup>2</sup> in number and in scope. Components of national income, viz., GDP at factor cost and GDP at market prices have become available on quarterly basis since 1996-97. Forecasts made using quarterly data based on a macro model can provide useful inputs for policy intervention and for improving the quality of annual forecasts. Internationally, structural models have generally been estimated both on quarterly basis and on annual basis.

There are important data consistency problems. Quarterly GDP data, both aggregate and sectoral, do not necessarily add up to the corresponding annual GDP data which themselves are revised several times. Similarly, quarterly fiscal deficits do not necessarily add to the annual fiscal deficit given in the central budget which, again by itself, differs from the net change in the liabilities of the central government shown in the budget on an annual basis. It is difficult to capture the fiscal sector in full since, on a quarterly basis, data related to the state governments are not available. There are other significant data limitations. In particular, while disaggregated output data are available on a quarterly basis, corresponding capital stock data are not available.

For two important stock variables, namely capital stock and government debt, quarterly flows should add to the end-year capital stock at the end of fourth quarter. The adjustments required for this purpose are explained in Appendix 1. Similarly, end-March government liabilities on annual basis should also match with the sum of liabilities for the four quarters. This also requires adjustment as explained in Appendix 1.

### 1.1 Sectoral Disaggregation and Inter-linkages

The model proposed here has four main sectors: Real Sector, Fiscal Sector, Monetary and Financial Sectors, and the External Sector. The Real Sector has three parts: (a) aggregate demand, (b) aggregate output, and (c) capital stock and investment. Three types of price indices are used: wholesale price indices, selected consumer price indices, and GDP deflators. For the wholesale price indices, the following sub-components are considered: food articles, primary articles, fuel and power, food products in the group of manufactured articles, and non-food products in the group of manufactured articles. Inflation based on the WPI index of manufactured articles excluding food products is often taken as indicative of core inflation.

The model is specified in terms of two layers: long run equilibrium relations and short term dynamics around the long run relationships. Output is divided into eight sectors. The long term output relations reflect creation of productive capacity by investment that accumulates as net fixed capital stock in each sector. The short term dynamics captures movement around the long run relationship. Production could be less than capacity due to demand deficiency or supply constraints or both. If demand is more than potential/capacity, it pushes up inflation. Output, aggregate demand, and money supply have a simultaneous impact on prices.

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<sup>1</sup> See Krishnamurthy (2008) for a review.

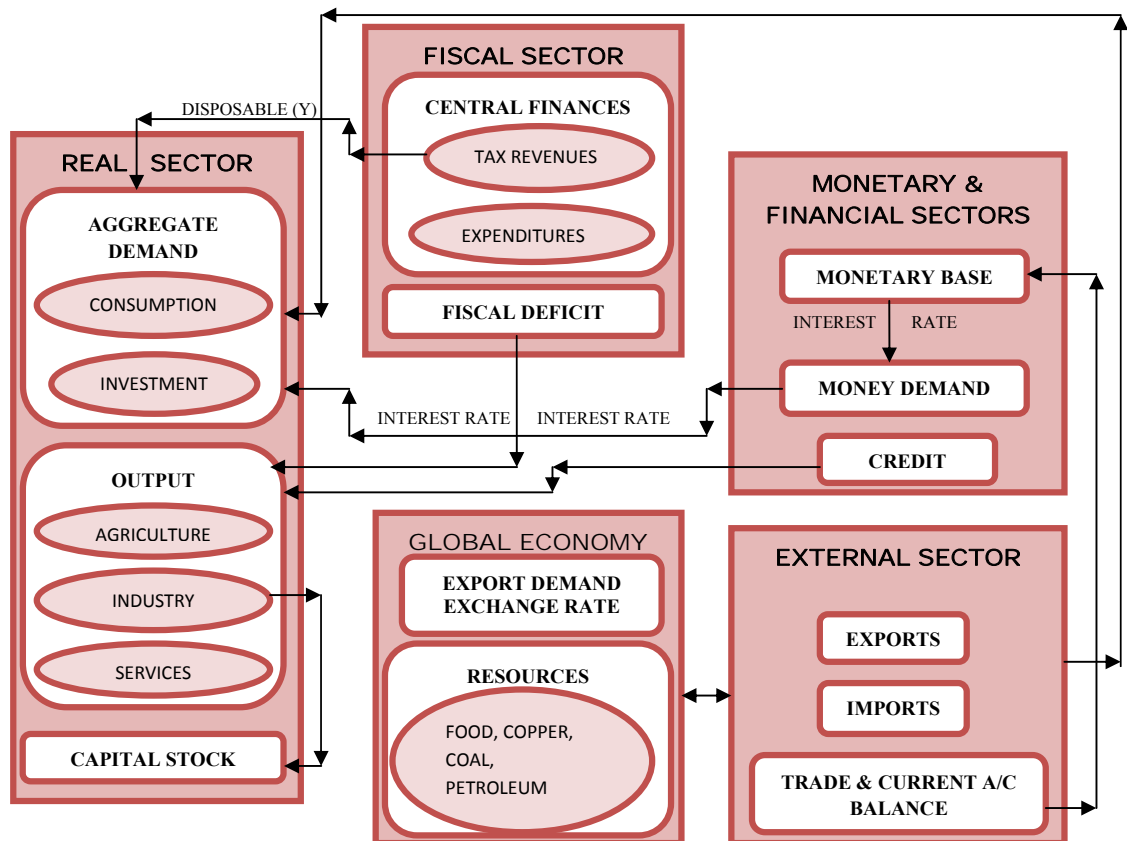
<sup>2</sup> One recent work is by Bhanumurthy and Kumawat (2009).



Aggregate demand is the sum of private consumption, government consumption, overall investment, and exports net of imports. Exports and imports are determined in dollar terms and then multiplied by the exchange rate to give the equivalent rupee amount. The exogenous influences in the external sector emanate from world output growth, and global prices of important resources like food, crude petroleum, coal, and copper. For income growth, we distinguish between developed countries and emerging economies.

In the monetary sector, reserve money (M0), broad money (M3), and liquidity aggregates (L1, L3) are determined. Using these, short term and long term interest rates are determined.

In the case of the fiscal sector, taxes are divided into the following aggregate categories: personal income tax, corporate income tax, Union excise duties, customs duties, service tax and other central taxes. Net central taxes are obtained after netting out the share of states in the shareable pool of central taxes. Total expenditure is divided into revenue expenditure and capital expenditure. Central revenue receipts are the sum of tax revenues and non-tax revenues. Revenue expenditure is further divided into primary revenue expenditure and interest payments. Capital receipts are divided into two parts: fiscal deficit and non-debt capital receipts.



**Flow Chart 1.1: Sectoral Inter-linkages**

## 1.2 Estimation Methodology

In general, the sample period ranges from 1997-98Q1 to 2012-13Q2. Estimation periods vary depending on data availability. All real variables are defined at 2004-05 prices. Since national income data prior to 2004-05 are at 1999-00 prices, these have been converted into 2004-05 prices using splicing method. A variable name preceded by 'L' indicates natural log of the variable. A variable name preceded by 'D' indicates first difference of the variable. Variable names preceded by 'Z' indicate deviation of the actual level from forecasted long term equilibrium level. Mean-adjusted quarterly dummy variables are used to capture seasonal influences.

As mentioned earlier, the model consists of two interacting layers: one set of relationship consists of long run equilibrium relations containing co integrated variables and a second set estimated in terms of first differences containing error correction terms indicating how the macro-economy evolves around the long run equilibrium path and the short term deviations move around the long term movement of the economy.

The stochastic equations are estimated by two stage least squares method. The level equations use co integration and/or co-breaking. This depends on whether an error correction term is found to be significant in the equation of short term dynamics around a long term equilibrium relationship. For each equation, the instruments used for estimation of the first stage consist of two groups: (a) a set of variables that are common across equations, separately for levels and first differences, and (b) equation specific pre-determined variables.

In the levels equations, the commonly used set of instrumental variables in the first stage is as follows: C, TT, LBPR, LER, LCNTR, LCNPKE, LCRRATIO, LYAR (-1)

The correlation coefficients among these as given in Table 1.1 over a common sample period (1999q1 to 2013 q2) indicate that the correlation coefficients are not too high and these instruments contain useful independent information.

**Table 1.1: Correlation Coefficients among Instrumental Variables: Levels**

Variables	TT	LBPR	LER	LCNTR	LCNPKE	LCRRATIO	LYAR(-1)
TT	1.000						
LBPR	-0.560	1.000					
LER	0.494	-0.383	1.000				
LCNTR	0.514	-0.376	0.280	1.000			
LCNPKE	0.528	-0.267	0.104	0.409	1.000		
LCRRATIO	-0.593	0.601	-0.622	-0.303	-0.299	1.000	
LYAR(-1)	0.582	-0.302	0.241	0.294	0.583	-0.294	1.000

*Estimated.*

The first difference equations also use instrumental variables wherever relevant consisting in general of a common set of predetermined variables and other equation-specific variables. The common set of instruments for the short term equations are as follows:

C DLBPR, DLCRRATIO, DLYAR (-1), DLYEGWSR (-1), DLYCSPSR (-1), DLYTHTCR (-1), DLYCONSR (-1)

The correlation coefficients among these as given in Table 1.2 over a common sample period (1999q1 to 2013 q2) indicate that the correlation coefficients are not too high and they contain useful independent information.

**Table 1.2: Correlation Coefficients among Instrumental Variables: First Differences**

Variables	DLBPR	DLCRRATIO	DLYAR(-1)	DLYEGWSR (-1)	DLYCSPSR (-1)	DLYTHTC R(-1)	DLYCON SR(-1)
DLBPR	1.000						
DLCRRATIO	0.462	1.000					
DLYAR(-1)	-0.004	-0.007	1.000				
DLYEGWSR(-1)	-0.158	0.042	-0.043	1.000			
DLYCSPSR(-1)	-0.262	-0.165	-0.236	0.126	1.000		
DLYTHTCR(-1)	-0.037	0.001	0.571	0.052	0.455	1.000	
DLYCONSR(-1)	-0.136	0.080	0.271	0.209	0.579	0.636	1.000

*Estimated*

Estimation provides for both unit roots and seasonal roots. The first three quarters are indicated by QQ1, QQ2, and QQ3. Generally, all of these are used together, even if some of these may not be statistically significant.

**BOX 1: DISTINGUISHING BETWEEN SHORT AND LONG RUN ELASTICITIES & SHORT AND LONG TERM ERROR CORRECTION MECHANISM**

In interpreting the various estimated equations, we will use terms like short and long run elasticities or responsiveness. These need to be distinguished from the error correction mechanism where we identify the extent of adjustment that may happen in the short run (one quarter). The error correction mechanism refers to the extent and the speed with which the short term disequilibrium between the actual value of a variable and its long term equilibrium value moves towards the long term equilibrium value. This is identified by the magnitude of the co-efficient of the term starting with the symbol 'Z' in the equations titled short term dynamics. This co efficient is expected to be negative in sign and its magnitude is expected to be less than 1. Thus, a co efficient equal to -0.6 indicates that 60% of the adjustment takes place in one quarter. The terms short and long run elasticities refer to the relationship of the dependent variable with an individual independent variable. If in the same equation there is a lagged dependent variable, we may distinguish between short and long run elasticities. The short run elasticity will be given by the magnitude of the co efficient associated with the independent variable and the long run elasticity will be equal to this magnitude divided by 1-the co efficient attached to the lagged dependent term.

The presentation is divided into nine Chapters. Chapter 1 provides the introduction. Chapters 2 to 6 give specification and estimation details covering the real, fiscal, monetary and financial, prices, and external sectors. Chapter 7 summarizes various model features including the details about the exogenous variables and provides an analysis relating to in-sample validation. Chapter 8 gives an overview of recent economic developments and forecasts and Chapter 9 gives the concluding observations.

## CHAPTER 2

### REAL SECTOR

The real sector consists of three parts: aggregate demand, aggregate output and investment and capital stock.

#### a. Aggregate Demand

Aggregate demand consists of private final consumption expenditure (CPR), government final consumption expenditure (CGR), gross fixed capital formation (GFCFR), exports (EXPR) net of imports (IMPR), change in stocks (CSTOCKR), investment in valuables (IVALR) and a statistical discrepancy term (DCPR). Thus, aggregate demand is given by:

##### 1. GDP at constant market prices:

$$YMR = (CPR + CGR) + (GFCFR + IVALR + CSTOCKR) + DCPR + (EXPR - IMPR)$$

##### 2. Private final consumption expenditure (CPR) is specified and estimated as:

$$a. LCPR = -0.180 + 0.671 * LYMRDISP - 0.049 * LIDLSR(-1) + 0.359 * LCPR(-4)$$

(-1.267)            (8.364)            (-2.581)            (4.611)

**Adj. R-sq: 0.99    D-W Stat: 2.048**

Short term dynamics

$$b. DLCPR = 0.002 + 0.582 * DLYMRDISP - 0.547 * ZLCPR(1) + 0.121 * QQ1 + 0.068 * QQ2$$

(0.451)            (2.911)            (-3.055)            (4.235)            (4.221)

$$+ 0.102 * QQ3$$

(4.165)

**Adj. R-sq: 0.93    D-W Stat: 2.190**

The appropriate income term for determining private consumption expenditure is private or personal disposable income. However, all the tax and transfer components needed to calculate the disposable income are not available on a quarterly basis. A proxy is developed for this purpose. Central direct taxes are deducted from GDP at market prices and interest payments are added to arrive at an indicator of disposable income in real terms after deflating these by the implicit price deflator for GDP at market prices. Indirect tax net of subsidies is used as a separate regressor. In this case the error correction mechanism is found to be significant. The magnitude of the coefficient of adjustment is 0.58.

In the case of private consumption expenditure, the long run marginal propensity to consume out of real disposable income is 0.67. Private consumption expenditure responds negatively to increases in indirect taxes net of subsidies.

### 3. Government final consumption expenditure

$$\text{a. LCGR} = 2.837 + 0.440*\text{LCPRIMEREREAL} - 0.062*\text{QQ1} - 0.086*\text{QQ2} - 0.026*\text{QQ3}$$

(6.365)                      (8.785)                      (-1.985)                      (-2.735)                      (-0.865)

$$+ 0.326*\text{LCGR}(-4)$$

(4.283)

**Adj. R-sq: 0.947      D-W Stat: 2.11176**

Short term dynamics

$$\text{b. DLCGR} = -0.007 - 0.848*\text{ZLCGR}(-1) + 0.571*\text{DLCPRIMEREREAL} + 0.330*\text{DLCGR}(-4)$$

(-0.758)                      (-6.251)                      (9.258)                      (5.726)

$$-0.009*\text{QQ1} - 0.025*\text{QQ2} + 0.071*\text{QQ3}$$

(-0.165)                      (-0.807)                      (2.335)

**Adj. R-sq: 0.937      D-W Stat: 2.126**

Real government final consumption expenditure has been related to central government's primary revenue expenditure (CPRIMEREREAL) deflated by the implicit price deflator of GDP at market prices. The implied assumption is that the state government's primary revenue expenditure also moves in line with centre's primary revenue expenditure. Apart from the fact that state level primary revenue expenditure data are not available on quarterly basis, it may be noted that an important part of centre's revenue expenditure is in the form of transfers to states.

The co efficient of adjustment is 0.85 in the equation describing the short term dynamics indicating that adjustments are completed in a period of little more than one quarter.

### 4. Gross fixed capital formation

$$\text{a. LGFCFR} = -0.071 + 0.238*\text{LYMRDISP} - 0.226*\text{LIDBIRL} + 0.789*\text{LGFCFR}(-1)$$

(-0.103)                      (2.246)                      (-2.381)                      (9.883)

$$-0.100*\text{DD109Q4} - 0.106*\text{QQ1} - 0.021*\text{QQ2} - 0.038*\text{QQ3}$$

(-1.188)                      (-3.279)                      (-3.055)                      (-5.426)

**Adj. R-sq: 0.996      D-W Stat: 2.162**

Short term dynamics

$$\text{b. DLGFCFR} = 0.025 - 0.172*\text{ZLGFCFR}(-1) - 0.119*\text{DD109Q4} - 0.143*\text{QQ1} - 0.053*\text{QQ2}$$

(5.945)                      (-1.869)                      (-3.556)                      (-11.942)                      (-4.519)

$$-0.046*\text{QQ3}$$

(-3.892)

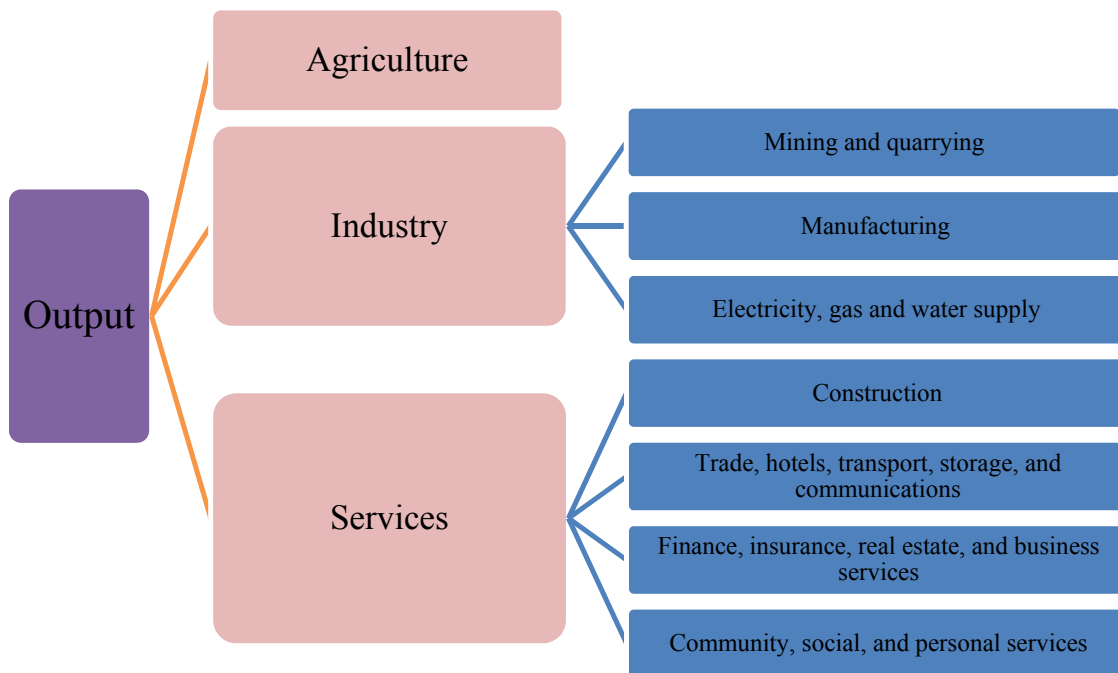
**Adj. R-sq: 0.716      D-W Stat: 2.057**

The gross fixed capital formation equation indicates a positive response to increases in the indicator used for disposable income and a negative response to long term interest rates. The short term elasticities in both cases is almost equal at 0.24 and 0.23 and the coefficient of lagged dependent term is 0.79 indicating that the long run elasticities are a lot higher than the short run elasticities. The coefficient of adjustment is 0.17. This indicates that investment adjustments take much longer to be completed (more than 5 quarters) as compared to adjustments in consumption expenditure.

The exports and imports equations are given in the section on the external sector. Investment in valuables and discrepancy terms are taken as exogenous. The excess of aggregate demand over aggregate supply determines change in stocks.

## b. Aggregate Output

The aggregate output is divided into outputs of eight sub sectors: Agriculture & allied activities (YAR), Mining & Quarrying (YMQR), Manufacturing (YMANR), Electricity, Gas & Water Supply (YEGWSR), Construction (YCOSNR), Trade, hotels, transport, storage, & communications (YTHTCR), Finance, Insurance, Real Estate & Business Services (YFRBSR), and Community, Social & Personal Services (YCSPSR). Together these provide the Gross Domestic Product at factor cost (YR). These are aggregated into Agriculture, Industry, and Services as shown by Flow Chart 2.1.



**Flow Chart 2.1: Output and its Sectoral Composition**

Thus, we have

5. Gross Domestic Product at factor cost  $YR=YAR+YINDR+YSER$
6. Industrial output  $YINDR=YMQR+YMANR+YEGWSR$
7. Service sector output  $YSER=YCOSNR+ YTHTCR+YFRBSR+YCSPSR$

Table 2.1 gives the correlation coefficients of quarter-on-quarter sectoral growth rates showing the strength of inter-sectoral interdependence.

**Table 2.1: Correlation Coefficients of Sectoral Growth Rates**  
(Quarter of current year over quarter of preceding year)

	yar	ymqr	ymanr	yegwsr	ycosnr	ythtcr	yfrbsr	ycpsr	yr
yar	1								
ymqr	-0.370	1.000							
ymanr	0.075	0.181	1.000						
yegwsr	-0.087	<b>0.520</b>	0.012	1.000					
ycosnr	0.106	0.413	<b>0.526</b>	0.336	1.000				
ythtcr	0.433	0.189	<b>0.665</b>	0.121	0.485	1.000			
yfrbsr	-0.010	0.389	0.178	0.310	0.359	0.317	1.000		
ycpsr	-0.062	-0.124	-0.316	-0.025	-0.019	-0.308	0.023	1.000	
yr	<b>0.705</b>	-0.004	<b>0.529</b>	0.099	<b>0.537</b>	<b>0.782</b>	0.399	0.123	1.000

Source (Basic Data): National Income Accounts

8. Change in Stocks (CSTOCKR):  $CSTOCKR= YMR-(YR+IDL SR)$

where, IDLSR is indirect tax net of subsidies.

In the sectoral production functions, the output series and capital stock series are non-stationary. We have examined whether in these cases the error correction mechanism works. In case the error correction is found to be significant, that is the first difference of the output adjust because of the deviation in actual output and long term output (for the previous quarter), the production in terms of current levels is determined by using the long term and short equations. The deviation from the long term output is indicated by prefixing the variable name by Z.

Capital stock data is not available on quarterly basis. Only aggregate investment data is available on quarterly basis. For this purpose, sectoral investment data for net fixed investment is generated by sectorally allocating the aggregate investment data in the same ratio as the previous data for the fourth quarter (end of financial year). The ratio changes every fourth quarter. The adjustment is on account of two factors: adjustment for moving from gross to net (consumption of fixed capital), and errors and omissions as the sum of the quarterly data (for four quarters) differs from the corresponding annual data.

All output functions in the long run equilibrium relationships are functions of capital stock in that sector which creates the productive capacity. Given this productive capacity, actual outputs differ depending on both demand and supply constraints.

The estimated equations are given below with a short explanation following thereof. As can be seen, there are two sets of equation explaining each sector: one showing the long run equilibrium relationship, and the other giving the error correction model that depicts the short term behaviour with respect to the co integrated model.



### 9. Output of agriculture and allied sectors:

$$\begin{aligned} \text{a. LYAR} &= 5.568 + 0.257*\text{LKAR}(-4) + 0.290*\text{LYEGWSR}(-1) - 0.019*\text{DRAINFALL} \\ &\quad (6.593) \quad (1.847) \quad (2.561) \quad (-2.084) \\ &\quad - 0.114*\text{DD103Q4} - 0.088*\text{QQ1} - 0.324*\text{QQ2} + 0.185*\text{QQ3} \\ &\quad (-3.493) \quad (-7.076) \quad (-26.239) \quad (15.119) \end{aligned}$$

**Adj. R-sq: 0.980 D-W Stat: 1.858**

Short term dynamics

$$\begin{aligned} \text{b. DLYAR} &= 0.003 - 0.630*\text{ZLYAR}(-1) + 0.231*\text{DLYAR}(-4) + 0.065*\text{DD104Q3} \\ &\quad (0.794) \quad (-4.164) \quad (1.962) \quad (1.961) \\ &\quad + 0.088*\text{QQ1} - 0.032*\text{QQ2} + 0.530*\text{QQ3} \\ &\quad (4.651) \quad (-2.443) \quad (6.278) \end{aligned}$$

**Adj. R-sq: 0.990 D-W Stat: 1.839**

The long run production function for the output of agriculture and allied sectors shows an elasticity, with respect to capital stock, of only 0.26. It is also constrained by the supply of electricity. The rainfall variable shows years in which rainfall is deficient as compared to the average. The sign of the co efficient attached to the rainfall variable is negative showing that output falls if rainfall is deficient. The error correction term shows a magnitude of 0.7.

### 10. Output of mining and quarrying:

$$\begin{aligned} \text{a. LYMQR} &= 1.437 + 0.090*\text{LKMQR}(-4) + 0.740*\text{LYMQR}(-1) - 0.176*\text{QQ1} - 0.117*\text{QQ2} \\ &\quad (3.329) \quad (2.832) \quad (9.429) \quad (-17.889) \quad (-11.196) \\ &\quad + 0.002*\text{QQ3} + 0.055*\text{D102Q1} \\ &\quad (0.159) \quad (3.243) \end{aligned}$$

**Adj. R-sq: 0.985 D-W Stat: 2.133**

Short term dynamics

$$\begin{aligned} \text{b. DLYMQR} &= 0.010 - 0.335*\text{ZLYMQR}(-1) - 0.193*\text{QQ1} - 0.100*\text{QQ2} + 0.027*\text{QQ3} \\ &\quad (2.913) \quad (-2.910) \quad (-20.959) \quad (-10.781) \quad (2.958) \end{aligned}$$

**Adj. R-sq: 0.924 D-W Stat: 2.074**

In the case of mining and quarrying, as can be seen, the responsiveness to capital stock is even smaller. The responsiveness to its own lagged value is high at 0.74 and is highly significant. Both the responses are positive. The error correction term shows a co efficient of adjustment of 0.34.

### 11. Output of manufacturing:

$$\begin{aligned} \text{a. LYMANR} &= 2.769 + 0.112*\text{LKMANR}(-4) + 0.665*\text{LYCONSR}(-1) - 0.087*\text{QQ1} \\ &\quad (7.262) \quad (1.998) \quad (14.345) \quad (-9.182) \\ &\quad - 0.053*\text{QQ2} - 0.018*\text{QQ3} + 0.075*\text{D106Q4} - 0.057*\text{DD109Q3} \\ &\quad (-5.741) \quad (-1.924) \quad (5.587) \quad (-2.158) \end{aligned}$$

**Adj. R-sq: 0.994**      **D-W Stat: 1.159**

Short term dynamics

$$\begin{aligned} \text{b. DLYMANR} &= 0.012 - 0.200*\text{ZLYMANR}(-1) + 0.245*\text{DLYMANR}(-1) - 0.126*\text{QQ1} \\ &\quad (4.189) \quad (-1.976) \quad (2.352) \quad (-18.064) \\ &\quad - 0.022*\text{QQ2} - 0.031*\text{QQ3} - 0.061*\text{DD109Q4} \\ &\quad (-2.087) \quad (-5.069) \quad (-3.406) \end{aligned}$$

**Adj. R-sq: 0.874**      **D-W Stat: 1.941**

For the manufacturing output, there is a positive response to changes in both capital stock in manufacturing and the output of the construction sector. While the degree of responsiveness is low to capital stock at 0.1, it is high with respect to output from the construction sector (0.67). The coefficient of adjustment is 0.2.

### 12. Output of electricity, gas and water supply:

$$\begin{aligned} \text{a. LYEGWSR} &= -0.691 + 0.209*\text{LKEGWSR}(-4) + 0.044*\text{DD108Q1} + 0.038*\text{D104Q2} \\ &\quad (-1.127) \quad (1.927) \quad (2.257) \quad (3.017) \\ &\quad + 0.469*\text{LYEGWSR}(-1) + 0.313*\text{LYEGWSR}(-4) \\ &\quad (4.084) \quad (3.069) \end{aligned}$$

**Adj. R-sq: 0.994**      **D-W Stat: 1.939**

Short term dynamics

$$\begin{aligned} \text{b. DLYEGWSR} &= 0.011 - 0.406*\text{ZLYEGWSR}(-1) + 0.201*\text{DLYEGWSR}(-4) + 0.041*\text{DD108Q1} \\ &\quad (3.628) \quad (-3.315) \quad (1.723) \quad (2.101) \\ &\quad + \\ &\quad + 0.028*\text{DD106Q1} - 0.003*\text{QQ1} - 0.011*\text{QQ2} - 0.012*\text{QQ3} \\ &\quad (1.443) \quad (-0.455) \quad (-1.471) \quad (-1.666) \end{aligned}$$

**Adj. R-sq**      **0.325**      **D-W Stat**      **2.04**

In the case of output of electricity, gas, and water supply, elasticity of response to capital stock is 0.21 and is positive. The output shows persistence with respect to existing capacity as reflected by the significant lagged output terms. The magnitude of error correction is 0.41.

### 13. Output of construction:

$$\begin{aligned} \text{a. LYCONSR} &= 1.102 + 0.137*\text{LKCONSR}(-4) + 0.749*\text{LYCONSR}(-1) - 0.074*\text{QQ1} \\ &\quad (2.581) \quad (2.550) \quad (7.631) \quad (-7.984) \\ &\quad -0.066*\text{QQ2} - 0.022*\text{QQ3} \\ &\quad (-7.748) \quad (-2.444) \end{aligned}$$

**Adj. R-sq: 0.996**                      **D-W Stat: 1.937**

Short term dynamics

$$\begin{aligned} \text{b. DLYCONSR} &= 0.018 - 0.171*\text{ZLYCONSR}(-1) + 0.201*\text{DLYCONSR}(-4) - 0.065*\text{QQ1} \\ &\quad (4.677) \quad (-2.034) \quad (1.650) \quad (-4.882) \\ &\quad - 0.051*\text{QQ2} - 0.008*\text{QQ3} - 0.054*\text{DD104Q3} \\ &\quad (-4.439) \quad (-0.875) \quad (-2.354) \end{aligned}$$

**Adj. R-sq: 0.713**                      **D-W Stat: 1.869**

In the case of construction sector, capital elasticity is 0.14 and is positive. The degree of responsiveness to its own lagged value is far greater and significant too. The magnitude of error correction is 0.17.

### 14. Output of trade, hotels, transport, storage and communication:

$$\begin{aligned} \text{a. LYTHTCR} &= -1.268 + 0.352*\text{LKTHTCR}(-4) + 0.781*\text{LYCONSR}(-1) - 0.111*\text{QQ1} \\ &\quad (-4.356) \quad (5.833) \quad (14.753) \quad (-9.404) \\ &\quad - 0.096*\text{QQ2} - 0.009*\text{QQ3} \\ &\quad (-8.304) \quad (-0.779) \end{aligned}$$

**Adj. R-sq: 0.995**                      **D-W Stat: 1.253**

Short term dynamics

$$\begin{aligned} \text{b. DLYTHTCR} &= 0.009 - 0.216*\text{ZLYTHTCR}(-1) + 0.582*\text{DLYTHTCR}(-4) \\ &\quad (2.413) \quad (-2.172) \quad (6.014) \\ &\quad + 0.063*\text{DD104Q3} - 0.046*\text{QQ1} - 0.021*\text{QQ2} + 0.002*\text{QQ3} \\ &\quad (2.908) \quad (-3.635) \quad (-2.440) \quad (0.256) \end{aligned}$$

**Adj. R-sq: 0.888**                      **D-W Stat: 2.145**

For output in trade, hotels, transport, storage and communications, the elasticity of response with respect to the sectoral capital stock is 0.35. The degree of responsiveness to output from construction is very high at 0.78 and is also statistically significant. The coefficient of adjustment is 0.22.

### 15. Output of financial, real estate and business services:

$$\begin{aligned} \text{a. LYFRBSR} &= 0.202 + 0.032*\text{LNFCREDITREAL} + 0.953*\text{LYFRBSR}(-1) - 0.042*\text{QQ1} \\ &\quad (1.600) \quad (2.127) \quad (38.125) \quad (-9.404) \\ &- 0.032*\text{QQ2} - 0.016*\text{QQ3} - 0.052*\text{DD101Q1} \\ &\quad (-7.279) \quad (-3.720) \quad (-4.415) \end{aligned}$$

**Adj. R-sq: 0.999      D-W Stat: 2.249**

Short term dynamics

$$\begin{aligned} \text{b. DLYFRBSR} &= 0.013 + 0.029*\text{DLNFCREDITREAL} - 0.296*\text{ZLYFRBSR}(-1) \\ &\quad (4.872) \quad (2.457) \quad (-3.571) \\ &+ 0.422*\text{DLYFRBSR}(-4) + 0.029*\text{DD109Q4} - 0.051*\text{DD101Q1} \\ &\quad (4.153) \quad (3.018) \quad (-5.167) \\ &- 0.028*\text{DD105Q2} - 0.018*\text{QQ1} - 0.013*\text{QQ2} - 0.009*\text{QQ3} \\ &\quad (-2.699) \quad (-3.070) \quad (-2.601) \quad (-2.267) \end{aligned}$$

**Adj. R-sq: 0.818      D-W Stat: 2.023**

For output of financial, real estate and business services, sectoral capital stock was not found to have a significant influence in the long run relationship. It responds to Non-Food Credit in real terms. The short term responsiveness is 0.30 and the co efficient attached to output lagged 4 quarters in 0.42.

### 16. Output of community, social and personal services:

$$\begin{aligned} \text{a. LYCSPSR} &= 4.264 + 0.653*\text{LCPRIMEREREAL} + 0.005*\text{QQ1} + 0.041*\text{QQ2} \\ &\quad (25.105) \quad (43.246) \quad (0.245) \quad (2.279) \\ &+ 0.002*\text{QQ3} - 0.126*\text{DD107Q1} - 0.160*\text{DD109Q3} \\ &\quad (0.122) \quad (-2.578) \quad (-3.201) \end{aligned}$$

**Adj. R-sq: 0.047      D-W Stat: 0.112**

Short term dynamics

$$\begin{aligned} \text{b. DLYCSPSR} &= 0.009 + 0.345*\text{DLCPRIMEREREAL} - 0.645*\text{ZLYCSPSR}(-1) - 0.195*\text{QQ1} \\ &\quad (1.892) \quad (10.962) \quad (-5.648) \quad (-8.412) \\ &- 0.015*\text{QQ2} - 0.124*\text{QQ3} \\ &\quad (-1.081) \quad (-8.385) \end{aligned}$$

**Adj. R-sq: 0.955      D-W Stat: 2.229**

In the short run, there was a positive response to changes in the output of community, social, and personal services with respect to primary revenue expenditure of the central

government defined in real terms. The elasticity of response in the short term is as high as 0.65. The co-efficient of adjustment estimated in the short term error correction equation is 0.65.

### c. Capital Stock and Sectoral Investment

For each production sector, net fixed capital stock is derived by adding sectoral investment to the end-quarter capital stock of the previous quarter. Investment into net fixed capital stock is derived by applying sectoral share to aggregate net investment into fixed capital stock. Three sectoral investment shares are taken as exogenous. These sectors are the agricultural, the mining and quarrying, and the electricity, gas, and water supply sectors. In all these 3 sectors, public sector investment is important and is policy driven to a large extent. Investment in the trade, hotels, transport, storage, and communications is taken as a residual. One is derived as a residual since all sectoral shares should add to 1. For the remaining four stochastic equations are developed. Since these are shares, the equations are developed in terms of levels and not first differences.

Sectoral capital stocks are thus given by the following identities.

17. Investment into net fixed capital stock:  $NIFCR = IFACTOR * (GFCFR)$

IFACTOR provides the adjustment for deduction of consumption of capital to obtain investment into net fixed capital stock from gross fixed capital formation.

18.  $KAR = KAR(-1) + SIAR * NIFCR$

19.  $KMQR = KMQR(-1) + SIMQR * NIFCR$

20.  $KMANR = KMANR(-1) + SIMANR * NIFCR$

21.  $KEGWSR = KEGWSR(-1) + SEGWSR * NIFCR$

22.  $KCONSR = KCONSR(-1) + SICONSR * NIFCR$

23.  $KTHTCR = KTHTCR(-1) + SITHTCR * NIFCR$

24.  $KFRBSR = KFRBSR(-1) + SIFRBSR * NIFCR$

25.  $KCSPSR = KCSPSR(-1) + SICSPSR * NIFCR$

For the sectoral shares the following equations have been developed.

26.  $LSICONSR = -0.739 + 0.752 * LSICONSR(-1) + 0.578 * DD102Q1$   
                   (-4.754)           (14.848)                   (3.644)

**Adj. R-sq: 0.783      D-W Stat: 1.129**

27.  $LSIEGWSR = -0.507 + 0.828 * LSIEGWSR(-1) - 0.383 * DD105Q1$   
                   (-2.699)           (13.125)                   (-5.635)

**Adj. R-sq: 0.772      D-W Stat: 1.899**

28.  $LSIFRBSR = -0.038 + 0.987 * LSIFRBSR(-1) - 0.065 * QQ1 + 0.497 * DD109Q1$   
                   (-0.741)           (32.541)           (-2.457)           (6.592)  
                   +0.442 \* DD100Q1  
                   (5.946)

**Adj. R-sq: 0.946      D-W Stat: 1.91**

In all these cases, the respective shares of sectoral investment are driven by the momentum of the sector and largely dependent on the history of the investment in these sectors.

$$29. \text{LSIMANR} = 3.241 + 0.883 * \text{LSIMANR}(-1) - 2.686 * (\text{LKMANR}(-1) / \text{LYMANRF}(-1))$$

(1.991)	(25.414)	(-2.072)
---------	----------	----------

- 0.565 * DD102Q1	- 0.447 * DD109Q1
(-7.865)	(-6.012)

**Adj. R-sq: 0.930      D-W Stat: 2.27**

For the manufacturing sector, expected productivity of capital has been considered to be an important determinant. This is measured by the lagged capital-output ratio which is the inverse of expected productivity. The expected value of output is taken as the long term forecasted value of output. Since it is the inverse of productivity, the expected sign is negative as indicated in the equation.

$$30. \text{SITHTCR} = 1 - (\text{SIAR} + \text{SIMQR} + \text{SIMANR} + \text{SIEGWSR} + \text{SICONSR} + \text{SIFRBSR} + \text{SICSPSR})$$

The share of investment in trade, hotels, transport, storage, and communication is taken as a residual. It may be noted that, in terms of magnitude of the share of the sector in overall investment is the highest.

## CHAPTER 3

### FISCAL SECTOR

The fiscal sector focuses only on the central government as the relevant data for the state governments are not available on a quarterly basis. The central taxes consist of personal income taxes (CITR), corporate income taxes (CPTR), Union excise duties (UDR), customs duties (CCDR), services taxes (CSVR) and other taxes (COTR). These add to gross central taxes. From these, the share of states (ASTATES) is deducted to derive the net central tax revenues.

Net central taxes are thus given by:

#### 31. Net central tax revenue:

$$CTR = CITR + CPTR + UDR + CCDR + CSVR + COTR - ASTATES$$

The service tax revenue has grown at a fast rate because of the expansion of coverage as well as rate increases. With the introduction of negative list, the tax base would be stabilized as would the buoyancy.

#### 32. Personal income tax revenue:

$$\begin{aligned}
 \text{a. LCITR} &= -7.564 + 1.247*(LYMR+LPYMR) - 0.521*QQ1 - 0.217*QQ2 \\
 &\quad (-13.661) \quad (31.247) \quad (-9.652) \quad (-4.021) \\
 &\quad - 0.363*QQ3 + 0.416*DD108Q3 \\
 &\quad (-6.480) \quad (2.960)
 \end{aligned}$$

**Adj. R-sq: 0.959**                      **D-W Stat: 1.928**

Short term dynamics

$$\begin{aligned}
 \text{b. DLCITR} &= - 0.004 - 0.856*ZLCITR(-1) + 0.744*DLCITR(-4) + 0.818*DD106Q3 \\
 &\quad (-0.111) \quad (-3.198) \quad (8.273) \quad (3.574) \\
 &\quad - 0.219*DLCITR(-1) \\
 &\quad (-2.456)
 \end{aligned}$$

**Adj. R-sq: 0.759**                      **D-W Stat: 2.154**

Since tax revenues are in nominal terms, we have used nominal income as the main determinant. For personal income tax, the average elasticity is estimated (buoyancy) to be 1.25. The magnitude of co efficient of adjustment is very high at 0.86.

#### 33. Tax on corporate incomes:

$$\begin{aligned}
 \text{a. LCPTR} = & -9.356 + 1.390*(\text{LYMR}+\text{LPYR}) - 1.062*\text{QQ1} - 0.122*\text{QQ2} \\
 & (-4.909) \quad (9.767) \quad (-9.933) \quad (-1.169) \\
 & - 0.165*\text{QQ3} + 0.540*\text{DD109Q1} + 0.412*\text{D105Q1} \\
 & (-1.568) \quad (2.000) \quad (2.969)
 \end{aligned}$$

**Adj. R-sq: 0.934                      D-W Stat: 1.856**

Short term dynamics

$$\begin{aligned}
 \text{b. DLCPTR} = & 0.069 - 0.808*\text{ZLCPTR}(-1) + 0.234*\text{DLCPTR}(-4) - 0.431*\text{DD112Q1} \\
 & (1.906) \quad (-5.353) \quad (2.075) \quad (-1.670) \\
 & - 0.877*\text{QQ1} + 0.532*\text{QQ2} - 0.067*\text{QQ3} \\
 & (-4.719) \quad (4.161) \quad (-0.664)
 \end{aligned}$$

**Adj. R-sq: 0.908                      D-W Stat: 1.924**

For corporate income tax, the elasticity given in the long run equation is even higher at 1.4 and the coefficient of adjustment is also high at 0.81

### 34. Customs duties:

$$\begin{aligned}
 \text{a. LCCDR} = & 0.641 + 0.191*(\text{LIMPR}+\text{LPIMP}) - 0.457*\text{DD109Q4} + 0.698 \text{LCCDR}(-1) \\
 & (2.161) \quad (3.789) \quad (-5.697) \quad (8.263) \\
 & - 0.069*\text{QQ1} + 0.032*\text{QQ2} - 0.014*\text{QQ3} \\
 & (-2.162) \quad (0.991) \quad (-0.426)
 \end{aligned}$$

**Adj. R-sq: 0.972                      D-W Stat: 2.050**

Short term dynamics

$$\begin{aligned}
 \text{b. DLCCDR} = & 0.033 - 0.435*\text{ZLCCDR}(-1) + 0.155*\text{DD105Q2} - 0.513*\text{DD109Q4} - 0.064*\text{QQ1} \\
 & (2.972) \quad (-3.155) \quad (1.876) \quad (-6.422) \quad (-2.041) \\
 & + 0.039*\text{QQ2} - 0.015*\text{QQ3} \\
 & (1.195) \quad (-0.466)
 \end{aligned}$$

**Adj. R-sq: 0.580                      D-W Stat: 1.603**

For customs duties, the short run elasticity is measured with respect to the value of imports. It is quite low at 0.19. The coefficient of the lagged dependent term is 0.7 indicating that the long run elasticity is close to 0.63. The error adjustment term shows a coefficient of 0.44 for customs duties.

### 35. Union excise duties:



$$\begin{aligned}
 \text{a. LUDR} &= 1.453 + 0.213*(\text{LYMR}+\text{LPYMR}) - 1.053*\text{QQ1} - 0.079*\text{QQ2} \\
 &\quad (2.240) \quad (3.320) \quad (-15.956) \quad (-1.131) \\
 &\quad - 0.351*\text{QQ3} + 0.565*\text{LUDR}(-1) \\
 &\quad (-8.263) \quad (4.545)
 \end{aligned}$$

**Adj. R-sq: 0.930**                      **D-W Stat: 2.026**

Short term dynamics

$$\begin{aligned}
 \text{b. DLUDR} &= -0.006 + 1.760*\text{DLYMR} - 0.320*\text{ZLUDR}(-1) - 1.047*\text{QQ1} \\
 &\quad (-0.305) \quad (2.158) \quad (-2.805) \quad (-9.963) \\
 &\quad + 0.162*\text{QQ2} - 0.520*\text{QQ3} - 0.323*\text{DD109Q4} \\
 &\quad (3.471) \quad (-6.669) \quad (-3.444)
 \end{aligned}$$

**Adj. R-sq: 0.973**                      **D-W Stat: 2.536**

For the Union excise duties also, the tax base is taken as nominal income (GDP at MP). The short run buoyancy is 0.21. The long run buoyancy is close to 0.49.

The revenue from service tax has shown high, but with volatile buoyancy. This is so because of the expanding coverage of the service tax base and variations in the tax rates. It may also be noted that since part of the service tax is claimed as input tax credit under the union excise duties, it may be desirable to determine union excise duties and service tax revenue together, rather than separately. For the time being, we are using buoyancy coefficient to determine the service tax revenue.

36. Service tax revenue:  $\text{CSVR} = \{((\text{BCSVR}) * (\text{CSVR})_{-1} * (\text{DGDP})) / \text{GDP}_{-1}\} + \text{CSVR}_{-1}$

37. Central revenue receipts:  $\text{CRR} = \text{CTR} + \text{CNTR}$

38. Central government interest payments:  $\text{CIP} = \text{CIPRATE} * \text{CDEBT}(-1)$

39. Effective interest rate

$$\begin{aligned}
 \text{CIPRATE} &= 0.639 + 0.045*\text{BPR} + 0.557*\text{CIPRATE}(-4) - 0.526*\text{QQ1} \\
 &\quad (2.506) \quad (1.843) \quad (7.109) \quad (-3.959) \\
 &\quad - 0.377*\text{QQ2} - 0.465*\text{QQ3} - 0.225*\text{D101Q3} \\
 &\quad (-3.289) \quad (-3.848) \quad (-2.830)
 \end{aligned}$$

**Adj. R-sq: 0.914**                      **D-W Stat: 2.575**

The effective interest rate on government borrowing is shown to depend on the policy rate. While the immediate impact is limited in magnitude, since the lagged dependent term has a significant co-efficient, the long run responsiveness is high.

40. Centre's revenue deficit:  $\text{CRD} = \text{CRE} - \text{CRR}$

41. Centre's capital expenditure:  $\text{CKR} = \text{CFD} + \text{CNDKR} - \text{CRD}$

42. Centre's fiscal deficit:  $CFD = FDTARGET * YMRN(-1)$

43. Central debt:  $CDEBT = CDEBT(-1) + CFD$

**44. Indirect taxes net of subsidies:**

$$\begin{aligned} \text{a. LIDLSR} = & -2.450 + 0.576 * LCIDTREAL + 1.359 * LYR(-4) - 0.976 * LCPRIMEREREAL \\ & (-1.819) \quad (3.171) \quad (4.515) \quad (-6.321) \\ & - 0.311 * QQ1 - 0.210 * QQ2 - 0.248 * QQ3 \\ & (-2.775) \quad (-3.668) \quad (-3.175) \end{aligned}$$

**Adj. R-sq: 0.830     D-W Stat: 1.146**

Short term dynamics

$$\begin{aligned} \text{b. DLIDLSR} = & 0.011 - 0.586 * ZLIDLSR(-1) + 0.956 * DLCIDTREAL \\ & (0.786) \quad (-2.416) \quad (2.395) \\ & - 0.822 * DLCPRIMEREREAL + 0.269 * DLIDLSR(-4) - 0.156 * QQ1 \\ & (-8.726) \quad (3.015) \quad (-0.511) \\ & - 0.192 * QQ2 - 0.006 * QQ3 \\ & (-4.312) \quad (-0.063) \end{aligned}$$

**Adj. R-sq: 0.897     D-W Stat: 1.759**

The indirect taxes net of subsidies are used in the aggregate demand and output sections. Since these constitute the difference between GDP at MP and GDP at FC, they are defined here in terms of constant 2004-05 prices. The indirect taxes are captured partly by the central indirect taxes deflated by the implicit price deflator of GDP at MP. It is not possible to capture state level indirect taxes because of non-availability of data at quarterly frequency. But, it is assumed that the movement of state sales taxes would be captured by the movement of central indirect taxes. Data on a quarterly frequency for subsidies defined under the national income accounting concept are also not available on a quarterly basis. However, these are reflected, at least, partly by the changes in central government's primary revenue expenditure.

In the equilibrium relationship, the coefficient of responsiveness with respect to changes in real central indirect taxes is 0.58. The tax base is captured by GDP at FC. Elasticity with respect to this is 1.36. The short term adjustment equation indicates the magnitude of the error correction term as 0.59.

Interest payments are separately estimated. This is made a function of central debt. However, there are differences between the quarterly fiscal deficit and the annual derived fiscal deficit which accumulates into debt. In particular, the sum of deficits of the four quarter does not add up to the annual derived fiscal deficit. The quarterly fiscal deficits are therefore adjusted by a factor to ensure that cumulatively adding the quarterly fiscal deficits gives the central government's annual liabilities at the end of the fourth quarter of every financial year.

The fiscal deficit is financed by three methods: monetized fiscal deficit that adds to the monetary base, domestic borrowing that puts pressure on interest rates, and borrowing from external sources that puts pressure on the exchange rate.

As the discussion on monetary aggregates show, government's borrowing from the RBI was virtually eliminated but, more recently its share in the monetary base has been increasing again after 2008-09.

Policy interventions aimed at expansionary fiscal policy can take the following major forms:

1. Reduction in indirect taxes accompanied by higher fiscal deficit with same expenditure/lower fiscal deficit with reduced expenditure
2. Increase in subsidies financed by higher fiscal deficit/accompanied by reduction in non-subsidy expenditure.
3. Increase in primary revenue expenditure (financed by additional borrowing/ financed by additional revenue measures)
4. Increase in capital expenditure financed by additional borrowing/financed by surplus on revenue account

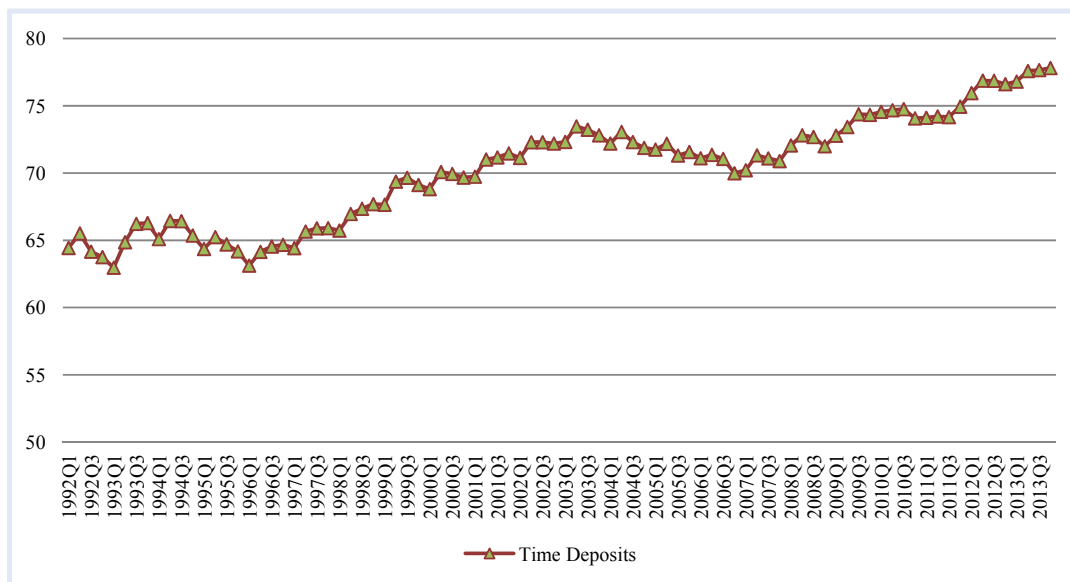
These are qualitatively different expansionary measures and would have different effects on the economy. Changes in the opposite direction would indicate contractionary policy.

## CHAPTER 4

### MONETARY AND CREDIT SECTORS

The monetary and financial sector consists of a number of monetary aggregates, liquidity aggregates, and interest rates. This sector is related to other sectors mainly as follows. Bank Credit is an input to output equations (real sector). Interest rate affects investment decisions (real sector). Reserve money is a component of wealth affecting aggregate demand. Financing of current account deficit affects monetary base.

M3 may be defined as the sum of four components: a) Currency with public, b) Other deposits with RBI, c) Demand deposits and d) Time deposits. The composition of M3 has been changing over time with time deposits accounting for a growing share in M3. M0 is also defined as an identity. It can be defined as the sum of: a) Currency in circulation, b) Other deposits with RBI and c) Banker's deposits with RBI.



**Chart 4.1: Share of Time Deposits in M3**

Chart 4.1 shows that the share of time deposits in M3 has been increasing over time. It was less than 65 percent in the early nineties but over time it has increased to more than 77 percent. A separate equation is therefore developed for time deposits.

Considering the differential behaviour of time deposits, the money multiplier can be decomposed into money multiplier applicable to terms in M3 other than time deposits (NTDEPOSITS) and time deposits (TDEPOSITS). Thus, the money multiplier (M3/M0) can be seen as the sum of the ratio of time deposits to reserve money (TDEPOSITS/M0) and the ratio of other components of M3 (NTDEPOSITS) to reserve money (NTDEPOSITS/M0). We define,  $MMULTONE = NTDEPOSITS/M0$ . The broad money can then be defined as follows:

45. Broad money:  $M3 = MMULTONE * M0 + TDEPOSITS$

#### 46. Multiplier related to components of M3 other than time deposits:

$$\begin{aligned} \text{a. MMULTONE} &= 0.374 - 0.066*\text{LDRMIN} + 0.809*\text{MMULTONE}(-1) + 0.100*\text{DD109Q3} \\ &\quad (2.858) \quad (-2.909) \quad (11.126) \quad (4.123) \\ &\quad - 0.075*\text{DD108Q1} \\ &\quad (-3.063) \end{aligned}$$

**Adj. R-sq: 0.883**                      **D-W Stat: 1.512**

Short term dynamics

$$\begin{aligned} \text{b. DMMULTONE} &= 0.000 - 0.105*\text{ZMMULTONE}(-1) - 0.072*\text{DLBPR} + 0.089*\text{DD109Q3} \\ &\quad (0.055) \quad (-1.699) \quad (-2.193) \quad (4.000) \\ &\quad - 0.085*\text{DD108Q1} + 0.050*\text{DD110Q2} - 0.067*\text{DD111Q4} \\ &\quad (-4.022) \quad (2.415) \quad (-3.198) \end{aligned}$$

**Adj. R-sq: 0.514**                      **D-W Stat: 1.674**

The money multiplier with respect to non-time deposits components of M3 responds negatively to the interest rate but, the magnitude of co-efficient is small.

#### 47. Time deposits:

$$\begin{aligned} \text{a. LTDEPOSITREAL} &= - 0.333 + 0.074*(\text{LM0-LPYMR}) + 0.937*\text{LTDEPOSITREAL}(-1) \\ &\quad (-1.921) \quad (2.529) \quad (41.883) \\ &\quad -0.011*\text{QQ1} - 0.007*\text{QQ2} - 0.011*\text{QQ3} + 0.033*\text{DD103Q1} \\ &\quad (-2.206) \quad (-1.330) \quad (-2.219) \quad (2.387) \\ &\quad + 0.077*\text{DD109Q4} \\ &\quad (3.271) \end{aligned}$$

**Adj. R-sq: 0.999**                      **D-W Stat: 2.001**

Short term dynamics

$$\begin{aligned} \text{b. DLTDEPOSITREAL} &= 0.026 - 0.124*\text{ZLTDEPOSITREAL}(-1) \\ &\quad (6.446) \quad (-2.509) \\ &\quad - 0.226*\text{DLTDEPOSITREAL}(-3) + 0.187*\text{DLTDEPOSITREAL}(-4) \\ &\quad (-2.261) \quad (1.962) \\ &\quad + 0.040*\text{DD109Q3} + 0.059*\text{DD109Q4} + 0.027*\text{DD103Q1} \\ &\quad (3.180) \quad (4.398) \quad (2.181) \end{aligned}$$

**Adj. R-sq: 0.470**                      **D-W Stat: 1.466**

The demand for time deposits is explained in real terms. This demand responds positively to the real value of reserve money indicating a real wealth effect. The error correction term shows a magnitude of adjustment of 0.12.

Reserve money from the sources side is the sum of net RBI credit to central and state governments, RBI's claims on commercial and cooperative banks, RBI's credit to commercial sector, net foreign exchange assets of the RBI, government's currency liabilities to the public minus net non-monetary liabilities of the RBI.

We relate changes in reserve money to changes in governments' liabilities (fiscal deficit) and changes in RBI's foreign exchange assets which are related to the current account deficit.

In defining the reserve money, three terms that indicate government's liabilities (GLIAB) and RBI's assets are given by:

Government Liabilities & RBI Assets

a.  $GLIAB = NRBICG + NRBISG + NFEARBI$

NRBICG: Net RBI Credit to Central Government

NRBISG: Net RBI Credit to State Governments

NFEARBI: Government's Currency Liabilities to Public

These relate to monetized fiscal deficit of the central and state governments.

Another important component that relates to financing of current account deficit comes from the net foreign exchange assets of the RBI

b.  $NFEARBI$ : Net Foreign Exchange Assets of the RBI

Two remaining sources of reserve money relate to RBI's claim on the commercial and banking sectors.

c.  $RBICPVT = RBICC + RBIGCB$

where,

RBICC RBI Credit to Commercial Sector

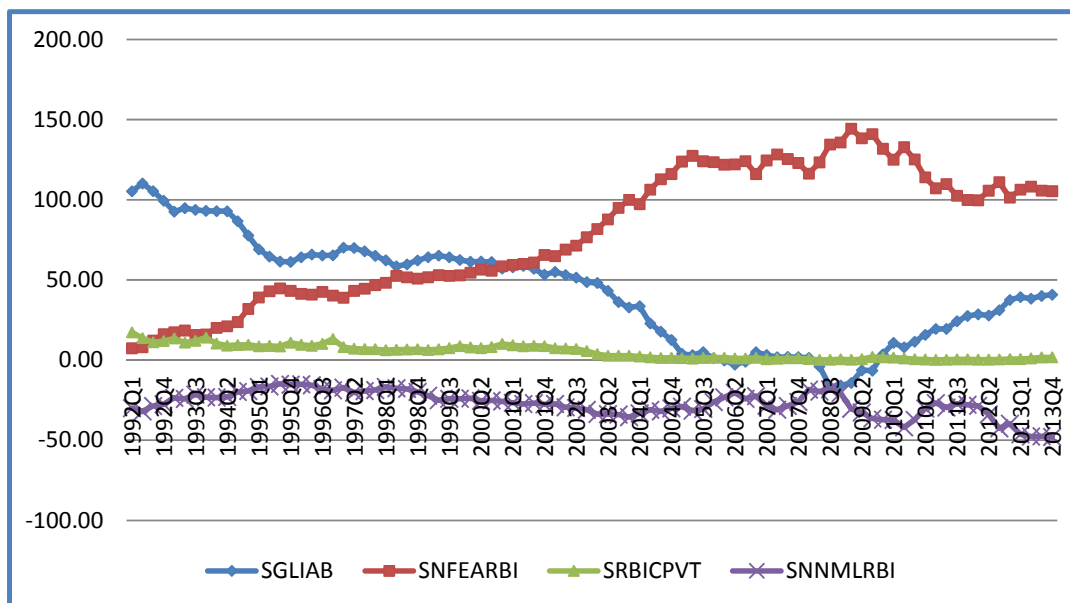
RBIGCB RBI's Gross Claims on Banks

These assets net of RBI's net non-monetary liabilities (NNMLRBI) provide the reserve money.

where NNMLRBI: Net Non-monetary Liabilities of RBI

Thus, reserve money is defined as

48. Reserve Money:  $M_0 = GLIAB + NFEARBI + RBICPVT - NNMLRBI$



**Chart 4.2: Composition of Reserve Money.**

As Chart 4.2 shows, the composition of reserve money has changed in a significant way since the early part of the previous decade. Around 2001, government’s liabilities reflecting monetized fiscal deficit and RBI’s foreign exchange reserves contributed roughly 50 percent each to reserve money. After that, the share of foreign exchange reserves increased to more than 100 percent with the rest of the assets being balanced out by RBI’s net non-monetary liabilities. A more recent trend is that around 2008-09, when fiscal deficit fell close to the combined central and state targets of the respective FRBMAs, monetized fiscal deficit was virtually eliminated. Since then, the monetized fiscal deficit has once again increased to contribute nearly 50 percent of the reserve money. At the same time, the financing of the ballooning current account deficit would increase the share of foreign exchange reserves in reserve money.

We relate government’s liabilities to RBI with centre’s fiscal deficit. Thus,

$$49. \text{GLIAB} = \text{GLCFDRATIO} * \text{CFD}$$

The net foreign exchange assets of the RBI are related to the overall foreign exchange reserves of the country.

$$50. \text{NFEARBI} = \text{RBIFERATIO} * \text{FERESERVESR}$$

**51. Liquidity aggregate:**

$$\begin{aligned}
 \text{a. LL1} = & -2.553 - 0.0798 * \text{DLBPR} + 0.368 * \text{LYMR} - 0.017 * \text{LCRRATIO} \\
 & (-3.003) \quad (-2.612) \quad (3.040) \quad (-1.847) \\
 & + 0.836 * \text{LL1}(-1) + 0.048 * \text{QQ1} + 0.040 * \text{QQ2} + 0.004 * \text{QQ3} \\
 & (15.434) \quad (3.645) \quad (2.275) \quad (0.810)
 \end{aligned}$$

**Adj. R-sq: 1.000 D-W Stat: 1.96**

Short term dynamics

$$\begin{aligned}
 \text{b. DLL1} &= 0.008 - 0.298 * \text{ZLL1}(-1) + 0.784 * \text{DLL1}(-4) + 0.019 * \text{DD104Q3} \\
 &\quad (1.753) \quad (-1.773) \quad (7.156) \quad (2.068) \\
 &\quad + 0.021 * \text{DD104Q4} - 0.031 * \text{DD101Q2} \\
 &\quad (2.225) \quad (-2.275)
 \end{aligned}$$

**Adj. R-sq: 0.473    D-W Stat: 1.36**

For the narrow definition of liquidity, we see it responding positively to real income and negatively to the two main monetary policy instruments namely the policy rate (Repo Rate) and the Cash Reserve Ratio (CRR) in the long run relationship.

## 52. Liquidity aggregate:

$$\begin{aligned}
 \text{a. LL3} &= 1.045 - 0.194 * \text{LIDBIRL} - 0.028 * (\text{LIDBIRL} - \text{LDRMIN}) + 0.622 * \text{LL3}(-2) \\
 &\quad (4.067) \quad (-4.003) \quad (-1.694) \quad (3.920) \\
 &\quad + 0.347 * \text{LL3}(-4) - 0.035 * \text{DD105Q3} + 0.001 * \text{QQ1} - 0.010 * \text{QQ2} - 0.006 * \text{QQ3} \\
 &\quad (2.245) \quad (-2.245) \quad (0.092) \quad (-1.644) \quad (-0.897)
 \end{aligned}$$

**Adj. R-sq: 0.999    D-W Stat: 1.468**

Short term dynamics

$$\begin{aligned}
 \text{b. DLL3} &= 0.039 - 0.335 * \text{ZLL3}(-1) - 0.010 * \text{DIDBIRL} - 0.422 * \text{DLL3}(-1) + 0.296 * \text{DLL3}(-4) \\
 &\quad (4.641) \quad (-2.340) \quad (-1.772) \quad (-3.198) \quad (2.313) \\
 &\quad + 0.008 * \text{D105Q2} + 0.000 * \text{QQ1} - 0.013 * \text{QQ2} - 0.008 * \text{QQ3} \\
 &\quad (2.064) \quad (0.069) \quad (-2.137) \quad (-1.444)
 \end{aligned}$$

**Adj. R-sq: 0.550    D-W Stat: 2.078**

For broad definition of liquidity, we relate it to long term lending rate and the excess between the long term lending rate and minimum deposit rate.

Liquidity shows a negative response to long term lending rate as also a negative response to the gap between the lending and deposit rate.



### 53. Deposit rate (minimum) DRMIN:

$$\begin{aligned} \text{a. LDRMIN} = & -13.15599 - 0.849 \cdot \text{LM3} + 1.887 \cdot \text{LYR} + 0.855 \cdot \text{LDRMIN}(-1) \\ & (-3.432164) \quad (-3.155) \quad (3.300) \quad (15.970) \\ & + 0.146 \cdot \text{QQ1} + 0.225 \cdot \text{QQ2} - 0.001 \cdot \text{QQ3} \\ & (2.638) \quad (3.187) \quad (-0.051) \end{aligned}$$

**Adj. R-sq: 0.893      D-W Stat: 1.983**

Short term dynamics

$$\begin{aligned} \text{b. DLDRMIN} = & 0.000 - 0.251 \cdot \text{ZLDRMIN}(-1) + 0.280 \cdot \text{DLBPR}(-1) - 0.304 \cdot \text{DLYR} \\ & (-0.035) \quad (-3.286) \quad (1.860) \quad (-2.109) \\ & + 0.288 \cdot \text{DLDRMIN}(-1) + 0.184 \cdot \text{DD108Q2} + 0.195 \cdot \text{DD111Q4} \\ & (3.471) \quad (3.966) \quad (4.210) \end{aligned}$$

**Adj. R-sq: 0.570      D-W Stat: 2.096**

The minimum deposit rate responds negatively to broad money and positively to real income.

### 54. Long term lending rate:

$$\begin{aligned} \text{a. LIDBIRL} = & 0.779 + 0.051 \cdot \text{LBPR} - 0.022 \cdot \text{LM3} - 0.096 \cdot \text{DD108Q1} + 0.772 \cdot \text{LIDBIRL}(-1) \\ & (2.309) \quad (1.902) \quad (-1.808) \quad (-2.963) \quad (10.492) \end{aligned}$$

**Adj. R-sq: 0.934      D-W Stat: 1.644**

Short term dynamics

$$\begin{aligned} \text{b. DLIDBIRL} = & -0.006 - 0.111 \cdot \text{ZLIDBIRL}(-1) + 0.163 \cdot \text{DD108Q2} - 0.051 \cdot \text{DD108Q4} \\ & (-1.789) \quad (-1.802) \quad (6.880) \quad (-2.152) \\ & - 0.081 \cdot \text{DD108Q1} \\ & (-3.399) \end{aligned}$$

**Adj. R-sq: 0.534      D-W Stat: 1.691**

### 55. Call money rate:

$$\begin{aligned} \text{a. LCMRATE} = & -16.469 + 0.710 \cdot \text{LBPR} + 3.848 \cdot \text{LYMRDISP} - 2.480 \cdot \text{LM3REAL} \\ & (-4.697) \quad (3.986) \quad (4.330) \quad (-4.206) \\ & + 0.364 \cdot \text{LCMRATE}(-1) - 0.401 \cdot \text{DD108Q2} + 0.282 \cdot \text{QQ1} + 0.456 \cdot \text{QQ2} \\ & (3.634) \quad (-2.932) \quad (2.931) \quad (3.975) \\ & + 0.078 \cdot \text{QQ3} \\ & (1.457) \end{aligned}$$

**Adj. R-sq: 0.827      D-W Stat: 1.793**

Short term dynamics

$$\begin{aligned} \text{b. DLCMRATE} &= 0.006 - 0.336*\text{ZLCMRATE}(-1) + 1.421*\text{DLBPR} - 0.079*\text{QQ1} - 0.042*\text{QQ2} \\ &\quad (0.375) \quad (-3.199) \quad (7.193) \quad (-1.754) \quad (-0.926) \\ &+ 0.039*\text{QQ3} - 0.380*\text{DD108Q1} \\ &\quad (0.864) \quad (-3.054) \end{aligned}$$

**Adj. R-sq: 0.605     D-W Stat: 2.308**

We explain food and non-food credit in real terms. These are seen as functions of interest rate and disposable incomes. In the case of food credit, it is the short term rate which has a significant influence.

**56. Food credit:**

$$\begin{aligned} \text{a. LFCREDITREAL} &= 1.217 + 0.434*\text{LCMRATE} + 0.279*\text{LFCREDITREAL}(-1) \\ &\quad (1.161382) \quad (4.607) \quad (2.601) \\ &+ 0.476*\text{LFCREDITREAL}(-4) + 0.321*\text{DD103Q1} + 0.449*\text{DD110Q1} \\ &\quad (4.472) \quad (2.014) \quad (2.631) \\ &+ 0.271*\text{DD105Q4} \\ &\quad (1.702) \end{aligned}$$

**Adj. R-sq: 0.498     D-W Stat: 1.922**

Short term dynamics

$$\begin{aligned} \text{b. DLFCREDITREAL} &= 0.020 - 0.289*\text{ZLFCREDIT}(-1) + 0.364*\text{DLCMRATE} \\ &\quad (0.851) \quad (-1.907) \quad (1.858) \\ &- 0.611*\text{DLFCREDITREAL}(-1) \\ &\quad (-5.471) \end{aligned}$$

**Adj. R-sq: 0.528     D-W Stat: 1.491**

**57. Non-food credit:**

$$\begin{aligned} \text{a. LNFCREDITREAL} &= - 5.029 + 0.644*\text{LYRDISP} + 0.681*\text{LNFCREDITREAL}(-4) \\ &\quad (-2.170) \quad (2.427) \quad (5.687) \\ &+ 0.047*\text{QQ1} + 0.075*\text{QQ2} + 0.016*\text{QQ3} \\ &\quad (1.002) \quad (1.509) \quad (0.367) \end{aligned}$$

**Adj. R-sq: 0.967     D-W Stat: 1.856**

Short term dynamics

$$\begin{aligned} \text{b. DLNFCREDITREAL} &= 0.020 - 0.703 * \text{ZLNFCREDITREAL}(-1) \\ &\quad (1.251) \quad \quad \quad (-5.195) \\ &+ 0.503 * \text{DLNFCREDITREAL}(-4) + 0.040 * \text{QQ1} + 0.008 * \text{QQ2} \\ &\quad (5.775) \quad \quad \quad (0.884) \quad \quad (0.185) \\ &+ 0.032 * \text{QQ3} \\ &\quad (0.715) \end{aligned}$$

**Adj. R-sq: 0.711**

**D-W Stat: 2.165**

For the non-food credit equation, it is the disposable income variable which seems to have a significant influence.

Thus, for the monetary and financial sectors, we have developed equations for 3 sets of variables: Money supply (M0 and M3), Liquidity (L1 and L3), and interest rates (CMRATE, IDBIRL, and DRMIN)

## CHAPTER 5

### EXTERNAL SECTOR

There are 3 main channels through which developments in the global economy affect the Indian Economy. First, growth in the world economy has a direct relationship with the demand for the Indian exports. We have divided global growth into two main parts for our purposes: 1) Growth in selected developed countries, and 2) growth in selected emerging market economies. In the first group we have taken a set of 8 countries. These are the US, UK, Japan, Canada, Australia, France, Germany, and Italy. We have used a VAR model to inter-link these growth rates and we use this model to forecast these growth rates. These are converted into one aggregate indicator by taking a weighted average. In the group of emerging market economies we have selected the following countries: Brazil, Mexico, South Korea, Turkey, Argentina, South Africa and Indonesia<sup>3</sup>.

The second channel through which the global economy affects the Indian economy is through the prices of crude petroleum. The effect of changes in the international crude oil prices directly affects the prices of fuel and energy in India. Furthermore, in periods when crude oil prices rise, foreign investment in India and inward foreign exchange remittances also rise. This affects the current account balance profile and through that the monetary base.

The third channel is through global prices of important minerals and metal including coal and copper. These also have similar effects like the changes in the crude oil prices. These affect prices directly and through remittances affect the monetary base too.

In this sector, we look at the current account balance as the sum of trade balance and the net invisibles. The current account balance is the counter part of capital account balance and the way the current account deficit is financed has a bearing on the country's foreign exchange reserves and the asset portfolio of RBI in terms of net foreign exchange reserves. This therefore affects the monetary base also. On the capital side, inflows and outflows are taken together to determine the balance of payments. This sector is linked to the real sector, i.e. GDP at factor cost through imports and exports.

The trade account can be divided into oil and non-oil exports and oil and non-oil imports. Since oil exports constitute a small part of total exports, we consider three aggregates for the merchandise trade account: Exports, oil imports and non-oil imports. We develop the equations in dollar terms and then use the exchange rate to convert these in rupees. Exports of goods and services are divided into three parts: exports of goods (oil and non-oil), remaining exports (exports of services).

The first two terms are taken in dollar terms and then converted into 2004-05 rupees by using exchange rate and price deflator. Thus,

58. Exports in USD:  $EXPDDR = EXPDD + REXPDD$

59. Imports are divided into three parts:  $IMPDD = IMPOILDD + IMPNOILDD + RIMPDD$

These are converted into rupee terms at constant prices.

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<sup>3</sup> China is not included as quarterly output data were not available.

Making adjustments for difference in the unit of measurement (million USD to Rs. Crore) and taking the variables from current to 2004-05 prices, we write:

60. Exports at 2004-05 prices:  $EXPR = (EXPDDR/10) * ER / PEXPR$

61. Imports at 2004-05 prices:  $IMPR = (IMPR/10) * ER / PIMP$

The balance of trade is derived in nominal terms (at current prices).

62.  $BOTRADE = EXPR * PEXP - IMPR * PIMP$

To this net invisibles (NINV) are added to derive the balance of payments (Current account surplus). Thus,

63.  $CAS = BOTRADE + NINV$

The estimated equations are given below.

**64. Oil Imports (USD million):**

a.  $LIMPOILDD = -13.04698 + 1.380 * LYMR + 0.863 * LPCRUDE + 0.246 * DD109Q2$   
 (-7.960005)      (10.137)      (13.613)      (1.971)

**Adj. R-sq: 0.987      D-W Stat: 1.818**

Short term dynamics

b.  $DLIMPOILDD = 0.019 + 0.871 * DLPCRUDE - 0.415 * ZLIMPOILDD(-1) + 0.192 * YMR$   
 (1.862)      (13.900)      (-4.693)      (2.484)

**Adj. R-sq: 0.806      D-W Stat: 2.354**

**65. Non-oil imports USD million:**

a.  $LIMPNOILDD = -9.360 - 1.012 * LER + 1.962 * LYEGWSR + 0.419 * LIMPNOILDD(-1)$   
 (-5.200)      (-5.429)      (6.120)      (4.338)

$+ 0.053 * QQ1 + 0.055 * QQ2 + 0.082 * QQ3$   
 (1.792)      (1.896)      (2.808)

**Adj. R-sq: 0.991      D-W Stat: 1.546**

Short term dynamics

b.  $DLIMPNOILDD = 0.048 - 1.438 * DLER - 0.219 * ZLIMPNOILDD(-1) + 0.291 * YMR$   
 (4.683)      (-4.310)      (-1.835)      (3.424)

$- 0.280 * DD109Q4 + 0.064 * QQ1 + 0.048 * QQ2 + 0.057 * QQ3$   
 (-3.559)      (2.247)      (1.645)      (2.007)

**Adj. R-sq: 0.506      D-W Stat: 2.048**

Imports of goods are divided into two parts: oil and non-oil. The equations are developed in terms of both components of imports being measured in USD. For oil imports, the elasticity of response with respect to real income is 1.4. The coefficient of adjustment is 0.87. For non-oil imports, there is a significant response to changes in exchange rate with an elasticity of close to 1 and changes in output of electricity, gas and water supply sector. The error correction coefficient is 0.22.

In order to make imports and exports of goods measured in dollar terms to the national income accounting aggregates of exports and imports that are measured in Rs. Cr at 2004-05 prices, we first convert the dollar aggregates using the exchange rate into Rs. Crore at current prices and then deflate exports and imports respectively by the export and import price deflators and calculate the residual exports and imports which reflect basically the exports and imports of services. These are also explained by stochastic equations for Other imports and Other Exports.

**66. Other imports:**

$$\text{a. LRIMPDD} = - 8.822 + 1.604*\text{LYINDR} - 0.355*\text{QQ1} - 0.144*\text{QQ2} - 0.107*\text{QQ3}$$

$$\begin{matrix} (-4.734) & (10.335) & (-2.954) & (-1.204) & (-0.892) \end{matrix}$$

**Adj. R-sq: 0.697      D-W Stat: 1.832**

Short term dynamics

$$\text{b. DLRIMPDD} = 0.046 - 0.830*\text{ZLRIMPDD}(-1) - 0.564*\text{QQ1} + 0.030*\text{QQ2}$$

$$\begin{matrix} (1.187) & (-6.298) & & (-5.137) & (0.276) \end{matrix}$$

$$- 0.109*\text{QQ3} - 0.977*\text{DD109Q1}$$

$$\begin{matrix} (-1.013) & (-3.400) \end{matrix}$$

**Adj. R-sq: 0.672      D-W Stat: 2.214**

Residual imports show an elasticity of 1.6 with respect to industrial output in the long run relationship and the error correction equation indicates an error correction coefficient of 0.83.

**67. Imports at constant prices:**

$$\text{a. LPIMP} = - 0.187 + 0.427*\text{LPYR}(-1) + 0.525*\text{LPIMP}(-1) + 0.041*\text{LPCRUE} + 0.031*\text{QQ1}$$

$$\begin{matrix} (-1.669) & (4.042) & (4.104) & (1.471) & (2.325) \end{matrix}$$

$$+ 0.019*\text{QQ2} - 0.006*\text{QQ3}$$

$$\begin{matrix} (1.471) & (-0.460) \end{matrix}$$

**Adj. R-sq: 0.981      D-W Stat: 1.543**

Short term dynamics

$$\text{b. DLPIMP} = 0.012 - 0.510*\text{ZLPIMP}(-1) + 0.072*\text{DLPCRUE} - 0.259*\text{YMR}$$

$$\begin{matrix} (2.721) & (-4.611) & (2.640) & (-2.900) \end{matrix}$$

$$+ 0.222 * DLPIMP(-1) + 0.021 * QQ1 + 0.000 * QQ2 - 0.029 * QQ3$$

(1.991)                      (1.793)                      (0.016)                      (-2.451)

**Adj. R-sq: 0.510      D-W Stat: 1.881**

The Equation for unit value of imports explains the import price deflator in terms of income effect and the international price of crude oil.

**68. Exports (USD million):**

a.  $LEXPDD = - 50.720 + 3.856 * LYECOUNTRIES - 0.401 * LER + 0.195 * LEXPDD(-1)$

(-7.510)                      (7.790)                      (-3.128)                      (1.881)

$$- 0.072 * QQ1 - 0.050 * QQ2 - 0.078 * QQ3$$

(-3.258)                      (-2.346)                      (-3.621)

**Adj. R-sq: 0.994                      D-W Stat: 1.705**

Short term dynamics

b.  $DLEXPDD = - 0.014995 - 0.789 * ZLEXPDD(-1) + 5.835 * DLYECOUNTRIES$

(-1.501437)                      (-6.062)    (7.586)

$$- 0.122 * YMR - 0.056 * QQ2 - 0.087 * QQ3 + 0.155 * DD105Q4$$

(-6.043)                      (-2.739)                      (-4.248)                      (2.880)

**Adj. R-sq: 0.726                      D-W Stat: 1.955**

Demand for exports is explained in terms of income of selected emerging market economies. The magnitude of the coefficient of responsiveness is 3.86. Exports respond negatively to changes in exchange rates since the dependent variable is measured in dollar terms.

**69. Other Exports:**

a.  $LREXPDD = - 104.244 + 2.320 * LYECOUNTRIES + 4.612 * LYDCOUNTRIES$

(-9.569)                      (5.566)    (4.670)

$$- 0.186 * QQ1 - 0.322 * QQ2 - 0.166 * QQ3 + 0.311 * DD109Q3$$

(-3.417)                      (-5.933)                      (-2.990)                      (2.146)

**Adj. R-sq: 0.952                      D-W Stat: 1.459**

Short term dynamics

b.  $DLREXPDD = - 0.009 - 0.640 * ZLREXPDD(-1) + 3.569 * DLYECOUNTRIES$

(-0.356)                      (-4.662)    (1.897)

$$- 0.237*YMR - 0.197*QQ2 + 0.054*QQ3 + 0.246*DLREXPDD(-4)$$

(-4.117)	(-3.445)	(1.070)	(2.250)
----------	----------	---------	---------

**Adj. R-sq: 0.670**

**D-W Stat: 2.279**

Residual exports show positive responsiveness both with respect to the income of developed countries and emerging market countries. The error correction coefficient is 0.64.

**70. Exports at constant price:**

a.  $LPEXP = 0.019 + 0.575*LPYR(-1) + 0.414*LPEXP(-4) - 0.014*QQ1 + 0.051*QQ2$

(1.909)	(5.979)	(4.158)	(-0.580)	(2.195)
---------	---------	---------	----------	---------

$+ 0.015*QQ3$

(0.639)

**Adj. R-sq: 0.925**

**D-W Stat: 1.927**

Short term dynamics

b.  $DLPEXP = 0.011 - 0.753*ZLPEXP(-1) + 0.001*QQ1 + 0.087*YMR - 0.022*QQ3$

(1.418)	(-6.524)	(0.036)	(3.789)	(-0.952)
---------	----------	---------	---------	----------

$+ 0.378*DLPEXP(-4) - 0.198*DD100Q1$

(5.512)	(-3.066)
---------	----------

**Adj. R-sq: 0.744**

**D-W Stat: 1.869**

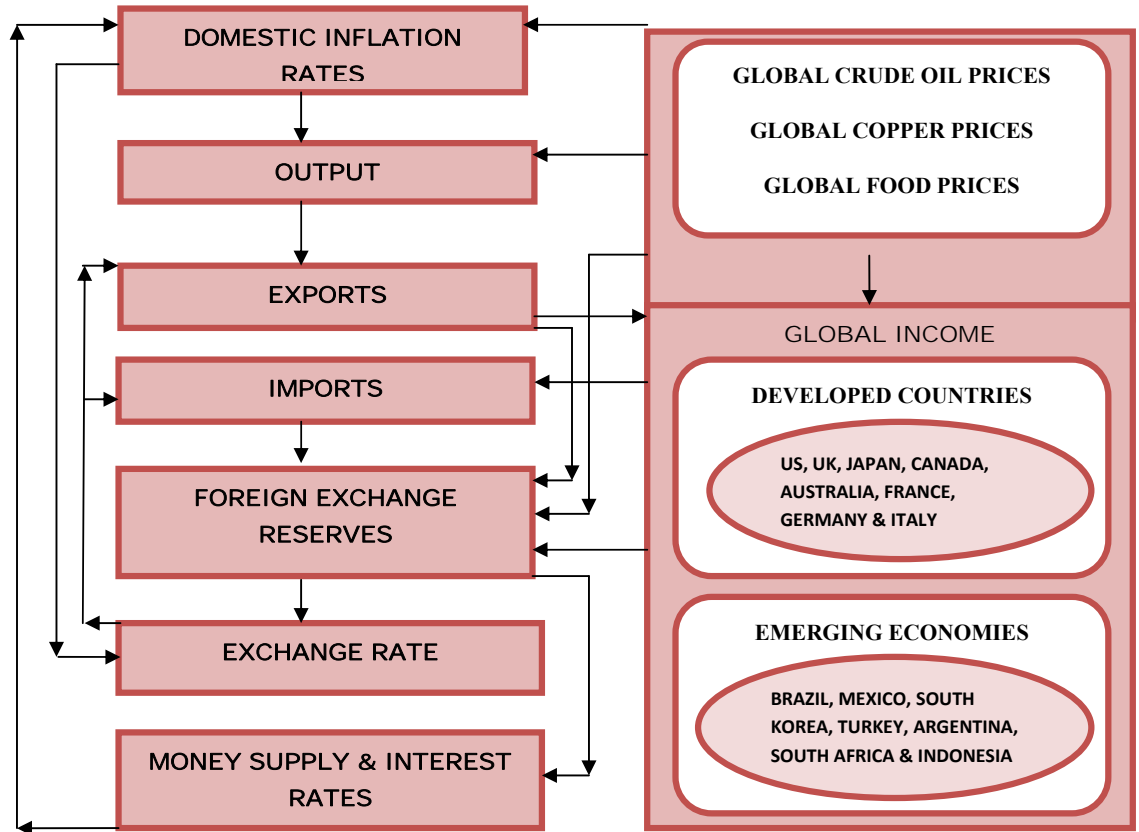
We have also developed an equation for the unit value of exports. This also depends on domestic output and the lagged dependent term.

The global economy influences the Indian economy through a variety of channels:

- a) Exchange rate influences the value of exports and imports directly as well as through affecting the relative prices of Indian exports and imports; the former influence is far stronger than the latter.
- b) Growth in net exports (EXPR-IMPR) directly affects the GDP growth at market prices (being part of the national income identity).
- c) International crude oil prices, coal prices and food prices affect various price aggregates.
- d) Financing of current account deficit affects the monetary base through affecting the foreign exchange reserves. This also affects the exchange rate.

Flow Chart 5.1 shows some of the expected influences emanating from the global economic forces. Not all of the inter-linkages have been found to be statistically but alternative specifications are still being worked on.





**Flow Chart 5.1: Global Sector Influences on Indian Economy**

## CHAPTER 6

### PRICES

Three sets of prices are considered: (a) implicit price deflators for the eight output sectors; (b) wholesale prices divided into the following categories: primary articles, fuel and energy, non-food manufactured articles, and food articles in the group of manufactured articles; and (c) one index reflecting consumer price movements. For the wholesale price indices, the all commodities index is derived as a weighted sum of the four components.

#### 71. Implicit price deflators-GDP at factor cost:

$$\begin{aligned} \text{a. LPYR} = & -0.898 - 0.020*\text{LIDLSR}(-4) + 0.084*\text{LYR}(-4) + 0.912*\text{LPYR}(-1) \\ & (-1.678) \quad (-2.081) \quad (2.037) \quad (16.681) \\ & + 0.030*\text{QQ1} + 0.023*\text{QQ2} + 0.018*\text{QQ3} \\ & (5.905) \quad (3.607) \quad (4.630) \end{aligned}$$

**Adj. R-sq: 0.998      D-W Stat: 1.640**

Short term dynamics

$$\begin{aligned} \text{b. DLPYR} = & 0.013 - 0.144*\text{ZLPYR}(-1) + 0.025*\text{QQ1} + 0.015*\text{QQ2} \\ & (10.299) \quad (-2.185) \quad (6.882) \quad (4.178) \\ & + 0.019*\text{QQ3} - 0.023*\text{DD109Q4} + 0.033*\text{DD109Q1} \\ & (5.253) \quad (-2.334) \quad (3.321) \end{aligned}$$

**Adj. R-sq: 0.593      D-W Stat: 1.677**

The price deflator for GDP at factor cost responds negatively to the effective indirect tax rate measured by the ratio of indirect tax net of subsidies to GDP at FC.

#### 72. Implicit price deflator - GDP at market prices:

$$\begin{aligned} \text{a. LPYMR} = & -0.074 + 0.946*\text{LPYR} + 0.007*(\text{LIDLSR}(-1)-\text{LPYR}(-1)) + 0.111*\text{LPYMR}(-1) \\ & (-2.847) \quad (39.956) \quad (2.799) \quad (3.186) \\ & - 0.134*\text{LPYMR}(-2) + 0.086*\text{LPYMR}(-3) \\ & (-4.011) \quad (4.076) \end{aligned}$$

**Adj. R-sq:1.000      D-W Stat: 1.636**

We have explained Wholesale Price Indices in terms of 5 main categories namely: 1) Food articles, 2) Primary Articles, 3) Fuel and Energy, 4) Food articles in the group of manufactured articles, and 5) other articles in the group of manufactured articles. The all commodities WPI is derived as a weighted sum of the following 4: Primary articles, Fuel and energy, Food articles in the manufactured articles group, and non-food articles in the manufactured articles group.

#### 73. Wholesale price index of food articles:

$$\begin{aligned}
 \text{a. LWPIFA} = & -0.063 + 0.037*LGFOODPRICE(-4) + 0.073*QQ1 + 0.059*QQ2 \\
 & (-1.296) \qquad (2.459) \qquad (12.007) \qquad (9.683) \\
 & + 0.061*QQ3 + 0.980*LWPIFA(-1) + 0.039*DD110Q4 \\
 & (9.844) \qquad (44.896) \qquad (2.500)
 \end{aligned}$$

**Adj. R-sq: 0.997     D-W Stat: 2.184**

Short term dynamics

$$\begin{aligned}
 \text{b. DLWPIFA} = & 0.009 - 0.277*ZLWPIFA(-1) + 0.092*QQ1 + 0.050*QQ2 + 0.057*QQ3 \\
 & (2.467) \qquad (-2.224) \qquad (8.538) \qquad (7.066) \qquad (8.279) \\
 & + 0.400*DLWPIFA(-1) \\
 & (2.701)
 \end{aligned}$$

**Adj. R-sq: 0.725     D-W Stat: 2.086**

The equation for food articles shows a positive influence of global food prices but, the elasticity is fairly small at 0.04. The magnitude of error correction term is 0.27.

#### 74. Wholesale price index: Primary articles:

$$\begin{aligned}
 \text{a. LWPIPA} = & -0.130 + 0.715*LWPIFA + 0.121*LWPIPA(-1) + 0.213*LWPIPA(-4) \\
 & (-1.362) \qquad (11.364) \qquad (2.105) \qquad (4.664) \\
 & - 0.020*LYAR + 0.035*LGCOALPRICE + 0.041*DD104Q1 \\
 & (-2.389) \qquad (6.432) \qquad (3.824)
 \end{aligned}$$

**Adj. R-sq: 0.999     D-W Stat: 1.380**

Short term dynamics

$$\begin{aligned}
 \text{b. DLWPIPA} = & 0.003 + 0.918*DLWPIFA - 0.367*ZLWPIPA(-1) \\
 & (1.230) \qquad (8.794) \qquad (-2.648) \\
 & + 0.039*DLGCOALPRICE + 0.003*QQ1 - 0.009*QQ2 - 0.018*QQ3 \\
 & (4.576) \qquad (0.322) \qquad (-1.335) \qquad (-2.644)
 \end{aligned}$$

**Adj. R-sq: 0.917     D-W Stat: 2.000**

In the case of primary articles, there is responsiveness to global coal prices apart from agricultural output and prices of food articles. The error correction coefficient is 0.37

#### 75. Wholesale price index - Fuel group:

$$\begin{aligned}
 \text{a. LWPIFUEL} &= 0.329 + 0.059*\text{LPCRUE} + 0.885*\text{LWPIFUEL}(-1) + 0.078*\text{DD101Q3} \\
 &\quad (4.899) \quad (5.014) \quad (38.366) \quad (3.334) \\
 &\quad - 0.061*\text{DD109Q4} + 0.010*\text{QQ1} + 0.025*\text{QQ2} + 0.023*\text{QQ3} \\
 &\quad (-2.573) \quad (1.176) \quad (2.980) \quad (2.785)
 \end{aligned}$$

**Adj. R-sq: 0.996      D-W Stat: 1.856**

Short term dynamics

$$\begin{aligned}
 \text{b. DLWPIFUEL} &= 0.011 + 0.059*\text{DLPCRUE} - 0.183*\text{ZLWPIFUEL}(-1) - 0.059*\text{DD109Q4} \\
 &\quad (2.472) \quad (2.765) \quad (-1.811) \quad (-2.121) \\
 &\quad + 0.093*\text{DD101Q3} + 0.020*\text{QQ1} + 0.031*\text{QQ2} + 0.025*\text{QQ3} \\
 &\quad (3.743) \quad (2.067) \quad (3.414) \quad (2.809) \\
 &\quad + 0.254*\text{DLWPIFUEL}(-1) \\
 &\quad (2.123)
 \end{aligned}$$

**Adj. R-sq: 0.483      D-W Stat: 2.022**

The fuel and energy prices are affected by the global crude oil prices but short term elasticity is small in terms of magnitude limited to 0.06. The magnitude of error correction is 0.18.

#### **76. Wholesale price index - manufactured products (food):**

$$\begin{aligned}
 \text{a. LWPIMFOOD} &= 0.071 + 0.057*\text{LGFOODPRICE} + 0.015*\text{QQ1} + 0.007*\text{QQ2} \\
 &\quad (0.765) \quad (2.670) \quad (1.985) \quad (0.849) \\
 &\quad + 0.006*\text{QQ3} + 0.929*\text{LWPIMFOOD}(-1) \\
 &\quad (0.740) \quad (24.041)
 \end{aligned}$$

**Adj. R-sq: 22.919      D-W Stat: 0.000**

Short term dynamics

$$\begin{aligned}
 \text{b. DLWPIFOOD} &= 0.007 - 0.175*\text{ZLWPIFOOD}(-1) + 0.287*\text{DLWPIFOOD}(-4) \\
 &\quad (2.701) \quad (-2.322) \quad (2.503) \\
 &\quad + 0.046*\text{DD110Q3} + 0.060*\text{DD104Q1} \\
 &\quad (2.658) \quad (3.376)
 \end{aligned}$$

**Adj. R-sq: 0.373      D-W Stat: 1.720**

The food articles in the manufactured articles group responds positively to food prices. The short term elasticity is 0.06. The magnitude of error correction is 0.17.

#### **77. Wholesale price index - Non-Food:**

$$\begin{aligned}
\text{a. LWPINFOOD} &= -0.004 + 0.014*\text{LPCRUE} + 0.066*\text{LYTHTCR} \\
&\quad (-0.044) \quad (2.751) \quad (2.582) \\
&+ 0.818*\text{LWPINFOOD}(-1) - 0.007*\text{QQ1} - 0.012*\text{QQ2} - 0.007*\text{QQ3} \\
&\quad (15.703) \quad (-1.742) \quad (-2.767) \quad (-2.060) \\
&- 0.025*\text{DD106Q4} \\
&\quad (-2.801)
\end{aligned}$$

**Adj. R-sq: 0.998      D-W Stat: 1.360**

Short term dynamics

$$\begin{aligned}
\text{b. DLWPINFOOD} &= 0.003 - 0.161*\text{ZLWPINFOOD}(-1) + 0.038*\text{DLYR} \\
&\quad (2.055) \quad (-1.973) \quad (1.999) \\
&+ 0.019*\text{DLIDLSR}(-1) + 0.022*\text{DD108Q4} + 0.522*\text{DLWPINFOOD}(-1) \\
&\quad (4.308) \quad (2.444) \quad (4.990) \\
&- 0.008*\text{QQ1} \\
&\quad (-2.276)
\end{aligned}$$

**Adj. R-sq: 0.508      D-W Stat: 2.139**

The non-food articles within the manufactured articles group respond to global crude oil prices and output in the trade, hotels, transport, and communication sector. The short term elasticities are very small though at 0.01 and 0.06 respectively. The co efficient of error correction is significant at 10% level and the magnitude is 0.16.

The WPI for manufactured articles is derived as a weighted sum of the index for food products and non-food products in the group of manufactured articles. Thus, it is defined as an identity below.

#### 78. Wholesale Price Index - Manufactured Products:

$$\text{WPIMAN} = 0.1535125* \text{WPIMFOOD} + 0.8464875*\text{WPINFOOD}$$

Finally, we derive the WPI All commodities index as the weighted sum of 4 product groups as indicated below:

#### 79. Wholesale Price Index - All Commodities:

$$\begin{aligned}
\text{WPIAC} &= 0.2011815*\text{WPIPA} + 0.1491021*\text{WPIFUEL} + 0.0997396*\text{WPIMFOOD} \\
&\quad + 0.5499768*\text{WPINFOOD}
\end{aligned}$$

This equation is seen as a weighted average of the component indices.

Two consumer price indices are also explained.

#### 80. Consumer price index for agricultural labour CPIAW:

$$\begin{aligned}
 \text{a. LCPIAW} &= -0.779 + 0.160*\text{LWPIMFOOD} + 0.046*\text{LIMPR} - 0.132*\text{LPIMP} \\
 &\quad (-4.008) \quad (2.116) \quad (3.405) \quad (-3.744) \\
 &+ 0.915*\text{LCPIAW}(-1) + 0.014*\text{QQ1} + 0.030*\text{QQ2} + 0.017*\text{QQ3} \\
 &\quad (17.331) \quad (2.974) \quad (6.554) \quad (3.925)
 \end{aligned}$$

**Adj. R-sq: 0.998     D-W Stat: 1.799**

Short term dynamics

$$\begin{aligned}
 \text{b. DLCPIAW} &= 0.011 - 0.155*\text{ZLCPIAW}(-1) + 0.024*\text{QQ1} + 0.032*\text{QQ2} \\
 &\quad (5.155) \quad (-3.198) \quad (6.168) \quad (9.146) \\
 &+ 0.012*\text{QQ3} + 0.479*\text{DLCPIAW}(-1) - 0.028*\text{DD101Q2} \\
 &\quad (3.387) \quad (4.966) \quad (-3.045)
 \end{aligned}$$

**Adj. R-sq: 0.700     D-W Stat: 1.914**

The CPI for agricultural labour responds positively to WPI food in manufactured articles and also to imports at constant prices. Their short term elasticities are 0.16 and 0.05 respectively. The error correction coefficient is 0.16.

### 81. Consumer price index for industrial workers CPIIW:

$$\begin{aligned}
 \text{a. LCPIIW} &= -0.068 + 0.687*\text{LCPIIW}(-1) + 0.045*\text{LM3} + 0.194*\text{LWPIPA} \\
 &\quad (-2.020) \quad (6.427) \quad (2.687) \quad (2.978) \\
 &+ 0.001*\text{QQ1} + 0.015*\text{QQ2} + 0.008*\text{QQ3} \\
 &\quad (0.268) \quad (2.721) \quad (1.809)
 \end{aligned}$$

**Adj. R-sq: 0.999     D-W Stat: 1.626**

Short term dynamics

$$\begin{aligned}
 \text{b. DLCPIIW} &= 0.004 - 0.261*\text{ZLCPIIW}(-1) + 0.511*\text{DLWPIPA} + 0.205*\text{DLCPIIW}(-1) \\
 &\quad (1.734) \quad (-3.356) \quad (3.807) \quad (2.031) \\
 &- 0.019*\text{QQ1} + 0.006*\text{QQ2} - 0.005*\text{QQ3} \\
 &\quad (-1.829) \quad (0.902) \quad (-0.891)
 \end{aligned}$$

**Adj. R-sq: 0.761     D-W Stat: 2.215**

The CPI for industrial workers responds positively to M3 and WPI of primary articles. The short term elasticities are 0.05 and 0.19 respectively. The magnitude of the error correction term is 0.26.

## CHAPTER 7

### VALIDATION AND MODEL FEATURES

In this section, we review properties of the model-based estimates for key endogenous variables for in-sample validation and other model features.

#### 7.1 In-Sample Validation

The main summary statistics that we have used for this purpose are (a) mean square error and (b) Theil inequality statistics (TIL). We also use a decomposition of the mean square error to examine whether any systematic errors are identifiable.

The summary statistics and the decomposition of the mean square error are given below. The mean square error [ $M_p$ ] and root mean square error (RMSQ) are defined as below.

$$M_p = [1/n \sum (P_t - A_t)^2] \text{ and } \text{RMSQ} = \sqrt{M_p}$$

These have a minimum value of zero in the case of perfect forecasts. There is no upper limit. Their inadequacy lies in not having a proper unit of measurement. They give the same weight to a deviation whether a variable is measured in rupees or billion rupees or percentages. They however, have interesting mathematical and statistical properties and lend themselves to useful decompositions.

Theil inequality coefficient with respect to change in variables is defined as follows:

$$\text{TIQ} = [\sum (\Delta P_t - \Delta A_t)^2]^{1/2} / (\sum \Delta A_t^2)^{1/2}$$

We use the following decomposition of the mean square error  $M_p$  can be decomposed as follows:

$$M_p = (\mu_p - \mu_A)^2 + (S_p - r S_A)^2 + (1 - r^2) S_A^2$$

where,  $\mu_p$  and  $\mu_A$  are the sample means of predictions and realization,  $S_p$  and  $S_A$  are their standard deviations and  $r$  is the correlation coefficient between them. The division of the terms on the right-hand side by the mean square error gives rise to the following quantities which are called 'inequality proportions':

$$U^M = (P - A) / M_p \quad \text{mean proportion}$$

$$U^R = (S_p - r S_A)^2 / M_p \quad \text{slope proportion}$$

$$U^D = (1 - r^2) S_A^2 / M_p \quad \text{disturbance proportion}$$

The terms thus provide information on the relative importance of one source of error vis-à-vis another. The mean proportion has a positive value if  $\mu_p \neq \mu_A$ . This is due, therefore, to 'bias'. The derivation of  $S_p$  for  $r S_A$  is due to slope error, and the third term is a disturbance component. We have selected 18 variables for presentation of analysis in groups of 6 variables each. The first group consists of output variables:

#### a. Output Variables

The following outputs have been selected for analysis: YAR, YMANR, YCONSR, YEGWSR, YTHTCR, and YFRBSR. We analyse the capacity of the model to forecasts ‘year-on-year growth rates’ on a quarterly basis. The period studied is for 16 quarters from 2008q1 to 2011q4. This period is one of the most volatile periods in recent times given the over- all volatility and economic slowdown during this period. We have ascertained that all turning points are adequately captured by the model. Table 7.1 gives the summary statistics of the forecasts errors. Considering that these statistics related to growth rates, the mean square errors are quite low. The decomposition of the mean square error also indicates that systematic errors are minimal and disturbance errors are high.

**Table 7.1: Prediction Performance: Selected Output Variables**

Var. name/Forecast	Summary Measures		Decomposition of Mean Square Error		
<b>YAR</b>	<b>RMSQ</b>	<b>TIL</b>	<b>Bias</b>	<b>Slope</b>	<b>Disturbance</b>
Static	3.13	0.63	0.01	0.00	0.99
Dynamic	3.64	0.73	0.03	0.01	0.96
<b>YMANR</b>					
Static	2.81	0.29	0.02	0.06	0.92
Dynamic	4.56	0.47	0.01	0.04	0.96
<b>YCONSR</b>					
Static	2.18	0.26	0.02	0.24	0.74
Dynamic	1.84	0.22	0.16	0.00	0.84
<b>YEGWSR</b>					
Static	2.08	0.35	0.05	0.28	0.67
Dynamic	1.80	0.30	0.03	0.14	0.82
<b>YTHTCR</b>					
<b>Static</b>	3.20	0.30	0.01	0.35	0.64
<b>Dynamic</b>	4.14	0.39	0.30	0.09	0.61
<b>YFRBSR</b>					
Static	1.39	0.12	0.00	0.37	0.63
Dynamic	1.78	0.16	0.10	0.11	0.79

*Source: Estimated*

## **b. Output and Demand Variables**

The second group consists of selected aggregate output, demand and liquidity variables. Table 7.2 provides the summary statistics describing the prediction performance. Again the root mean square is quite low. It may be noted that the RMSQ is not independent of the unit of measurement. For variables that show high volatility in the magnitude of growth rates, the nominal numbers of RMSQ may be relatively high (e.g. CGR). Here also, systematic elements that can explain the errors have low contribution to the mean square error and the main term responsible is the disturbance term.



**Table 7.2 Prediction Performance: Selected Output and Demand Variables**

Var. name/Forecast	Summary Measures		Decomposition of Mean Square Error		
	<b>RMSQ</b>	<b>TIL</b>	<b>Bias</b>	<b>Slope</b>	<b>Disturbance</b>
<b>YR</b>					
Static	1.80	0.21	0.00	0.23	0.77
Dynamic	2.13	0.25	0.01	0.24	0.76
<b>YMR</b>					
Static	1.83	0.21	0.00	0.06	0.94
Dynamic	1.98	0.23	0.02	0.23	0.76
<b>CPR</b>					
Static	1.70	0.21	0.01	0.20	0.79
Dynamic	1.71	0.21	0.00	0.22	0.78
<b>CGR</b>					
Static	11.36	0.67	0.01	0.13	0.86
Dynamic	8.07	0.48	0.01	0.00	0.98
<b>GFCFR</b>					
Static	5.29	0.43	0.01	0.16	0.82
Dynamic	6.37	0.52	0.05	0.00	0.95
<b>L3</b>					
Static	1.41	0.08	0.00	0.02	0.98
Dynamic	2.22	0.12	0.00	0.00	0.99

Source: Estimated

### c. Monetary and Fiscal Variables

The third group consists of selected fiscal and external sector aggregates. Since the fiscal variables are defined in current rupee terms, the volatility in terms of the magnitude of coefficients is high. But in all cases, the relative contribution of bias and slope errors are relatively small and the disturbance term which reflects the influence of random disturbances accounts for relatively larger part of the mean square error.

**Table 7.3: Prediction performance: Selected Monetary and Fiscal Variables**

Var. name/Forecast	Summary Measures		Decomposition of Mean Square Error		
	<b>RMSQ</b>	<b>TIL</b>	<b>Bias</b>	<b>Slope</b>	<b>Disturbance</b>
<b>CITR</b>					
Static	16.75	0.64	0.02	0.23	0.75
Dynamic	15.69	0.60	0.03	0.06	0.91
<b>UDR</b>					
Static	8.12	0.34	0.01	0.04	0.95
Dynamic	8.78	0.36	0.21	0.03	0.76
<b>CCDR</b>					
Static	7.23	0.18	0.10	0.23	0.67
Dynamic	18.29	0.46	0.02	0.08	0.90
<b>EXPDD</b>					
Static	8.21	0.24	0.02	0.03	0.95
Dynamic	8.20	0.24	0.07	0.00	0.93
<b>IMPOILDD</b>					
<b>Static</b>	15.75	0.29	0.00	0.00	1.00
<b>Dynamic</b>	18.39	0.34	0.00	0.00	0.99
<b>PEXP</b>					
Static	5.08	0.55	0.06	0.16	0.78
Dynamic	4.95	0.54	0.13	0.04	0.83

Source: Estimated

#### d. Price Indices

The fourth group consists of the main price indices. The in-sample performance of the price indices model show low RMSQs and the limited role of bias and slope errors in explaining the residual errors.

**Table 7.4: Prediction Performance: Price Indices**

Var. name/Forecast	Summary Measures		Decomposition of Mean Square Error		
	<b>RMSQ</b>	<b>TIL</b>	<b>Bias</b>	<b>Slope</b>	<b>Disturbance</b>
<b>WPIPA</b>					
Static	2.23	0.17	0.05	0.00	0.95
Dynamic	5.65	0.43	0.43	0.02	0.54
<b>WPIAC</b>					
Static	3.69	0.45	0.04	0.18	0.78
Dynamic	3.07	0.38	0.21	0.01	0.78
<b>WPIMFOOD</b>					
Static	2.85	0.33	0.04	0.02	0.94
Dynamic	4.62	0.53	0.17	0.00	0.83
<b>WPINFOOD</b>					
Static	1.51	0.25	0.00	0.13	0.87
Dynamic	2.20	0.36	0.02	0.13	0.85
<b>PYR</b>					
<b>Static</b>	1.47	0.19	0.00	0.16	0.84
<b>Dynamic</b>	2.20	0.29	0.33	0.00	0.67
<b>PYMR</b>					
Static	1.42	0.19	0.00	0.11	0.88
Dynamic	2.19	0.28	0.32	0.01	0.67

Source: Estimated

#### 7.2 Sectoral and Equation Structure

There are four main sectors in the model: real sector, fiscal sector, monetary and credit sectors and the external sector. The real sector is divided into three parts: aggregate demand, aggregate output, and capital stock and sectoral investment. Three prices indicators are considered: wholesale prices, consumer prices and implicit price deflators. The number of equations is indicated sector-wise in Table 7.5. There are 81 equations in the model consisting of 35 identities and 46 stochastic equations. The detailed structure is given in Appendix 2.

**Table 7.5: Sectoral Composition of Equations and Identities**

Number of Equations and Identities			
Sector	Stochastic Equations	Identities	Total
<b>Aggregate Demand</b>	3	1	4
<b>Output</b>	8	4	12
<b>Capital Stock and Sectoral Investment</b>	5	9	14
<b>Fiscal Sector</b>	5	9	14
<b>Monetary Sector</b>	9	4	13
<b>External Sector</b>	7	6	13
<b>Prices</b>	9	2	11
<b>All sectors</b>	46	35	81

Source: compiled

The global economy is exogenous but a number of influences emanate from the global economy affecting the Indian economy. These influences may be divided into three groups. Growth of world income, which has been divided into two groups consisting of developed countries (eight countries) and emerging economies (seven countries). Growth in incomes in these countries affect global price movements, particularly crude oil prices, and prices of important resources like coal, metals (copper is taken as an indicator) apart from the global price of food.

### 7.3 Structure of Adjustment Dynamics

An important feature of the model is the estimation of the short-term dynamics around the long-run equilibrium relationship. Table 7.6 gives the co efficient of error correction and the speed of adjustment for all the equations.

**Table 7.6: Coefficients of Error Correction**

Variable	Magnitude of Co efficient	No. of Quarters Required for 100% Adjustments
DLCPR	0.547	1.83
DLCGR	0.848	1.18
DLGFCFR	0.172	5.81
DLYAR	0.630	1.59
DLYMQR	0.335	2.99
DLYMANR	0.200	5.00
DLYEGWSR	0.400	2.50
DLYCONSR	0.171	5.85
DLYTHTCR	0.216	4.63
DLYFRBSR	0.296	3.38
DLYCSPSR	0.645	1.55
DLCITR	0.856	1.17
DLCPTR	0.808	1.24
DLCCDR	0.435	2.30
DLUDR	0.320	3.13
DLIDLSR	0.586	1.71
DMMULTONE	0.105	9.52
DLTDEPOSITREAL	0.124	8.06
DLL1	0.298	3.36
DLL3	0.335	2.99
DLDRMIN	0.251	3.98
DLIDBIRL	0.111	9.01
DLCMRATE	0.336	2.98
DLFCREDITREAL	0.289	3.46
DLNFCREDITREAL	0.703	1.42
DLIMPOILDD	0.415	2.41
DLIMNOILDD	0.219	4.57
DLRIMPDD	0.830	1.20
DLPIMP	0.510	1.96
DLEXPDD	0.789	1.27
DLREXPDD	0.640	1.56
DLPEXP	0.753	1.33
DLPYR	0.144	6.94
DLWPIFA	0.277	3.61
DLWPIPA	0.367	2.72
DLWPIFUEL	0.183	5.46

<b>DLWPIMFOOD</b>	0.175	5.71
<b>DLWPINFOOD</b>	0.161	6.21
<b>DLCPIAW</b>	0.155	6.45
<b>DLCPIIW</b>	0.261	3.83

Source: Derived from Equation Estimates

The magnitude of the error correction term is expected to be negative and less than one. This indicates that if the actual value of a variable is less than its equilibrium value, it would increase as a proportion of the difference. The magnitude of the proportion indicates as to what percentage of the difference between actual and equilibrium value is made up in one quarter. From this, the number of quarters it will take to achieve 100 percent adjustment can also be worked out. Thus, if the error correction coefficient has a value of 0.5, it will take two quarters to complete the adjustment. In all the estimated equations, we find that the error-correction coefficient has a value of less than 1 and that it has a negative sign.

From table 7.6, it can be seen that some patterns of adjustment become quite clear. Consumption expenditure tends to adjust faster than investment expenditure. Exports and imports also adjust relatively faster. Prices tend to adjust slowly. Some prices are stickier than others. Interest rates also adjust relatively slowly.

## 7.5 Exogenous Variables

The exogenous variables of the system are given below:

**Table 7.7 List of Exogenous Variables**

Income & Output	Fiscal	Monetary	External
DCPR	ASTSTATES	BPR	DFRESERVESR
IFACTOR	BCSVRR	CRRATIO	ER
IVALR	CNDKR <sup>4</sup>	GLCFDRATIO	GCOALPRICE
	CPRIMERE <sup>5</sup>	RBIFERRATIO	GFOODPRICE
	CTOTHER	RBICPVT	NINVRATIO
	FDFACTOR	NNMLRBI	PCRUDE

Source: As per model specification

Two types of dummy variables are used: intercept dummies, prefixed by 'D' and pulse dummies, prefixed by 'DD'.

Intercept dummies series takes the values 0, up to the specified quarter, and 1 afterwards. Here DD100Q1 refers to FY 1999-00, first quarter. Seasonal dummies are indicated by QQ1, QQ2, and QQ3.

<sup>4</sup> This can be substituted by fiscal deficit to GDP ratio.

<sup>5</sup> This can be substituted by revenue deficit to GDP ratio. The choice depends on whether revenue deficit to GDP ratio and fiscal deficit to GDP are being targeted. A useful rule can be to take these as the exogenous variables if the levels of these deficits relative to GDP are above the levels prescribed in the FRBMA Act and Rules.

**Table 7.8 Seasonal and Intercept Dummies**

Seasonal dummies	Intercept dummies
QQ1	D101Q3
QQ2	D102Q1
QQ3	D104Q2
	D105Q1
	D105Q2
	D106Q4

Pulse dummies take the value 1 in the specified quarter, 0 everywhere else. Here DD99Q2 refers to FY 99, 1998-99, second quarter. Table 7.9 gives the quarters where outliers were noted. The role of these dummies is to keep the magnitude of the coefficient of other variables on the right hand side from such outliers. These are considered more relevant for the forecast period where the value of the dummy is kept at zero.

**Table 7.9 Pulse Dummies**

<b>DD100Q1</b>	<b>DD101Q1</b>	<b>DD102Q1</b>	<b>DD103Q1</b>	<b>DD104Q1</b>	<b>DD105Q1</b>
<b>DD100Q4</b>	DD101Q3		DD103Q3	DD104Q3	DD105Q2
			DD103Q4		DD105Q3
					DD105Q4
<b>DD106Q1</b>	DD107Q1	DD108Q1	DD109Q1	DD110Q1	DD111Q4
<b>DD106Q4</b>	DD107Q4	DD108Q2	DD109Q2	DD110Q2	DD112Q2
		DD108Q3	DD109Q3	DD110Q3	
		DD108Q4	DD109Q4	DD110Q4	

*Source: As used in the estimation process*

The values of exogenous variables for the base run of the model are given in Appendix 5.

## CHAPTER 8

### OVERVIEW AND BASE FORECASTS

In this section, we present the forecasts in the context of recent developments in the Indian economy. The presentation is divided into six parts: (1) aggregate demand, (2) aggregate output and its components, (3) fiscal aggregates, (4) monetary variables, (5) external sector variables, and (6) inflation rates. In the tables given in this Chapter, quarterly Y-o-Y growth rates are shown beginning FY12 Q1 where FY 12 means fiscal year 2011-12. Up to FY13Q2, growth rates are on the basis of latest available estimates. FY13Q3 onwards up to FY14Q4 are the forecasts in the base run. These are given in bold so as to distinguish forecasts from historical data. Historical data themselves may relate to advanced, quick or provisional estimates or the corresponding actual in the case national income estimates or revised or budget estimates or accounts in the case of fiscal data.

#### 8.1 Aggregate Demand

Aggregate demand consists of five main aggregates: private consumption expenditure, government consumption expenditure, gross fixed domestic capital formation, exports and imports. These are given at 2004-05 prices. Table 8.1 quarter-wise year-on-year growth rates, for a quarter calculated with the value of the variable four quarters back, for the components of aggregate demand using actual as per available estimates continued with forecasts. The latter group is distinguished by the shaded bold digits.

**Table 8.1: Aggregate Demand**

Financial Year/Quarters	(% per annum)					
	Private consumption expenditure	Government consumption expenditure	Gross domestic fixed capital formation	Exports	Imports	GDP at market prices
FY12Q1	4.86	4.89	14.66	17.97	19.33	8.99
FY12Q2	4.56	7.17	5.02	19.75	27.04	6.91
FY12Q3	6.42	4.65	-0.32	6.13	26.96	6.24
FY12Q4	6.13	4.13	3.62	18.10	2.01	5.61
Avg.FY12	5.49	5.21	5.75	15.49	18.84	6.94
FY13Q1	3.98	9.03	0.66	10.08	7.88	3.94
FY13Q2	3.68	8.67	4.06	4.26	6.56	2.81
<b>FY13Q3</b>	<b>7.36</b>	<b>-2.95</b>	<b>8.61</b>	<b>5.94</b>	<b>11.53</b>	<b>5.98</b>
<b>FY13Q4</b>	<b>7.07</b>	<b>-0.53</b>	<b>8.39</b>	<b>11.24</b>	<b>11.46</b>	<b>4.63</b>
Avg.FY13	5.52	3.56	5.43	7.88	9.36	4.34
<b>FY14Q1</b>	<b>5.59</b>	<b>-4.58</b>	<b>8.18</b>	<b>9.42</b>	<b>9.65</b>	<b>4.68</b>
<b>FY14Q2</b>	<b>4.56</b>	<b>11.79</b>	<b>8.05</b>	<b>11.49</b>	<b>8.97</b>	<b>4.63</b>
<b>FY14Q3</b>	<b>5.35</b>	<b>14.88</b>	<b>7.93</b>	<b>16.45</b>	<b>8.98</b>	<b>6.34</b>
<b>FY14Q4</b>	<b>5.70</b>	<b>3.54</b>	<b>7.91</b>	<b>18.65</b>	<b>8.15</b>	<b>7.03</b>
Avg.FY14	5.30	6.41	8.02	14.00	8.94	5.67

Source: NAS (Various Quarters) and Model Forecasts

Note: Financial years are referred to as FY. FY14 means, financial year 2013-14.

One of the main concerns in recent quarters has been the volatility and lowering of the investment demand in the form of gross domestic capital formation. We expect a revival in the next few quarters.

In the model estimates, it is indicated that GDP at market prices may fall to a little above 4 percent in FY 13. The CSO advanced estimates have put it at 3.3 percent. With investment picking up, GDP at market prices is expected to rise to about 5.7 percent in FY 14. With a fiscal intervention, as indicated by the current budget, being based on expenditure compression, there may be an adverse impact on the output of the sector ‘community, social, and services’ as discussed in the next section. However, with the fiscal strategy driving reduction in subsidies, we expect growth in GDP at market prices to be marginally higher than GDP at factor cost. The position in FY13 was the reverse of this. We also expect the upturn in growth to occur in the second to third quarter of FY14, which should gather momentum in subsequent quarters.

## 8.2 Aggregate Output and Its Components

In this section, we look at the prospects of aggregate and sector-wise output for the period up to FY14Q4 in the light of recent growth performance. Table 8.2 gives the quarter-wise year-on-year growth rates with respect to actuals up to 2013Q2 and the forecasts for the latter period estimated with respect to actual or forecasts as relevant. This pattern is maintained in the remaining tables in this chapter.

**Table 8.2: Output and Its Components: Quarter-wise Y-o-Y Growth Rates**

(% per annum)

Financial Year/Quarters	Agriculture and allied sectors	Mining and quarrying	Manufacturing	Electricity, gas and water supply	Construction	Financial, real estate, and business services	Trade, hotels, transport, storage, and communications	Community, social and personal services	GDP at factor cost
FY12Q1	3.67	-0.20	7.26	7.95	3.51	9.38	13.78	3.18	7.96
FY12Q2	3.12	-5.44	2.93	9.82	6.29	9.90	9.53	6.06	6.71
FY12Q3	2.82	-2.83	0.55	9.03	6.64	9.13	9.99	6.45	6.13
FY12Q4	1.67	4.33	-0.25	4.88	4.84	10.03	6.98	7.08	5.33
Avg.FY12	2.82	-1.03	2.62	7.92	5.32	9.61	10.07	5.69	6.53
FY13Q1	2.90	0.12	0.19	6.30	10.93	10.84	4.00	7.92	5.45
FY13Q2	1.20	1.86	0.80	3.36	6.70	9.41	5.50	7.53	5.28
<b>FY13Q3</b>	<b>2.24</b>	<b>3.33</b>	<b>5.89</b>	<b>6.31</b>	<b>9.45</b>	<b>3.12</b>	<b>8.05</b>	<b>5.39</b>	<b>5.55</b>
<b>FY13Q4</b>	<b>2.63</b>	<b>3.13</b>	<b>6.29</b>	<b>5.96</b>	<b>9.03</b>	<b>4.29</b>	<b>4.61</b>	<b>-1.23</b>	<b>4.01</b>
Avg.FY13	2.24	2.11	3.29	5.48	9.03	6.91	5.54	4.90	5.07
FY14Q1	3.63	2.94	6.57	6.01	8.88	5.10	4.64	-6.72	3.56
FY14Q2	3.28	2.76	6.71	6.04	8.80	6.61	3.99	-1.30	4.31
FY14Q3	3.17	2.59	6.77	6.05	8.68	7.86	6.76	9.84	6.85
FY14Q4	3.26	2.43	6.80	5.99	8.48	8.11	7.93	9.93	7.35
Avg.FY14	3.33	2.68	6.71	6.02	8.71	6.92	5.83	2.94	5.52

Source: NAS (Various Quarters) and Model Forecasts

As indicated in Table 8.2, FY14 may show better output performance not only in agriculture but also in manufacturing and some of the service sectors. However, the sectoral

growth rates in industry and services will remain below historical benchmarks of high growth rates. The Overall growth in GDP at factor cost at 2004-05 prices may be around 5.5 percent.

### 8.3 Fiscal Sector

The fiscal sector mainly relates to the central government. We look at the main direct and indirect taxes and the revenue and capital accounts. Fiscal deficit is accumulated into central debt from which interest payments are derived.

Table 8.3 gives the quarter-wise Y-o-Y growth rates using actuals continued with forecasts.

**Table 8.3: Central Tax Revenues: Quarter-wise Y-o-Y Growth Rates**

	(% per annum)					
Financial Year/Quarters	Personal income tax revenues	Corporate tax revenues	Union excise duties	Customs duties	Service Tax	Central net tax revenues
FY12Q1	1.95	-27.83	23.18	37.70	31.11	-6.30
FY12Q2	28.97	21.26	8.43	9.26	41.61	17.81
FY12Q3	14.96	10.08	-0.78	3.05	36.81	5.04
FY12Q4	23.07	11.99	-0.30	-3.67	36.16	16.42
<b>Avg.FY12</b>	<b>17.24</b>	<b>3.87</b>	<b>7.63</b>	<b>11.59</b>	<b>36.42</b>	<b>8.24</b>
FY13Q1	40.19	52.97	8.05	-1.20	40.65	32.79
FY13Q2	15.35	-1.60	17.48	11.86	27.79	7.54
<b>FY13Q3</b>	<b>16.85</b>	<b>26.66</b>	<b>6.59</b>	<b>17.41</b>	<b>9.87</b>	<b>14.45</b>
<b>FY13Q4</b>	<b>14.04</b>	<b>19.41</b>	<b>4.26</b>	<b>16.05</b>	<b>-1.54</b>	<b>5.92</b>
<b>Avg.FY13</b>	<b>21.61</b>	<b>24.36</b>	<b>9.09</b>	<b>11.03</b>	<b>19.19</b>	<b>15.17</b>
<b>FY14Q1</b>	<b>14.42</b>	<b>11.20</b>	<b>5.06</b>	<b>17.75</b>	<b>16.23</b>	<b>2.38</b>
<b>FY14Q2</b>	<b>14.34</b>	<b>14.04</b>	<b>4.79</b>	<b>16.46</b>	<b>13.62</b>	<b>7.34</b>
<b>FY14Q3</b>	<b>17.55</b>	<b>19.38</b>	<b>8.65</b>	<b>16.47</b>	<b>15.76</b>	<b>17.59</b>
<b>FY14Q4</b>	<b>17.71</b>	<b>24.23</b>	<b>8.75</b>	<b>16.07</b>	<b>16.17</b>	<b>20.40</b>
<b>Avg.FY14</b>	<b>16.00</b>	<b>17.21</b>	<b>6.81</b>	<b>16.69</b>	<b>15.45</b>	<b>11.93</b>

Source: Comptroller General of Accounts and Model Forecasts

In terms of growth of individual tax revenues, we do not see the kind of buoyancy of service tax that was assumed in the Union Budget for FY14. It will be more than 1 but not more than 2 as was assumed in the Union Budget. The buoyancy of Union excise duties may be well below 1.

Table 8.4 provides the key fiscal indicators



**Table 8.4: Key Fiscal Indicators: Quarter-wise Y-o-Y Growth Rates and Relative to GDP at Market Prices**

Financial Year/Quarters	Central interest payments	Central revenue expenditure	Central revenue deficit (% to GDPmp at current prices)	Central fiscal deficit (% to GDPmp at current prices)	Central debt (% to GDPmp at current prices)
FY12Q1	24.77	7.20	6.59	7.97	58.88
FY12Q2	15.60	14.84	4.25	5.76	51.29
FY12Q3	30.80	14.45	2.91	4.33	52.57
FY12Q4	5.19	5.25	5.32	5.26	53.65
<b>Avg.FY12</b>	<b>19.09</b>	<b>10.44</b>	<b>4.77</b>	<b>5.83</b>	<b>54.10</b>
FY13Q1	20.81	20.35	6.67	8.31	49.46
FY13Q2	-2.60	13.58	4.84	6.41	50.84
<b>FY13Q3</b>	<b>17.06</b>	<b>6.13</b>	<b>2.00</b>	<b>3.57</b>	<b>51.70</b>
<b>FY13Q4</b>	<b>12.12</b>	<b>0.62</b>	<b>4.20</b>	<b>2.71</b>	<b>52.39</b>
<b>Avg.FY13</b>	<b>11.85</b>	<b>10.17</b>	<b>4.43</b>	<b>5.25</b>	<b>51.10</b>
<b>FY14Q1</b>	<b>11.26</b>	<b>-7.92</b>	<b>4.00</b>	<b>5.41</b>	<b>47.95</b>
<b>FY14Q2</b>	<b>6.52</b>	<b>12.67</b>	<b>5.50</b>	<b>4.96</b>	<b>49.03</b>
<b>FY14Q3</b>	<b>8.97</b>	<b>33.28</b>	<b>4.00</b>	<b>4.44</b>	<b>50.10</b>
<b>FY14Q4</b>	<b>8.45</b>	<b>16.27</b>	<b>4.00</b>	<b>4.41</b>	<b>51.23</b>
<b>Avg.FY14</b>	<b>8.80</b>	<b>13.58</b>	<b>4.38</b>	<b>4.80</b>	<b>49.58</b>

Source: Comptroller General of Accounts and Model Forecasts

Centre's fiscal deficit may be contained to below 5 percent in FY14 but it will have an adverse impact on the growth of output in the sector entitled 'community, social, and personal services' (Table 8.2).

## 8.4 Monetary Sector

We review and forecast key monetary variables here. Table 8.5 gives the details.

**Table 8.5: Monetary Aggregates: Quarter-wise Y-o-Y Growth Rates and Rate**  
(% per annum)

Financial Year/Quarters	Reserve money (M0)	Liquidity aggregate (L3)	Broad money (M3)	Long term interest rate (IDBIRL)
FY12Q1	17.60	16.71	17.32	10.25
FY12Q2	15.93	16.51	16.78	10.25
FY12Q3	14.75	15.70	15.47	10.25
FY12Q4	8.80	13.55	13.97	10.25
<b>Avg.FY12</b>	<b>14.27</b>	<b>15.62</b>	<b>15.88</b>	<b>10.25</b>
FY13Q1	7.34	15.74	14.22	10.25
FY13Q2	6.50	13.23	13.64	10.25
<b>FY13Q3</b>	<b>8.00</b>	<b>14.82</b>	<b>8.73</b>	<b>10.25</b>
<b>FY13Q4</b>	<b>10.50</b>	<b>14.89</b>	<b>11.31</b>	<b>10.25</b>
<b>Avg.FY13</b>	<b>8.08</b>	<b>14.67</b>	<b>11.97</b>	<b>10.25</b>

FY14Q1	12.00	14.97	12.55	10.25
FY14Q2	13.00	14.66	13.51	10.25
FY14Q3	13.00	14.74	13.49	10.30
FY14Q4	14.00	14.73	14.21	10.30
Avg.FY14	13.00	14.77	13.44	10.28

Source: Reserve Bank of India and Model Forecasts

Broad money growth is likely to be contained in the range of 13-14 percent. Easing of monetary policy should be calibrated so as to contain M3 growth within these limits if the inflation rate is to be brought down to acceptable limits. Growth of M0 should also be calibrated so as to remain in the range of 12-13 percent.

## 8.5 External Sector

Table 8.6 gives the external sector aggregates forecasts.

**Table 8.6: External Sector Aggregates: Quarter-wise Y-o-Y Growth Rates and Ratio with respect to GDP at Market Prices**

Financial Year/Quarters	Exports of goods (in USD)	Imports of goods (in USD)	Net invisibles Ratio (% to GDPmp)	Balance of trade (% to GDPmp at current prices)	(% per annum)
					Current account surplus (% to GDPmp at current prices)
FY12Q1	21.95	23.38	2.42	-6.43	-3.84
FY12Q2	30.28	27.65	4.53	-8.72	-4.22
FY12Q3	16.20	33.62	4.79	-8.64	-4.39
FY12Q4	6.83	30.08	-6.82	1.98	-4.47
Avg.FY12	18.82	28.68	1.23	-5.45	-4.23
FY13Q1	8.41	7.21	9.73	-10.49	-8.19
FY13Q2	5.88	9.14	8.00	-13.11	-3.38
FY13Q3	6.06	11.89	7.50	-12.45	-4.45
FY13Q4	7.48	3.14	6.60	-12.65	-5.15
Avg.FY13	6.96	7.85	7.96	-12.17	-5.29
FY14Q1	7.76	9.94	6.50	-10.42	-3.82
FY14Q2	10.23	8.04	6.50	-12.52	-5.42
FY14Q3	13.23	7.10	6.30	-11.04	-4.54
FY14Q4	14.88	7.87	7.00	-10.58	-4.08
Avg.FY14	11.52	8.24	6.58	-11.14	-4.46

Source: Reserve Bank of India and Model Forecasts

In the context of the external sector, a major concern is the level of current account deficit. Financing such a large deficit increase inward foreign exchange will affect reserve money by affecting RBI's foreign exchange assets. Export growth is likely to remain sluggish until developed and emerging market economies emerge out of the current global slowdown. Some important relief to the Indian economy can come if the global crude oil prices stabilize or begin to fall. It may be noted that exports and imports growth when measured in rupee

terms are given in Table 8.1 pertaining to aggregate demand. The current account deficit as percentage of GDP may exceed 5 percent in FY 13. In the next year, it may fall by about 1 percentage point.

## 8.6 Inflation based on Wholesale Price Index

In this section, we look at the WPI based inflation profile in recent past and forecasts going up to 2014Q4. Table 8.7 gives inflation rates for six categories of commodity groups, viz., food articles, primary articles, fuel and energy group, manufactured articles, all commodities, and manufactured articles excluding food products. The last group indicates core inflation.

**Table 8.7: Inflation Rates based on Wholesale Price Index**

(% per annum)

Financial Year/Quarters	Inflation rate for WPI food articles	Inflation rate for WPI primary articles	Inflation rate for WPI fuel and energy	Inflation rate for WPI manufactured articles	Inflation rate for WPI all commodities	Inflation rate for WPI manufactured articles excluding food products (core)
FY12Q1	8.83	13.09	12.74	7.38	9.71	7.35
FY12Q2	9.14	12.05	12.99	7.87	9.01	7.80
FY12Q3	6.34	7.76	15.08	7.95	7.50	8.13
FY12Q4	5.05	6.70	14.94	5.89	7.54	5.92
<b>Avg.FY12</b>	<b>7.34</b>	<b>9.90</b>	<b>13.94</b>	<b>7.27</b>	<b>8.44</b>	<b>7.30</b>
FY13Q1	10.82	9.87	11.90	5.29	7.78	5.15
FY13Q2	9.11	10.17	9.68	6.16	7.29	5.62
<b>FY13Q3</b>	<b>7.77</b>	<b>8.40</b>	<b>6.63</b>	<b>3.59</b>	<b>5.35</b>	<b>3.49</b>
<b>FY13Q4</b>	<b>7.75</b>	<b>8.31</b>	<b>5.99</b>	<b>3.78</b>	<b>5.31</b>	<b>3.75</b>
<b>Avg.FY13</b>	<b>8.87</b>	<b>9.19</b>	<b>8.55</b>	<b>4.71</b>	<b>6.43</b>	<b>4.50</b>
<b>FY14Q1</b>	<b>7.63</b>	<b>8.31</b>	<b>6.28</b>	<b>3.85</b>	<b>5.43</b>	<b>3.76</b>
<b>FY14Q2</b>	<b>7.54</b>	<b>8.20</b>	<b>6.12</b>	<b>4.14</b>	<b>5.56</b>	<b>4.11</b>
<b>FY14Q3</b>	<b>7.55</b>	<b>8.22</b>	<b>5.95</b>	<b>3.92</b>	<b>5.42</b>	<b>3.86</b>
<b>FY14Q4</b>	<b>7.58</b>	<b>8.21</b>	<b>5.81</b>	<b>3.60</b>	<b>5.19</b>	<b>3.49</b>
<b>Avg.FY14</b>	<b>7.58</b>	<b>8.24</b>	<b>6.04</b>	<b>3.87</b>	<b>5.40</b>	<b>3.81</b>

Source: Office of Economic Advisor and Model Forecasts

Inflation based on WPI for the all commodities index is seen to be coming down to about 5.4 percent in FY14 from about 6.4 in FY 13 if the present policy configuration is continued. The WPI inflation for non-food manufactured articles may fall to below 4 percent in FY14 from 4.5 percent in FY13. Inflation for food articles and primary articles will however remain around 8 percent.

## CHAPTER 9

### CONCLUDING OBSERVATIONS

#### 9.1 Overview

In this work a macro econometric model of the Indian Economy based on quarterly data has been presented. The model consists of 81 equations of which 46 are stochastic equations and 35 are identities. The model has 4 sectors, namely: a) the real sector, b) the fiscal sector, c) the monetary and credit sectors and d) the external sector. The real sector has 3 segments consisting of aggregate demand, aggregate output, and capital stock and sectoral investments. Aggregate output consists of 8 sectors including a) agriculture, b) mining and quarrying, c) manufacturing, d) electricity, gas, and water supply, e) construction, f) trade, hotels, transport, storage, and communications, g) financial, real estate and business services and h) community, public and social services.

The model is specified and estimated in terms of two layers consisting of long run equilibrium relationships and the short term dynamics around each long run relationship. The model is estimated by using two stage least squares where, different sets of instrumental variables are used for equations specified in terms of levels of variables and changes in levels of variables (first differences).

Various inter-sectoral interactions have been incorporated in the model. The global economy also exerts a significant influence on the Indian economy through a number of channels including those emanating from resource prices, growth in income, and inflow of foreign capital.

An important objective of this modelling exercise is to provide a framework in which quarterly forecasts of important macroeconomic aggregates can be prepared. The model is also constructed in a manner such that a number of policy simulations can be carried out. These simulations can examine the time path of variables of interest when one-time shocks are given to any of the policy instruments. Different policy instruments can also be combined in order to examine their joint influence on the variables of interest.

On the fiscal side, important policy instruments that are taken as exogenous are primary revenue expenditure of the central government and the central fiscal deficit. Important monetary instruments include the RBI policy rate (repo rate) and the cash reserve ratio. In addition, stochastic shocks can be introduced on other variables including those arising from the global economy.

#### 9.2 Adjustment Dynamics

From the estimates of the error correction term in the equation describing the short term dynamics around the long run equilibrium relationships, it has been possible to derive the magnitude of error correction and the speed of adjustment. We notice the following broad patterns:

- Consumption expenditure adjusts much faster than investment expenditure. Within consumption expenditure, government expenditure adjusts even faster. It takes about

1.2 quarters for adjustment to be completed in government consumption expenditure and 1.8 quarters for adjustment to be completed in private consumption expenditure.

- Investment adjusts far more slowly. It takes nearly 6 quarters for gross fixed capital formation to adjust to its long term value.
- There are varying periodicities of adjustments in sectoral outputs. The fastest in this case is community, social, and public services where adjustment happens in 1.6 quarters followed by financial, real estate, and business services. In the case of manufacturing, adjustment requires about 5 quarters and construction, 6 quarters.
- For tax revenue variables, adjustments are faster for income and corporate income tax revenues where it takes just a little more than 1 quarter for the adjustment to be completed. In the case of indirect taxes, it takes 2.3 quarters for customs duties and nearly 3.1 quarters for Union excise duties.
- The short term interest rates take much less for adjustment to be completed: nearly 3 quarters for the call money rate and 4 quarters for the deposit rate. The long term lending rate takes nearly 9 quarters for adjustment to be completed.
- For the prices also we notice that adjustment time required for food articles and primary articles is smaller than those for fuel and energy and manufactured products.

### **9.3 Future Work**

This model provides a starting point for further exploring both the structural relationships of the model and its use for policy simulations. The policy simulations can highlight deficiencies of past policies. It can also be used for examining the impact of alternative policy configurations in a forecasting framework so that one may examine, given any initial imbalance, what might be the preferred configuration of policy intervention. The global influences also need to be further developed and articulated. So far, the model does not provide for a determination of movement in the global economy including growth and prices. Similarly, the fiscal sector relates only to the central fiscal aggregates due to the lack of state level data on a quarterly basis. One of the objectives for the future work would be to develop strategies for estimating state level government expenditures, revenues, and deficits in order to complete the treatment of the fiscal sector in the quarterly model. The exchange rate is being taken as exogenous for the time being. It is proposed to endogenise it in the later versions of the model.

This work should be taken as work-in-progress. As discussed elsewhere, the quarterly model is part of an overall modelling framework in which models with annual data with a medium term perspective and a long term perspective are interlinked.

## Appendices

Appendix 1: Notes on Adjustments for Stock Variables: Capital Stock and Fiscal Deficit

Appendix 2: List of Equations

Appendix 3: List of Variables

Appendix 4: Estimated Equations

- a. Aggregate demand equations
- b. Aggregate output and sectoral investment equations
- c. Fiscal sector equations
- d. Monetary and financial sector equations
- e. External sector equations
- f. Equations for price indices

Appendix 5: Values of Exogenous Variables in Base Run

## Appendix 1:

### a. Note on Adjustment for Capital Stock Data

This adjustment is done to ensure that the change in net fixed capital stock obtained as the sum of changes in the four quarters is equal to the corresponding change obtained through annual data.

From annual data we have Gross Fixed Capital Stock (GFCF) data say,  $K_0$ ,  $K_1$ , for two successive years. From this, we obtain investment in the current year as  $(K_1 - K_0)$ . Thus,

$$(K_1 - K_0) = DK$$

Annual data enables one to calculate this for each of the eight sector giving  $DK_i$

Where  $i = 1, 2, 3, 4, 5, 6, 7, 8$  denote the 8 output and investment sectors.

For deriving quarterly data for Gross Fixed Investment, we first obtain the annual gross fixed investment (SGFCF) as the Sum of Gross Fixed Capital Formation.

$$SGFCF * (DK / SGFCF) = DK$$

$$\text{Where, } SGFCF = \sum GFCF (Q_N)$$

Then, we get the ratio of DK to SGFCF. Thus, to get the quarterly aggregates of gross fixed investment, we do the following:

$$GFCF (Q_N) * (DK / SGFCF)$$

Where  $N = 1, 2, 3, 4$  denoting the 4 fiscal quarters.

We can see that the sum of quarterly aggregate gross fixed investment is equal to the annual change in gross fixed investment since

To obtain the sectoral ratios for each quarter, the following calculations are done:

$$GFCF (Q_N) * (DK / SGFCF) * (DK_1 / DK)$$

Where, the ratio  $(DK_1 / DK)$  is the ratio of value of investment in the beginning of the first quarter to value of investment at the end of fourth quarter.

Assuming a linear growth for different quarters, we can derive, for example, the growth rate of first quarter as follows:

$$((DK_1 / DK)^1 - (DK_1 / DK)^0) / 4 = Q1$$

Similarly, we can cumulate these to derive the values at the end of 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> quarters.

This process ensures that sum of quarterly investments add to annual change in fixed capital stock and sum of sectoral investments add to change in aggregate fixed capital stock.

### **b. Note on Adjustment for Fiscal Deficit**

Central fiscal deficit is taken as the change in central government fiscal liabilities. Two adjustments are involved. First, the central fiscal deficit in the budget differs from the change in government liabilities and secondly, the sum of quarterly fiscal deficits may not add to the annual deficit. Central fiscal deficit for each quarter is multiplied by  $\text{CFD (annual)}/\text{Sum (CFD quarterly)}$ , which is further multiplied by the ratio of change in annual liabilities with annual central fiscal deficit as given in the budget.



## Appendix 2: List of Equations

EQUATION NO.	VARIABLE	VARIABLE DESCRIPTION	EQUATION TYPE
1	YMR	GDP at constant MP	Identity
2	CPR	Private final consumption expenditure	Stochastic
3	CGR	Government final consumption expenditure	Stochastic
4	GDFDR	Gross fixed capital formation	Stochastic
5	YR	GDP FC	Identity
6	YINDR	Industrial output	Identity
7	YSER	Service sector output	Identity
8	CSTOCKR	Change in stock	Identity
9	YAR	Output of agriculture and allied sectors	Stochastic
10	YMQR	Output of mining and quarrying	Stochastic
11	YMANR	Output of manufacturing	Stochastic
12	YEGWSR	Output of electricity, gas and water supply	Stochastic
13	YCONSR	Output of construction	Stochastic
14	YTHTCR	Output of trade, hotels, transport, storage and communication	Stochastic
15	YFRBSR	Output of financial, real estate and business services	Stochastic
16	YCSPSR	Output of community, social and personal services	Stochastic
17	NIFCR	Net fixed capital stock	Identity
18	KAR	Capital stock of agriculture and allied sectors	Identity
19	KMQR	Capital stock of mining and quarrying	Identity
20	KMANR	Capital stock of manufacturing sector	Identity
21	KEGWSR	Capital stock of electricity, gas and water supply	Identity
22	KCONSR	Capital stock of construction sector	Identity
23	KTHTCR	Capital stock of trade, hotels, transport, storage and communication	Identity
24	KFRBSR	Capital stock of financial, real estate and business services	Identity
25	KCSPSR	Capital stock of community, social and personal services	Identity
26	SICONSR	Sectoral share of construction	Stochastic
27	SIEGWSR	Sectoral share of electricity, gas and water supply	Stochastic
28	SIFRBSR	Sectoral share of financial, real estate and business services	Stochastic
29	SIMANR	Sectoral share of manufacturing sector	Stochastic
30	SITHTCR	Sectoral share of trade, hotels, transport, storage and communication	Stochastic
31	CTR	Net central tax revenue	Identity
32	CITR	Personal income tax revenue	Stochastic
33	CPTR	Tax on corporate incomes	Stochastic
34	CCDR	Customs duties	Stochastic
35	UDR	Union excise duties	Stochastic

36	CSVR	Service tax revenue	Identity
37	CRR	Central revenue receipts	Identity
38	CIP	Central government interest payments	Identity
39	CIPRATE	Effective interest rate	Identity
40	CRD	Centre's revenue deficit	Identity
41	CKR	Centre's capital expenditure	Identity
42	CFD	Centre's fiscal deficit	Identity
43	CDEBT	Central debt	Identity
44	IDLSR	Indirect taxes net of subsidies	Stochastic
45	M3	Broad Money	Identity
46	MMULTONE	Money Multiplier	Stochastic
47	TDEPOSITREAL	Time deposit	Stochastic
48	M0	Reserve Money	Identity
49	GLIAB	Government liabilities	Identity
50	NFEARBI	Net foreign exchange assets of RBI	Identity
51	L1	Narrow liquidity	Stochastic
52	L3	Broad liquidity	Stochastic
53	RMIN	Minimum deposit rate	Stochastic
54	IDBIRL	Long term lending rate	Stochastic
55	CMRATE	Call money rate	Stochastic
56	FCREDITREAL	Food credit (deflated)	Stochastic
57	NFCREDITREAL	Non-food credit (deflated)	Stochastic
58	EXPDDR	Exports in USD	Identity
59	IMPDD	Imports in USD	Identity
60	EXPR	Exports in 2004-05 prices	Identity
61	IMPR	Imports in 2004-05 prices	Identity
62	BOTRADE	Balance of trade in nominal terms (current prices)	Identity
63	CAS	Current account surplus	Identity
64	IMPOILDD	Oil imports in USD million	Stochastic
65	IMPNOILDD	Non-oil imports in USD million	Stochastic
66	RIMPDD	Other imports	Stochastic
67	PIMP	Imports at constant prices	Stochastic
68	EXPDD	Exports in USD million	Stochastic
69	REXPDD	Other exports	Stochastic
70	PEXP	Exports at constant prices	Stochastic
71	PYR	Implicit price deflator GDP FC	Stochastic
72	PYMR	Implicit price deflator GDP MP	Stochastic
73	WPIFA	WPI food articles	Stochastic
74	WPIPA	WPI primary articles	Stochastic

<b>75</b>	<b>WPIFUEL</b>	<b>WPI fuel group</b>	<b>Stochastic</b>
<b>76</b>	<b>WPIMFOOD</b>	<b>WPI manufactured products (food)</b>	<b>Stochastic</b>
<b>77</b>	<b>WPINFOOD</b>	<b>WPI non-food</b>	<b>Stochastic</b>
<b>78</b>	<b>WPIMAN</b>	<b>WPI manufactured products</b>	<b>Identity</b>
<b>79</b>	<b>WPIAC</b>	<b>WPI All commodities</b>	<b>Identity</b>
<b>80</b>	<b>CPIAW</b>	<b>CPI agricultural workers</b>	<b>Stochastic</b>
<b>81</b>	<b>CPIIW</b>	<b>CPI Industrial workers</b>	<b>Stochastic</b>

### Appendix 3: List of Variables

Variable name	Description	Unit	Source
<b>ASTSTATES</b>	Assignment to states	Current prices	CGA
<b>BCREDIT</b>	Bank credit	Current prices	RBI
<b>BOTRADE</b>	Balance of trade	Current prices	CSO
<b>BPR</b>	RBI policy rate (Bank rate/repo rate)	Rate (%)	RBI
<b>CAS</b>	Current account surplus	Current prices	CSO
<b>CCDR</b>	Customs duty revenue	Current prices	CGA
<b>CDEBT</b>	Centre's outstanding liabilities	Current prices	CGA
<b>CFD</b>	Central fiscal deficit	Current prices	CGA
<b>CGR</b>	Government consumption expenditure	Current prices	CSO
<b>CIP</b>	Centre's interest payments	Current prices	CGA
<b>CIPRATE</b>	Effective interest rate on centre's debt	Current prices	CGA
<b>CITR</b>	Personal income tax revenue	Current prices	CGA
<b>CKR</b>	Centre's capital receipts	Current prices	CGA
<b>CMRATE</b>	Call money rate	Rate (%)	RBI
<b>CNDKR</b>	Central non-debt capital states	Current prices	CGA
<b>CPIAW</b>	Consumer price index for agricultural labour	1986-87=1	Office of Economic Advisor
<b>CPIIW</b>	Consumer price index for industrial workers	2001=1	Office of Economic Advisor
<b>CPR</b>	Private consumption expenditure at constant prices	at 2004-05 prices	CSO
<b>CPRIMERE</b>	Central primary revenue expenditure	Current prices	CGA
<b>CPTR</b>	Corporate income tax revenue	Current prices	CGA
<b>CRD</b>	Central revenue deficit	Current prices	CGA
<b>CRE</b>	Central government revenue expenditure	Current prices	CGA
<b>CRR</b>	Central revenue receipts	Current prices	CGA
<b>CSTOCKR</b>	Change in stock	2004-05 prices	CSO
<b>CSVR</b>	Service tax revenue	Current prices	CGA
<b>CTE</b>	Central government total expenditure	Current prices	CGA
<b>CTOTHER</b>	Other central tax revenue	Current prices	CGA
<b>CTR</b>	Centre's net tax revenues	Current prices	CGA
<b>DISCPRR</b>	Discrepancy in GDP at market prices	at 2004-05 prices	CSO
<b>DISCR</b>	Discrepancy in GDP at market prices	at 2004-05 prices	CSO
<b>DRMIN</b>	Minimum deposit rate	Rate (%)	RBI
<b>ER</b>	Exchange rate (Rs. Per USD)	Rs per USD	RBI
<b>EXPDD</b>	Exports in USD	Current dollars	RBI
<b>EXPDDR</b>	Exports of goods denominated in USD	USD million	RBI
<b>EXPNOILDD</b>	Non-oil exports in USD	Current dollars	RBI
<b>EXPOILDD</b>	Oil exports in USD	Current dollars	RBI
<b>EXPR</b>	Exports at constant prices	at 2004-05 prices	CSO
<b>FCREDIT</b>	Food credit	Current prices	RBI
<b>FDFACTOR</b>	Fiscal deficit factor to ensure sum of 4 quarters fiscal deficit adds to annual fiscal deficit		Derived

<b>FDRATIO</b>	Fiscal deficit to GDP ratio	Ratio	Derived
<b>GCFCR</b>	Gross fixed capital formation	at 2004-05 prices	CSO
<b>GCOALPRICE</b>	Index of world coal price	2005=100	EU data base
<b>GCOPPERPRICE</b>	Index of world copper price	2005=100	EU data base
<b>GFCFR</b>	Gross fixed capital formation	at 2004-05 prices	CSO
<b>GFOODPRICE</b>	Index of world food price	2005=100	EU data base
<b>IDBIRL</b>	Long term lending rate (interest rate charged by IDBI)	per cent	RBI
<b>IDBIRL</b>	IDBI lending rate	Rate (%)	RBI
<b>IDLSR</b>	Indirect taxes net of subsidies	at 2004-05 prices	CSO
<b>IDLSR</b>	Indirect taxes net of subsidies at constant prices	at 2004-05 prices	CSO
<b>IFACTOR1</b>	Investment factor	Ratio	Derived
<b>IFACTOR2</b>	Investment factor	Ratio	Derived
<b>IMPDDR</b>	Imports of goods denominated in USD	USD million	RBI
<b>IMPNOILDD</b>	Non-oil imports in USD	Current dollars	RBI
<b>IMPOILDD</b>	Oil Imports in USD	Current dollars	RBI
<b>IMPR</b>	Imports at constant prices	at 2004-05 prices	CSO
<b>INVAL</b>	Investment in valuables	at 2004-05 prices	CSO
<b>IVALR</b>	Investment in valuables	at 2004-05 prices	CSO
<b>KAR</b>	Net fixed capital stock in agriculture	at 2004-05 prices	CSO
<b>KCONSR</b>	Net fixed capital stock in construction	at 2004-05 prices	CSO
<b>KCSPSR</b>	Net fixed capital stock in community, social and public services	at 2004-05 prices	CSO
<b>KEGWSR</b>	Net fixed capital stock in electricity, gas and water supply	at 2004-05 prices	CSO
<b>KFRBSR</b>	Net fixed capital stock in financial, real estate and business services	at 2004-05 prices	CSO
<b>KMANR</b>	Net fixed capital stock in manufacturing	at 2004-05 prices	CSO
<b>KMQR</b>	Net fixed capital stock in mining and quarrying	at 2004-05 prices	CSO
<b>KR</b>	Total net fixed capital stock	at 2004-05 prices	CSO
<b>KTHTCR</b>	Net fixed capital stock in trade, hotels, transport and communications	at 2004-05 prices	CSO
<b>L1</b>	Narrow Liquidity	Current prices	RBI
<b>L3</b>	Broad liquidity	Current prices	RBI
<b>M0</b>	Reserve money	Current prices	RBI
<b>M3</b>	Broad money	Current prices	RBI
<b>NFCREDIT</b>	Non-food credit	Current prices	RBI
<b>NINVRATIO</b>	Net invisibles to GDP ratio	Ratio	RBI
<b>OEXPR</b>	Other exports	at 2004-05 prices	Derived
<b>OIMPR</b>	Other imports	at 2004-05 prices	Derived
<b>OTR</b>	Revenue from other central taxes	Current prices	CGA
<b>PCRUDE</b>	International crude oil price (USD per barrel)	USD per barrel	FRED
<b>PEXP</b>	Unit value of exports	2004-05 =1	CSO
<b>PIMP</b>	Implicit price deflator of imports	2004-05=1	CSO
<b>PIMP</b>	Unit value of imports	2004-05 =1	CSO
<b>PYMR</b>	Implicit price deflator of GDP at market prices	2004-05=1	CSO
<b>PYR</b>	Implicit price deflator of GDP at factor cost	2004-05=1	CSO
<b>QQ1</b>	Mean-adjusted seasonal dummy for quarter 1		

<b>QQ2</b>	Mean-adjusted seasonal dummy for quarter 2		
<b>QQ3</b>	Mean-adjusted seasonal dummy for quarter 3		
<b>REXPDD</b>	Exports at constant prices of services derived as excess of IMPR over imports of goods	at 2004-05 prices	Derived
<b>RIMPDD</b>	Imports at constant prices of services derived as excess of IMPR over imports of goods	at 2004-05 prices	Derived
<b>SIAR</b>	Share of investment in agriculture	Ratio	Derived
<b>SIAR</b>	Share of agriculture in investment in net fixed capital formation	at 2004-05 prices	CSO
<b>SICONS</b>	Share of construction in investment in net fixed capital formation	at 2004-05 prices	CSO
<b>SICSPSR</b>	Share of investment in community, social and public services	Ratio	Derived
<b>SICSPSR</b>	Share of community, social and personal services in net fixed capital formation	at 2004-05 prices	CSO
<b>SIEGWSR</b>	Share of agriculture in electricity, gas and water supply in net fixed capital formation	at 2004-05 prices	CSO
<b>SIFRBSR</b>	Share of financial, real estate and business services in investment in net fixed capital formation	at 2004-05 prices	CSO
<b>SIMANR</b>	Share of manufacturing in investment in net fixed capital formation	at 2004-05 prices	CSO
<b>SIMQR</b>	Share of investment in mining and quarrying	Ratio	Derived
<b>SIMQR</b>	Share of mining and quarrying in investment in net fixed capital formation	at 2004-05 prices	CSO
<b>SITHTCR</b>	Share of trade, hotels, restaurants, transport and communications in net fixed capital formation	at 2004-05 prices	CSO
<b>TDEPOSITS</b>	Time deposits	Current prices	RBI
<b>UDR</b>	Union excise duties	Current prices	CGA
<b>WPIAC</b>	Wholesale price index for all commodities	2004-05=1	Office of Economic Advisor
<b>WPIFA</b>	Wholesale price index of food articles	2004-05=100	Office of Economic Advisor
<b>WPIFMAN</b>	Wholesale price index of manufactured articles	2004-05=100	Office of Economic Advisor
<b>WPIFUEL</b>	Wholesale price index of fuel and power	2004-05=100	Office of Economic Advisor
<b>WPIMFOOD</b>	Wholesale price index of food products in the group of manufactured articles	2004-05=100	Office of Economic Advisor
<b>WPINFOOD</b>	Wholesale price index of manufactured articles other than food products	2004-05=100	Office of Economic Advisor
<b>WPIPA</b>	Wholesale price index of primary articles	2004-05=100	Office of Economic Advisor
<b>YAR</b>	GDP at factor cost in agriculture	at 2004-05 prices	CSO
<b>YARGENTINA</b>	GDP of Argentina	2005 USD million	EU data base
<b>YAUSTRALIA</b>	GDP of AUSTRALIA	2005 USD million	EU data base
<b>YBRAZIL</b>	GDP of Brazil	2005 USD million	EU data base
<b>YCANADA</b>	GDP of CANADA	2005 USD million	EU data base
<b>YCONSR</b>	GDP at factor cost in construction	at 2004-05 prices	CSO

<b>YCSPSR</b>	GDP at factor cost in community, social and personal services	at 2004-05 prices	CSO
<b>YDCOUNTRIES</b>	Sum of GDP at constant USD of selected developed countries covering US, UK, France, Germany, Canada, Australia, Italy and Japan	2005 US Dollars	EU data base
<b>YECOUNTRIES</b>	Sum of GDP at constant USD of selected emerging market economy countries covering Argentina, Brazil, Indonesia, Korea, Mexico, South Africa, and Turkey,	2005 US Dollars	EU data base
<b>YEGWSR</b>	GDP at factor cost in electricity, gas, and water supply	at 2004-05 prices	CSO
<b>YFRANCE</b>	GDP of France	2005 USD million	EU data base
<b>YFRBSR</b>	GDP at factor cost in financial, real estate and business services	at 2004-05 prices	CSO
<b>YGERMANY</b>	GDP of Germany	2005 USD million	EU data base
<b>YINDONESIA</b>	GDP of Indonesia	2005 USD million	EU data base
<b>YINDR</b>	Output in industrial sector	at 2004-05 prices	CSO
<b>YITALY</b>	GDP of Italy	2005 USD million	EU data base
<b>YJAPAN</b>	GDP of Japan	2005 USD million	EU data base
<b>YMANR</b>	GDP at factor cost in manufacturing	at 2004-05 prices	CSO
<b>YMEXICO</b>	GDP of Mexico	2005 USD million	EU data base
<b>YMQR</b>	GDP at factor cost in mining and quarrying	at 2004-05 prices	CSO
<b>YMR</b>	GDP at market prices	at 2004-05 prices	CSO
<b>YMRDISP</b>	GDP at factor cost net of central direct taxes less central interest payments	at 2004-05 prices	CSO
<b>YR</b>	GDP at factor cost	at 2004-05 prices	CSO
<b>YRN</b>	GDP at factor cost at current prices	2004-05 base series	CSO
<b>YSAFRICA</b>	GDP of South Africa	2005 USD million	EU data base
<b>YSER</b>	Output in services sector	at 2004-05 prices	CSO
<b>YSOUTHKOREA</b>	GDP of South Korea	2005 USD million	EU data base
<b>YTHTCR</b>	GDP in trade, hotels, restaurants, transport and communications in net fixed capital formation	at 2004-05 prices	CSO
<b>YTURKEY</b>	GDP of Turkey	2005 USD million	EU data base
<b>YUK</b>	GDP of United Kingdom	2005 USD million	EU data base
<b>YUS</b>	GDP of US	2005 USD million	EU data base

## Appendix 4: Estimated Equations

### a) Aggregate Demand

1. Private consumption expenditure
2. Government consumption expenditure
3. Gross fixed capital formation

It may be noted that occasionally the equation describing the short term dynamics contains only predetermined variables. Since these are included in the set of instrumental variables, the 2SLS estimates amount to OLS estimates. The instrumental variables are still listed to maintain a uniform pattern of presentation. This applies to all the subsequent sections.

#### Long Run Relation: Private Consumption Expenditure

Dependent Variable: LCPR

Method: Two-Stage Least Squares

Sample (adjusted): 2000Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LIDLSR(-1) LCPR(-4) QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.180	0.142	-1.267	0.212
LYMRDISP	0.671	0.080	8.364	0.000
LIDLSR(-1)	-0.049	0.019	-2.581	0.013
LCPR(-4)	0.359	0.078	4.611	0.000
Adjusted R-squared	0.995	S.D. dependent var		0.27
F-statistic	1725.01	Durbin-Watson stat		2.05

#### Short-term Dynamics

Dependent Variable: DLCPR

Method: Two-Stage Least Squares

Sample (adjusted): 2000Q1 2013Q2

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLCPR(-1) QQ1

QQ2 QQ3 DLCPR(-2) DLCPR(-4) DD100Q4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002	0.004	0.451	0.655
DLYMRDISP	0.582	0.200	2.911	0.006
ZLCPR(-1)	-0.547	0.179	-3.055	0.004
QQ1	0.121	0.029	4.235	0.000
QQ2	0.068	0.016	4.221	0.000
QQ3	0.102	0.024	4.165	0.000
DLCPR(-4)	0.385	0.085	4.520	0.000
DD100Q4	-0.075	0.028	-2.678	0.010
Adjusted R-squared	0.931	S.D. dependent var		0.09
F-statistic	99.97	Durbin-Watson stat		2.19

CPR Private consumption expenditure at constant prices

IDLSR Indirect taxes net of subsidies

YMRDISP GDP at factor cost net of central direct taxes less central interest payments



**Long Run Relation: Government Consumption Expenditure**

Dependent Variable: LCGR

Method: Two-Stage Least Squares

Sample (adjusted): 1999Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) QQ1 QQ2 QQ3 LCGR(-4) LCPRIMEREREAL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.837	0.446	6.365	0.000
LCPRIMEREREAL	0.440	0.050	8.785	0.000
QQ1	-0.062	0.031	-1.985	0.052
QQ2	-0.086	0.031	-2.735	0.009
QQ3	-0.026	0.030	-0.865	0.391
LCGR(-4)	0.326	0.076	4.283	0.000
Adjusted R-squared	0.947	S.D. dependent var		0.31
F-statistic	206.31	Durbin-Watson stat		2.11

**Short-term Dynamics**

Dependent Variable: DLCGR

Method: Two-Stage Least Squares

Sample (adjusted): 1999Q2 2013Q2

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1)

DLYEGWSR(-1) DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1)

ZLCGR(-1) DLCGR(-4) QQ1 QQ2 QQ3 DLCPRIMEREREAL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.007	0.009	-0.758	0.452
ZLCGR(-1)	-0.848	0.136	-6.251	0.000
DLCPRIMEREREAL	0.571	0.062	9.258	0.000
DLCGR(-4)	0.330	0.058	5.726	0.000
QQ1	-0.009	0.055	-0.165	0.870
QQ2	-0.025	0.030	-0.807	0.424
QQ3	0.071	0.030	2.335	0.024
Adjusted R-squared	0.937	S.D. dependent var		0.28
F-statistic	140.59	Durbin-Watson stat		2.13

CGR

Government consumption expenditure

CPRIMEREREAL

Central primary revenue expenditure deflated by PYMR

**Long Run Relation: Gross Fixed Capital Formation**

Dependent Variable: LGFCFR

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LGFCFR(-1) DD109Q4 QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.071	0.686	-0.103	0.918
LYMRDISP	0.238	0.106	2.246	0.029
LIDBIRL	-0.226	0.095	-2.381	0.021
LGFCFR(-1)	0.789	0.080	9.883	0.000
DD109Q4	-0.100	0.033	-3.055	0.004
QQ1	-0.106	0.020	-5.426	0.000
QQ2	-0.021	0.018	-1.188	0.240
QQ3	-0.038	0.012	-3.279	0.002
Adjusted R-squared	0.996	S.D. dependent var		0.45
F-statistic	1962.02	Durbin-Watson stat		2.16

**Short-term Dynamics**

Dependent Variable: DLGFCFR

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q2 2013Q3

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(

-1) DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLGFCFR(-1)

DD109Q4 DD107Q3 QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.025	0.004	5.945	0.000
ZLGFCFR(-1)	-0.172	0.092	-1.869	0.067
DD109Q4	-0.119	0.033	-3.556	0.001
QQ1	-0.143	0.012	-11.942	0.000
QQ2	-0.053	0.012	-4.519	0.000
QQ3	-0.046	0.012	-3.892	0.000
Adjusted R-squared	0.716	S.D. dependent var		0.06
F-statistic	31.76	Durbin-Watson stat		2.06

GFCFR Gross fixed capital formation

YMRDISP GDP at factor cost net of central direct taxes less central interest payments

IDBIRL Long term lending rate (interest rate charged by IDBI)

b) Outputs

1. Agriculture and allied sectors
2. Mining and quarrying
3. Manufacturing
4. Electricity, gas and water supply
5. Construction
6. Trade, hotels, transport, storage and communications
7. Financial, real estate and business services
8. Community, social and personal services
9. Share of investment in construction
10. Share of investment in electricity, gas and water supply
11. Share of investment in financial, real estate and business services
12. Share of investment in manufacturing

### Long Run Relation

Dependent Variable: LYAR

Method: Two-Stage Least Squares

Sample (adjusted): 2000Q1 2012Q4

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LKAR(-4) LYEGWSR(-1) DD103Q3 DD103Q4 DD110Q3

QQ1 QQ2 QQ3 DRAINFALL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.568	0.844	6.593	0.000
LKAR(-4)	0.257	0.139	1.847	0.072
LYEGWSR(-1)	0.290	0.113	2.561	0.014
DRAINFALL	-0.019	0.009	-2.084	0.043
DD103Q4	-0.114	0.033	-3.493	0.001
QQ1	-0.088	0.012	-7.076	0.000
QQ2	-0.324	0.012	-26.239	0.000
QQ3	0.185	0.012	15.119	0.000
Adjusted R-squared	0.981	S.D. dependent var		0.22
F-statistic	375.72	Durbin-Watson stat		1.86

### Short-term Dynamics

Dependent Variable: DLYAR

Method: Two-Stage Least Squares

Sample (adjusted): 2000Q1 2013Q1

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLYAR(-1)

DLYAR(-4) DD104Q3 QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.003	0.004	0.794	0.431
ZLYAR(-1)	-0.630	0.151	-4.164	0.000
DLYAR(-4)	0.231	0.118	1.962	0.056
DD104Q3	0.065	0.033	1.961	0.056
QQ1	0.088	0.019	4.651	0.000
QQ2	-0.032	0.013	-2.443	0.019
QQ3	0.530	0.084	6.278	0.000
Adjusted R-squared	0.990	S.D. dependent var		0.30
F-statistic	821.53	Durbin-Watson stat		1.84

YAR	GDP at factor cost in agriculture
KAR	Net fixed capital stock in agriculture
YEGWSR	GDP at factor cost in electricity, gas, and water supply
DRAINFALL	Deficiency in rainfall in relative to average in years of deficient rainfall.

**Long Run Relation**

Dependent Variable: LYMQR

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2012Q4

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LKMQR(-4) LYMQR(-1) QQ1 QQ2 QQ3 D102Q1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.437	0.432	3.329	0.002
LKMQR(-4)	0.090	0.032	2.832	0.007
LYMQR(-1)	0.740	0.078	9.429	0.000
QQ1	-0.176	0.010	-17.889	0.000
QQ2	-0.117	0.010	-11.196	0.000
QQ3	0.002	0.012	0.159	0.874
D102Q1	0.055	0.017	3.243	0.002
Adjusted R-squared	0.985	S.D. dependent var		0.20
F-statistic	635.22	Durbin-Watson stat		2.13

**Short-term Dynamics**

Dependent Variable: DLYMQR

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q2 2013Q1

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLYMQR(-1)

DLYMQR(-1) QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.010	0.003	2.913	0.005
ZLYMQR(-1)	-0.335	0.115	-2.910	0.005
QQ1	-0.193	0.009	-20.959	0.000
QQ2	-0.100	0.009	-10.781	0.000
QQ3	0.027	0.009	2.958	0.005
Adjusted R-squared	0.924	S.D. dependent var		0.09
F-statistic	180.70	Durbin-Watson stat		2.07

YMQR GDP at factor cost in mining and quarrying

KMQR Net fixed capital stock in mining and quarrying

**Long Run Relation**

Dependent Variable: LYMANR

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2012Q4

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LKMANR(-4) LYCONSR(-1) QQ1 QQ2 QQ3 D106Q4

DD107Q3 DD109Q3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.769	0.381	7.262	0.000
LKMANR(-4)	0.112	0.056	1.998	0.051
LYCONSR(-1)	0.665	0.046	14.345	0.000
QQ1	-0.087	0.010	-9.182	0.000
QQ2	-0.053	0.009	-5.741	0.000
QQ3	-0.018	0.009	-1.924	0.060
D106Q4	0.075	0.013	5.587	0.000
DD109Q3	-0.057	0.027	-2.158	0.036
Adjusted R-squared	0.994	S.D. dependent var		0.33
F-statistic	1422.95	Durbin-Watson stat		1.16

**Short-term Dynamics**

Dependent Variable: DLYMANR

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q2 2013Q1

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLYMANR(-1)

DLYMANR(-1) QQ1 QQ2 QQ3 DD109Q4 DD110Q1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.012	0.003	4.189	0.000
ZLYMANR(-1)	-0.200	0.101	-1.976	0.054
DLYMANR(-1)	0.245	0.104	2.352	0.023
QQ1	-0.126	0.007	-18.064	0.000
QQ2	-0.022	0.011	-2.087	0.042
QQ3	-0.031	0.006	-5.069	0.000
DD109Q4	-0.061	0.018	-3.406	0.001
DD110Q1	0.093	0.021	4.537	0.000
Adjusted R-squared	0.874	S.D. dependent var		0.05
F-statistic	59.41	Durbin-Watson stat		1.94

YMANR GDP at factor cost in manufacturing

KMANR Net fixed capital stock in manufacturing

**Long Run Relation**

Dependent Variable: LYEGWSR

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2012Q4

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LKEGWSR(-4) LYCONSR(-1) LYFRBSR(-1) QQ1 QQ2

QQ3 LYEGWSR(-1) DD108Q1 D104Q2 LYEGWSR(-1) LYEGWSR(-4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.691	0.613	-1.127	0.265
LKEGWSR(-4)	0.209	0.108	1.927	0.059
DD108Q1	0.044	0.020	2.257	0.028
D104Q2	0.038	0.013	3.017	0.004
LYEGWSR(-1)	0.469	0.115	4.084	0.000
LYEGWSR(-4)	0.313	0.102	3.069	0.003
Adjusted R-squared	0.994	S.D. dependent var		0.25
F-statistic	2134.32	Durbin-Watson stat		1.94

**Short-term Dynamics**

Dependent Variable: LYEGWSR

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2012Q4

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LKEGWSR(-4) LYCONSR(-1) LYFRBSR(-1) QQ1 QQ2

QQ3 LYEGWSR(-1) DD108Q1 D104Q2 LYEGWSR(-1) LYEGWSR(-4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.691	0.613	-1.127	0.265
LKEGWSR(-4)	0.209	0.108	1.927	0.059
DD108Q1	0.044	0.020	2.257	0.028
D104Q2	0.038	0.013	3.017	0.004
LYEGWSR(-1)	0.469	0.115	4.084	0.000
LYEGWSR(-4)	0.313	0.102	3.069	0.003
Adjusted R-squared	0.994	S.D. dependent var		0.25
F-statistic	2134.32	Durbin-Watson stat		1.94

YEGWSR GDP at factor cost in electricity, gas, and water supply

KEGWSR Net fixed capital stock in electricity, gas and water supply

**Long Run Relation**

Dependent Variable: LYCONSR

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2012Q4

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LKCONSR(-4) LYCONSR(-1) QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.102	0.427	2.581	0.013
LKCONSR(-4)	0.137	0.054	2.550	0.014
LYCONSR(-1)	0.749	0.098	7.631	0.000
QQ1	-0.074	0.009	-7.984	0.000
QQ2	-0.066	0.008	-7.748	0.000
QQ3	-0.022	0.009	-2.444	0.018
Adjusted R-squared	0.996	S.D. dependent var		0.39
F-statistic	3342.91	Durbin-Watson stat		1.94

**Short-term Dynamics**

Dependent Variable: DLYCONSR

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q2 2013Q1

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(

-1) DLYCSPSR(-1) LYTHTCR(-1) DLYCONSR(-1) ZLYCONSR(-1)

DLYCONSR(-4) QQ1 QQ2 QQ3 DD104Q3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.018	0.004	4.677	0.000
ZLYCONSR(-1)	-0.171	0.084	-2.034	0.047
DLYCONSR(-4)	0.201	0.122	1.650	0.105
QQ1	-0.065	0.013	-4.882	0.000
QQ2	-0.051	0.011	-4.439	0.000
QQ3	-0.008	0.009	-0.875	0.385
DD104Q3	-0.054	0.023	-2.354	0.022
Adjusted R-squared	0.713	S.D. dependent var		0.04
F-statistic	25.48	Durbin-Watson stat		1.87

YCONSR GDP at factor cost in construction

KCONSR Net fixed capital stock in construction



**Long Run Relation**

Dependent Variable: LYTHTCR

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2012Q4

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LKTHTCR(-4) LYCONSR(-1) QQ1 QQ2 QQ3 DD109Q3

D101Q2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.268	0.291	-4.356	0.000
LKTHTCR(-4)	0.352	0.060	5.833	0.000
LYCONSR(-1)	0.781	0.053	14.753	0.000
QQ1	-0.111	0.012	-9.404	0.000
QQ2	-0.096	0.012	-8.304	0.000
QQ3	-0.009	0.012	-0.779	0.439
Adjusted R-squared	0.995	S.D. dependent var		0.43
F-statistic	2146.73	Durbin-Watson stat		1.25

**Short-term Dynamics**

Dependent Variable: DLYTHTCR

Method: Two-Stage Least Squares

Sample (adjusted): 1999Q2 2013Q1

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) LYTHTCR(-1) DLYCONSR(-1) ZLYTHTCR(-1)

DLCTE DD104Q3 QQ1 QQ2 QQ3 DLYTHTCR(-4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.009	0.004	2.413	0.020
ZLYTHTCR(-1)	-0.216	0.099	-2.172	0.035
DLYTHTCR(-4)	0.582	0.097	6.014	0.000
DD104Q3	0.063	0.022	2.908	0.005
QQ1	-0.046	0.013	-3.635	0.001
QQ2	-0.021	0.009	-2.440	0.018
QQ3	0.002	0.009	0.256	0.799
Adjusted R-squared	0.888	S.D. dependent var		0.06
F-statistic	73.51	Durbin-Watson stat		2.14

YTHTCR GDP in trade, hotels, restaurants, transport and communications in net fixed capital formation

KTHTCR Net fixed capital stock in trade, hotels, transport and communications

YCONSR GDP at factor cost in construction

**Long Run Relation**

Dependent Variable: LYFRBSR

Method: Two-Stage Least Squares

Sample (adjusted): 2000Q1 2012Q4

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LKFRBSR(-4) LYFRBSR(-1) LYFRBSR(-2) LYFRBSR(-3)

LYFRBSR(-4) DD104Q1 QQ1 QQ2 QQ3 DD101Q1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.202	0.126	1.600	0.117
LNFCREDITREAL	0.032	0.015	2.127	0.039
LYFRBSR(-1)	0.953	0.025	38.125	0.000
QQ1	-0.042	0.004	-9.404	0.000
QQ2	-0.032	0.004	-7.279	0.000
QQ3	-0.016	0.004	-3.720	0.001
DD101Q1	-0.052	0.012	-4.415	0.000
Adjusted R-squared	0.999	S.D. dependent var		0.37
F-statistic	9235.35	Durbin-Watson stat		2.25

**Short-term Dynamics**

Dependent Variable: DLYFRBSR

Method: Two-Stage Least Squares

Sample (adjusted): 2000Q2 2013Q2

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLYFRBSR(-1)

DLYFRBSR(-4) DD109Q4 DD101Q1 DD105Q2 QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.013	0.003	4.872	0.000
DLNFCREDITREAL	0.029	0.012	2.457	0.018
ZLYFRBSR(-1)	-0.296	0.083	-3.571	0.001
DLYFRBSR(-4)	0.422	0.101	4.153	0.000
DD109Q4	0.029	0.010	3.018	0.004
DD101Q1	-0.051	0.010	-5.167	0.000
DD105Q2	-0.028	0.010	-2.699	0.010
QQ1	-0.018	0.006	-3.070	0.004
QQ2	-0.013	0.005	-2.601	0.013
QQ3	-0.009	0.004	-2.267	0.029
Adjusted R-squared	0.818	S.D. dependent var		0.02
F-statistic	27.76	Durbin-Watson stat		2.02

YFRBSR	GDP at factor cost in financial, real estate and business services
KFRBSR	Net fixed capital stock in financial, real estate and business services
YMANR	GDP at factor cost in manufacturing
NFCREDIT	Non-food credit

**Long Run Relation**

Dependent Variable: LYCSPSR

Method: Two-Stage Least Squares

Sample (adjusted): 1999Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) QQ1 QQ2 QQ3 DD107Q1 DD109Q3 LCPRIMEREREAL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.264	0.170	25.105	0.000
LCPRIMEREREAL	0.653	0.015	43.246	0.000
QQ1	0.005	0.019	0.245	0.808
QQ2	0.041	0.018	2.279	0.027
QQ3	0.002	0.019	0.122	0.904
DD107Q1	-0.126	0.049	-2.578	0.013
DD109Q3	-0.160	0.050	-3.201	0.002
S.E. of regression	0.047	Sum squared resid		0.11
Prob(F-statistic)	0.00	Second-Stage SSR		0.11

**Short-term Dynamics**

Dependent Variable: DLYCSPSR

Method: Two-Stage Least Squares

Sample (adjusted): 1999Q2 2013Q2

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLYCSPSR(-1)

QQ1 QQ2 QQ3 DLCPRIMEREREAL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.009	0.005	1.892	0.064
DLCPRIMEREREAL	0.345	0.031	10.962	0.000
ZLYCSPSR(-1)	-0.645	0.114	-5.648	0.000
QQ1	-0.195	0.023	-8.412	0.000
QQ2	-0.015	0.014	-1.081	0.285
QQ3	-0.124	0.015	-8.385	0.000
Adjusted R-squared	0.955	S.D. dependent var		0.17
F-statistic	241.13	Durbin-Watson stat		2.23

YCSPSR	GDP at factor cost in community, social and personal services
KCSPSR	Net fixed capital stock in community, social and public services
CPRIMERE	Central primary revenue expenditure

**Long Run Relation**

Dependent Variable: LSICONSR

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LSICONSR(-1) DD102Q1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.739	0.155	-4.754	0.000
LSICONSR(-1)	0.752	0.051	14.848	0.000
DD102Q1	0.578	0.159	3.644	0.001
Adjusted R-squared	0.783	S.D. dependent var		0.33
F-statistic	111.18	Durbin-Watson stat		1.13

**Short-term Dynamics**

Dependent Variable: LSIEGWSR

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2012Q1

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LSIEGWSR(-1) QQ1 QQ2 QQ3 DD105Q1 LKEGWSR(-1)

LSIEGWSR(-1 TO -4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.507	0.188	-2.699	0.009
LSIEGWSR(-1)	0.828	0.063	13.125	0.000
DD105Q1	-0.383	0.068	-5.635	0.000
Adjusted R-squared	0.772	S.D. dependent var		0.14
F-statistic	95.62	Durbin-Watson stat		1.90

SICONSR Share of construction in investment in net fixed capital formation

SIEGWSR Share of agriculture in electricity, gas and water supply in net fixed capital formation

**Long Run Relation**

Dependent Variable: LSIFRBSR

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LSIFRBSR(-1) LSICSPSR QQ1 QQ2 QQ3 DD109Q1

DD100Q1

C	-0.038	0.051	-0.741	0.462
LSIFRBSR(-1)	0.987	0.030	32.541	0.000
QQ1	-0.065	0.027	-2.457	0.017
QQ2	-0.00026	0.026	-0.010	0.992
QQ3	0.000	0.026	0.000	1.000
DD109Q1	0.497	0.075	6.592	0.000
DD100Q1	0.442	0.074	5.946	0.000
Adjusted R-squared	0.946	S.D. dependent var		0.31
F-statistic	179.87	Durbin-Watson stat		1.91

**Short-term Dynamics**

Dependent Variable: LSIMANR

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q2 2012Q1

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LSIMANR(-1) DD102Q1 DD109Q1 LKMANR(-1)/LYMANRF(-1)

-1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.241	1.628	1.991	0.052
LSIMANR(-1)	0.883	0.035	25.414	0.000
LKMANR(-1)/LYMANRF(-1)	-2.686	1.297	-2.072	0.043
DD102Q1	-0.565	0.072	-7.865	0.000
DD109Q1	-0.447	0.074	-6.012	0.000
Adjusted R-squared	0.930	S.D. dependent var		0.27
F-statistic	184.29	Durbin-Watson stat		2.27

SIFRBSR Share of financial, real estate and business services in investment in net fixed capital formation

SIMANR Share of manufacturing in investment in net fixed capital formation

c) Fiscal Sector

1. Personal income tax
2. Corporate income tax
3. Customs duties
4. Union excise duties
5. Effective interest rate on central debt

**Long Run Relation**

Dependent Variable: LCITR

Method: Two-Stage Least Squares

Sample (adjusted): 2001Q2 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) QQ1 QQ2 QQ3 DD108Q3 DD105Q3 LCITR(-1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.902	0.854	-6.908	0.000
LYMRN	0.979	0.127	7.680	0.000
QQ1	-0.627	0.059	-10.669	0.000
QQ2	-0.182	0.041	-4.395	0.000
QQ3	-0.296	0.041	-7.268	0.000
DD108Q3	0.329	0.100	3.284	0.002
DD105Q3	-0.687	0.103	-6.667	0.000
LCITR(-1)	0.213	0.100	2.137	0.039
Adjusted R-squared	0.979	S.D. dependent var		0.65
F-statistic	322.21	Durbin-Watson stat		1.77

**Short-term Dynamics**

Dependent Variable: DLCITR

Method: Two-Stage Least Squares

Sample (adjusted): 2002Q2 2013Q2

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLCITR(-1)

DLCITR(-4) DD106Q3 DLCITR(-1) DD105Q3 DD105Q4 QQ1 QQ2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.020	0.032	-0.629	0.533
DLYMRN	1.914	0.859	2.227	0.032
ZLCITR(-1)	-0.509	0.171	-2.978	0.005
DD105Q3	-0.775	0.114	-6.830	0.000
DD105Q4	0.669	0.106	6.336	0.000
QQ1	-0.737	0.092	-7.988	0.000
QQ2	0.063	0.047	1.360	0.182
QQ3	-0.367	0.093	-3.959	0.000
Adjusted R-squared	0.948	S.D. dependent var		0.44
F-statistic	115.21	Durbin-Watson stat		2.02

CITR Personal income tax revenue

YMRN GDP at current market prices

**Long Run Relation**

Dependent Variable: LCPTR

Method: Two-Stage Least Squares

Sample (adjusted): 2001Q2 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) QQ1 QQ2 QQ3 DD109Q1 DD105Q1 DD102Q1 LCPTR(-1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-9.550	1.933	-4.940	0.000
LYMRN	1.249	0.218	5.734	0.000
QQ1	-0.951	0.101	-9.392	0.000
QQ2	0.104	0.126	0.827	0.413
QQ3	-0.136	0.089	-1.528	0.134
DD109Q1	0.459	0.229	2.004	0.052
DD105Q1	-0.772	0.232	-3.326	0.002
DD102Q1	-1.039	0.234	-4.439	0.000
LCPTR(-1)	0.240	0.117	2.053	0.047
Adjusted R-squared	0.951	S.D. dependent var		0.98
F-statistic	117.67	Durbin-Watson stat		1.71

**Short-term Dynamics**

Dependent Variable: DLCPTR

Method: Two-Stage Least Squares

Sample (adjusted): 2002Q2 2013Q2

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(

-1) DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLCPTR(-1)

DLCPTR(-1) DLCPTR(-4) DD112Q1 QQ1 QQ2 QQ3 DD109Q3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.103	0.038	2.696	0.011
ZLCPTR(-1)	-0.483	0.173	-2.795	0.008
DLCPTR(-4)	0.205	0.111	1.843	0.074
QQ1	-0.810	0.175	-4.617	0.000
QQ2	0.565	0.128	4.418	0.000
QQ3	-0.076	0.107	-0.706	0.485
DD105Q3	0.443	0.251	1.762	0.087
DD105Q1	-0.812	0.261	-3.111	0.004
DD104Q1	-0.820	0.252	-3.248	0.003
Adjusted R-squared	0.906	S.D. dependent var		0.78
F-statistic	48.36	Durbin-Watson stat		1.51

CPTR Corporate income tax revenue

YMRN GDP at current market prices



**Long Run Relation**

Dependent Variable: LCCDR

Method: Two-Stage Least Squares

Sample (adjusted): 2001Q2 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) DD109Q4 LCCDR(-1) QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.641	0.297	2.161	0.037
LIMPR+LPIMP	0.191	0.050	3.789	0.001
DD109Q4	-0.457	0.080	-5.697	0.000
LCCDR(-1)	0.698	0.085	8.263	0.000
QQ1	-0.069	0.032	-2.162	0.036
QQ2	0.032	0.032	0.991	0.327
QQ3	-0.014	0.032	-0.426	0.672
Adjusted R-squared	0.972	S.D. dependent var		0.46
F-statistic	282.25	Durbin-Watson stat		2.05

**Short-term Dynamics**

Dependent Variable: DLCCDR

Method: Two-Stage Least Squares

Sample (adjusted): 2001Q3 2013Q2

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLCCDR(-1)

DD105Q2 DD109Q4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.033	0.011	2.972	0.005
ZLCCDR(-1)	-0.435	0.138	-3.155	0.003
DD105Q2	0.155	0.083	1.876	0.068
DD109Q4	-0.513	0.080	-6.422	0.000
QQ1	-0.064	0.032	-2.041	0.048
QQ2	0.039	0.032	1.195	0.239
QQ3	-0.015	0.032	-0.466	0.644
Adjusted R-squared	0.580	S.D. dependent var		0.12
F-statistic	11.83	Durbin-Watson stat		1.60

CCDR Customs duty revenue  
 IMPR Imports at constant prices  
 PIMP Implicit price deflator of imports

**Long Run Relation**

Dependent Variable: CIPRATE

Method: Two-Stage Least Squares

Sample (adjusted): 1999Q1 2012Q1

Instrument specification: C TT LER LCNTR LCRRATIO LYAR(-1) LYMQR(-1) CIPRATE(-4) QQ1 QQ2 QQ3 D101Q3 BPR

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.639	0.255	2.506	0.016
BPR	0.045	0.025	1.843	0.072
CIPRATE(-4)	0.557	0.078	7.109	0.000
QQ1	-0.526	0.133	-3.959	0.000
QQ2	-0.377	0.115	-3.289	0.002
QQ3	-0.465	0.121	-3.848	0.000
D101Q3	-0.225	0.080	-2.830	0.007
Adjusted R-squared	0.914	S.D. dependent var		0.63
F-statistic	92.88	Durbin-Watson stat		2.57

**Long Run Relation**

Dependent Variable: LIDLSR

Method: Two-Stage Least Squares

Sample (adjusted): 2001Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LIDLSR(-4) LYR(-4) DD109Q3 LIDLSR(-1) LYR(-4)

LCPRIMERE DD109Q3 QQ1 QQ2 QQ3 DD112Q1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.450	1.347	-1.819	0.076
LCIDTREAL	0.576	0.182	3.171	0.003
LYR(-4)	1.359	0.301	4.515	0.000
LCPRIMEREREAL	-0.976	0.154	-6.321	0.000
QQ1	-0.311	0.112	-2.775	0.008
QQ2	-0.210	0.057	-3.668	0.001
QQ3	-0.248	0.078	-3.175	0.003
Adjusted R-squared	0.830	S.D. dependent var		0.26
F-statistic	40.44	Durbin-Watson stat		1.15

**Short-term Dynamics**

Dependent Variable: DLIDLSR

Method: Two-Stage Least Squares

Sample (adjusted): 2001Q2 2013Q2

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1)

DLYEGWSR(-1) DLYCPSR(-1) DLYTHTCR(-1) DLYCONSR(-1)

ZLIDLSR(-1) DLCPRIMEREREAL DLIDLSR(-4) QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.011	0.014	0.786	0.436
ZLIDLSR(-1)	-0.586	0.242	-2.416	0.020
DLCIDTREAL	0.956	0.399	2.395	0.021
DLCPRIMEREREAL	-0.822	0.094	-8.726	0.000
DLIDLSR(-4)	0.269	0.089	3.015	0.004
QQ1	-0.156	0.306	-0.511	0.612
QQ2	-0.192	0.045	-4.312	0.000
QQ3	-0.006	0.103	-0.063	0.950
Adjusted R-squared	0.897	S.D. dependent var		0.30
F-statistic	60.54	Durbin-Watson stat		1.76

IDLSR Indirect taxes net of subsidies  
CIDTREAL CIDT deflated by PYMR  
CPRIMEREREAL Central primary revenue expenditure deflated by PYMR

d) Monetary Sector

1. Liquidity aggregate: narrow definition (L1)
2. Liquidity aggregate: broad definition (L3)
3. Time deposits
4. Money multiplier w.r.t. to currency and demand deposits
5. Long term lending rate (IDBIRL)
6. Short term deposit rate (DRMIN)
7. Call money rate (CMRATE)

**Long Run Relation**

Dependent Variable: LL1

Method: Two-Stage Least Squares

Sample (adjusted): 2000Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LBPR LCRRATIO DD103Q4 DD109Q3 QQ1 QQ2 QQ3

LL1(-1) DD109Q4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.553	0.850	-3.003	0.004
DLBPR	-0.079	0.030	-2.612	0.012
LYMR	0.368	0.121	3.040	0.004
LCRRATIO	-0.017	0.009	-1.847	0.071
LL1(-1)	0.836	0.054	15.434	0.000
QQ1	0.048	0.013	3.645	0.001
QQ2	0.040	0.018	2.275	0.028
QQ3	0.004	0.005	0.810	0.422
Adjusted R-squared	1.000	S.D. dependent var		0.64
F-statistic	31077.13	Durbin-Watson stat		1.96

**Short-term Dynamics**

Dependent Variable: DLL1

Method: Two-Stage Least Squares

Sample (adjusted): 2001Q1 2013Q2

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(

-1) DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) QQ2 QQ3

DD103Q1 DLL1(-4) DLCRRATIO DLBPR DLL1(-4) DD104Q3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.008	0.005	1.753	0.087
ZLL1(-1)	-0.298	0.168	-1.773	0.083
DLL1(-4)	0.784	0.110	7.156	0.000
DD104Q3	0.019	0.009	2.068	0.045
DD104Q4	0.021	0.009	2.225	0.031
DD101Q2	-0.031	0.014	-2.275	0.028
Adjusted R-squared	0.473	S.D. dependent var		0.01
F-statistic	11.64	Durbin-Watson stat		1.36

L1 Narrow Liquidity

BPR RBI policy rate (Bank rate/repo rate)

CRRATIO Currency reserve ratio

YMR GDP at market prices

**Long Run Relation**

Dependent Variable: LL3

Method: Two-Stage Least Squares

Sample (adjusted): 2000Q2 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LL3(-2) LL3(-4) DD105Q3 QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.045	0.257	4.067	0.000
LIDBIRL	-0.194	0.048	-4.003	0.000
LIDBIRL-LDRMIN	-0.028	0.017	-1.694	0.097
LL3(-2)	0.622	0.159	3.920	0.000
LL3(-4)	0.347	0.154	2.245	0.030
DD105Q3	-0.035	0.016	-2.245	0.030
QQ1	0.001	0.006	0.092	0.927
QQ2	-0.010	0.006	-1.644	0.107
QQ3	-0.006	0.007	-0.897	0.375
Adjusted R-squared	0.999	S.D. dependent var		0.63
F-statistic	12906.85	Durbin-Watson stat		1.47

**Short-term Dynamics**

Dependent Variable: DLL3

Method: Two-Stage Least Squares

Sample (adjusted): 2000Q3 2013Q2

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLL3(-1) DIDBIRL

DLL3(-1) DLL3(-4) D105Q2 QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.039	0.008	4.641	0.000
ZLL3(-1)	-0.335	0.143	-2.340	0.024
DIDBIRL	-0.010	0.005	-1.772	0.083
DLL3(-1)	-0.422	0.132	-3.198	0.003
DLL3(-4)	0.296	0.128	2.313	0.026
D105Q2	0.008	0.004	2.064	0.045
QQ1	0.000	0.005	0.069	0.946
QQ2	-0.013	0.006	-2.137	0.038
QQ3	-0.008	0.006	-1.444	0.156
Adjusted R-squared	0.550	S.D. dependent var		0.02
F-statistic	8.78	Durbin-Watson stat		2.08

L3                   Liquidity broad definition  
IDBIRL               Long term lending rate (interest rate charged by IDBI)  
M3                    Broad money

**Long Run Relation**

Dependent Variable: MMULTONE

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) MMULTONE(-1) DD109Q3 DD108Q1 DD110Q1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.374	0.131	2.858	0.006
LDRMIN	-0.066	0.023	-2.909	0.005
MMULTONE(-1)	0.809	0.073	11.126	0.000
DD109Q3	0.100	0.024	4.123	0.000
DD108Q1	-0.075	0.024	-3.063	0.003
Adjusted R-squared	0.883	S.D. dependent var		0.07
F-statistic	117.38	Durbin-Watson stat		1.51

**Short-term Dynamics**

Dependent Variable: DMMULTONE

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2013Q3

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYHTTCR(-1) DLYCONSR(-1) ZMMULTONE(-1)

DLBPR DMMULTONE(-1 TO -4) DD109Q3 QQ1 QQ2 QQ3 DD108Q1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000	0.003	0.055	0.956
ZMMULTONE(-1)	-0.105	0.062	-1.699	0.095
DLBPR	-0.072	0.033	-2.193	0.033
DD109Q3	0.089	0.022	4.000	0.000
DD108Q1	-0.085	0.021	-4.022	0.000
DD110Q2	0.050	0.021	2.415	0.019
DD111Q4	-0.067	0.021	-3.198	0.002
Adjusted R-squared	0.514	S.D. dependent var		0.03
F-statistic	11.94	Durbin-Watson stat		1.67

M3 Broad money

M0 Reserve money

IDBIRL Long term lending rate (interest rate charged by IDBI)

**Long Run Relation**

Dependent Variable: LTDEPOSITREAL

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2013Q3

Instrument specification: TT LYAR(-1) LYMANR(-1) LYEGWSR(-1)  
 LYCSPSR(-1) LYTHTCR(-1) QQ1 QQ2 QQ3 LTDEPOSITREAL(-1 TO  
 -4) DD103Q1 DD111Q2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.333	0.174	-1.921	0.060
LM0-LPYMR	0.074	0.029	2.529	0.014
LTDEPOSITREAL(-1)	0.937	0.022	41.883	0.000
QQ1	-0.011	0.005	-2.206	0.032
QQ2	-0.007	0.005	-1.330	0.189
QQ3	-0.011	0.005	-2.219	0.031
DD103Q1	0.033	0.014	2.387	0.021
DD109Q4	0.077	0.024	3.271	0.002
Adjusted R-squared	0.999	S.D. dependent var		0.51
F-statistic	13284.70	Durbin-Watson stat		2.00

**Short-term Dynamics**

Dependent Variable: DLTDEPOSITREAL

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q2 2013Q3

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)  
 DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1)  
 ZLTDEPOSITREAL(-1) QQ1 QQ2 QQ3 DD109Q3 DD109Q4 DD105Q2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.026	0.004	6.446	0.000
ZLTDEPOSITREAL(-1)	-0.124	0.049	-2.509	0.015
DLTDEPOSITREAL(-3)	-0.226	0.100	-2.261	0.028
DLTDEPOSITREAL(-4)	0.187	0.095	1.962	0.055
DD109Q3	0.040	0.012	3.180	0.002
DD109Q4	0.059	0.013	4.398	0.000
DD103Q1	0.027	0.012	2.181	0.034
DD107Q4	0.041	0.012	3.342	0.002
Adjusted R-squared	0.470	S.D. dependent var		0.02
F-statistic	8.73	Durbin-Watson stat		1.47

TDEPOSITREAL Time deposits deflated by implicit price deflator  
 M0 Reserve money  
 IDBIRL Long term lending rate (interest rate charged by IDBI)



**Long Run Relation**

Dependent Variable: LIDBIRL

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q3 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LM3(-1) LIDBIRL(-1 TO -4) LIDBIRL(-1) LIDBIRL(-4)

DD104Q1 DD108Q1 LBPR(-1 TO -4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.779	0.337	2.309	0.025
LBPR	0.051	0.027	1.902	0.062
LM3	-0.022	0.012	-1.808	0.076
DD108Q1	-0.096	0.032	-2.963	0.005
LIDBIRL(-1)	0.772	0.074	10.492	0.000
Adjusted R-squared	0.934	S.D. dependent var		0.12
F-statistic	210.28	Durbin-Watson stat		1.64

**Short-term Dynamics**

Dependent Variable: DLIDBIRL

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q4 2013Q3

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLIDBIRL(-1)

DLIDBIRL(-1 TO -4) DD108Q2 DD104Q4 DD108Q4 DD108Q1 QQ1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.006	0.003	-1.789	0.079
ZLIDBIRL(-1)	-0.111	0.062	-1.802	0.077
DD108Q2	0.163	0.024	6.880	0.000
DD108Q4	-0.051	0.024	-2.152	0.036
DD108Q1	-0.081	0.024	-3.399	0.001
Adjusted R-squared	0.534	S.D. dependent var		0.03
F-statistic	17.91	Durbin-Watson stat		1.69

IDBIRL Long term lending rate (interest rate charged by IDBI)

M3 Broad money

BPR RBI policy rate (Bank rate/repo rate)

**Long Run Relation**

Dependent Variable: LDRMIN

Method: Two-Stage Least Squares

Sample (adjusted): 2000Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LDRMIN(-1) QQ1 QQ2 QQ3 LBPR(-1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-13.156	3.833	-3.432	0.001
LM3	-0.849	0.269	-3.155	0.003
LYR	1.887	0.572	3.300	0.002
LDRMIN(-1)	0.855	0.054	15.970	0.000
QQ1	0.146	0.055	2.638	0.011
QQ2	0.225	0.071	3.187	0.003
QQ3	-0.001	0.025	-0.051	0.960
LBPR(-1)	0.145	0.065	2.247	0.030
Adjusted R-squared	0.893	S.D. dependent var		0.19
F-statistic	65.19	Durbin-Watson stat		1.98

**Short-term Dynamics**

Dependent Variable: DLDRMIN

Method: Two-Stage Least Squares

Sample (adjusted): 2000Q1 2013Q2

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLDRMIN(-1)  
DLDRMIN(-1 TO -4) DD108Q2 DD111Q4 DD110Q4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000	0.007	-0.035	0.972
ZLDRMIN(-1)	-0.251	0.076	-3.286	0.002
DLBPR(-1)	0.280	0.150	1.860	0.069
DLYR	-0.304	0.144	-2.109	0.040
DLDRMIN(-1)	0.288	0.083	3.471	0.001
DD108Q2	0.184	0.046	3.966	0.000
DD111Q4	0.195	0.046	4.210	0.000
DD110Q4	-0.172	0.046	-3.747	0.001
Adjusted R-squared	0.570	S.D. dependent var		0.07
F-statistic	13.62	Durbin-Watson stat		2.10

DRMIN	Minimum deposit rate
BPR	RBI policy rate (Bank rate/repo rate)
M3	Broad money
YR	GDP at factor cost

**Long Run Relation**

Dependent Variable: LCMRATE

Method: Two-Stage Least Squares

Sample (adjusted): 2000Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LCMRATE(-1) LCMRATE(-4) QQ1 QQ2 QQ3

DD108Q2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-16.469	3.506	-4.697	0.000
LBPR	0.710	0.178	3.986	0.000
LYMRDISP	3.848	0.889	4.330	0.000
LM3REAL	-2.480	0.590	-4.206	0.000
LCMRATE(-1)	0.364	0.100	3.634	0.001
DD108Q2	-0.401	0.137	-2.932	0.005
QQ1	0.282	0.096	2.931	0.005
QQ2	0.456	0.115	3.975	0.000
QQ3	0.078	0.054	1.457	0.152
Adjusted R-squared	0.827	S.D. dependent var		0.31
F-statistic	33.77	Durbin-Watson stat		1.79

**Short-term Dynamics**

Dependent Variable: DLCMRATE

Method: Two-Stage Least Squares

Sample (adjusted): 2000Q1 2013Q2

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1)

DLYEGWSR(-1) DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1)

ZLCMRATE(-1) DLBPR QQ1 QQ2 QQ3 DD108Q1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.006	0.016	0.375	0.709
ZLCMRATE(-1)	-0.336	0.105	-3.199	0.003
DLBPR	1.421	0.198	7.193	0.000
QQ1	-0.079	0.045	-1.754	0.086
QQ2	-0.042	0.046	-0.926	0.359
QQ3	0.039	0.045	0.864	0.392
DD108Q1	-0.380	0.124	-3.054	0.004
Adjusted R-squared	0.605	S.D. dependent var		0.18
F-statistic	14.54	Durbin-Watson stat		2.31

CMRATE Call money rate

YMRDISP GDP at factor cost net of central direct taxes less central interest payments

M3REAL M3 deflated by PYMR

**Long Run Relation**

Dependent Variable: LFCREDITREAL

Method: Two-Stage Least Squares

Sample (adjusted): 2001Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LFCREDITREAL(-1) LFCREDITREAL(-4) DD103Q1

DD110Q1 QQ1 QQ2 QQ3 DD105Q4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.217	1.048	1.161	0.252
LCMRATE	0.434	0.094	4.607	0.000
LFCREDITREAL(-1)	0.279	0.107	2.601	0.013
LFCREDITREAL(-4)	0.476	0.106	4.472	0.000
DD103Q1	0.321	0.159	2.014	0.050
DD110Q1	0.449	0.171	2.631	0.012
DD105Q4	0.271	0.159	1.702	0.096
Adjusted R-squared	0.498	S.D. dependent var		0.22
F-statistic	9.63	Durbin-Watson stat		1.92

**Short-term Dynamics**

Dependent Variable: DLFCREDITREAL

Method: Two-Stage Least Squares

Sample (adjusted): 2001Q2 2013Q2

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(

-1) DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLFCREDIT(-1)

DLFCREDITREAL(-1) DD110Q4 DD103Q4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.020	0.024	0.851	0.399
ZLFCREDIT(-1)	-0.289	0.151	-1.907	0.063
DLCMRATE	0.364	0.196	1.858	0.070
DLFCREDITREAL(-1)	-0.611	0.112	-5.471	0.000
Adjusted R-squared	0.528	S.D. dependent var		0.24
F-statistic	19.75	Durbin-Watson stat		1.49

M3	Broad money
M0	Reserve money
IDBIRL	Long term lending rate (interest rate charged by IDBI)

**Long Run Relation**

Dependent Variable: LNFCREDITREAL

Method: Two-Stage Least Squares

Sample (adjusted): 2001Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LNFCREDITREAL(-4) QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.029	2.317	-2.170	0.035
LYRDISP	0.644	0.266	2.427	0.019
LNFCREDITREAL(-4)	0.681	0.120	5.687	0.000
QQ1	0.047	0.046	1.002	0.322
QQ2	0.075	0.050	1.509	0.139
QQ3	0.016	0.043	0.367	0.716
Adjusted R-squared	0.967	S.D. dependent var		0.57
F-statistic	290.64	Durbin-Watson stat		1.86

**Short-term Dynamics**

Dependent Variable: DLNFCREDITREAL

Method: Two-Stage Least Squares

Sample (adjusted): 2001Q2 2013Q3

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1)

ZLNFCREDITREAL(-1) DLNFCREDITREAL(-4) QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.020	0.016	1.251	0.217
ZLNFCREDITREAL(-1)	-0.703	0.135	-5.195	0.000
DLNFCREDITREAL(-4)	0.503	0.087	5.775	0.000
QQ1	0.040	0.045	0.884	0.382
QQ2	0.008	0.044	0.185	0.854
QQ3	0.032	0.045	0.715	0.479
Adjusted R-squared	0.711	S.D. dependent var		0.20
F-statistic	25.12	Durbin-Watson stat		2.17

M3 Broad money

M0 Reserve money

IDBIRL Long term lending rate (interest rate charged by IDBI)

e) External Sector

1. Imports of oil in dollar terms
2. Non-oil imports in dollar terms
3. Exports of goods in dollar terms
4. Other imports in rupee terms
5. Other exports in rupee terms
6. Unit value of exports
7. Unit value of imports

**Long Run Relation**

Dependent Variable: LIMPOILDD

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2013Q1

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LPCRUDE DD109Q2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-13.047	1.639	-7.960	0.000
LYMR	1.380	0.136	10.137	0.000
LPCRUDE	0.863	0.063	13.613	0.000
DD109Q2	0.246	0.125	1.971	0.054
Adjusted R-squared	0.987	S.D. dependent var		1.02
F-statistic	1488.51	Durbin-Watson stat		1.82

**Short-term Dynamics**

Dependent Variable: DLIMPOILDD

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q2 2013Q1

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) DLPCRUDE

ZLIMPOILDD(-1) DD109Q2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.019	0.010	1.862	0.068
DLPCRUDE	0.871	0.063	13.900	0.000
ZLIMPOILDD(-1)	-0.415	0.089	-4.693	0.000
YMR	0.192	0.077	2.484	0.016
Adjusted R-squared	0.806	S.D. dependent var		0.17
F-statistic	82.53	Durbin-Watson stat		2.35

IMPOILDD Oil Imports in USD

PCRUDE International crude oil price (USD per barrel)

GCOALPRICE Index of world coal price

**Long Run Relation**

Dependent Variable: LIMPNOILDD

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q2 2013Q1

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LER LIMPNOILDD(-1) QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-9.360	1.800	-5.200	0.000
LER	-1.012	0.186	-5.429	0.000
LYEGWSR	1.962	0.321	6.120	0.000
LIMPNOILDD(-1)	0.419	0.097	4.338	0.000
QQ1	0.053	0.030	1.792	0.079
QQ2	0.055	0.029	1.896	0.064
QQ3	0.082	0.029	2.808	0.007
Adjusted R-squared	0.991	S.D. dependent var		0.82
F-statistic	1045.87	Durbin-Watson stat		1.55

**Short-term Dynamics**

Dependent Variable: DLIMPNOILDD

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q3 2013Q1

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) DLER

ZLIMPNOILDD(-1) DD109Q1 DD109Q4 QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.048	0.010	4.683	0.000
DLER	-1.438	0.334	-4.310	0.000
ZLIMPNOILDD(-1)	-0.219	0.120	-1.835	0.072
YMR	0.291	0.085	3.424	0.001
DD109Q4	-0.280	0.079	-3.559	0.001
QQ1	0.064	0.029	2.247	0.029
QQ2	0.048	0.029	1.645	0.106
QQ3	0.057	0.028	2.007	0.050
Adjusted R-squared	0.506	S.D. dependent var		0.11
F-statistic	9.48	Durbin-Watson stat		2.05

IMPNOILDD

Non-oil imports in USD

ER

Exchange rate (Rs. Per USD)

YMR

GDP at market prices

YEGWSR

GDP at factor cost in electricity, gas, and water supply



**Long Run Relation**

Dependent Variable: LEXPDD

Method: Two-Stage Least Squares

Sample (adjusted): 1999Q4 2013Q1

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LER LEXPDD(-1) PEXP(-1) QQ1 QQ2 QQ3

LYECOUNTRIES

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-50.720	6.754	-7.510	0.000
LYECOUNTRIES	3.856	0.495	7.790	0.000
LER	-0.401	0.128	-3.128	0.003
LEXPDD(-1)	0.195	0.104	1.881	0.066
QQ1	-0.072	0.022	-3.258	0.002
QQ2	-0.050	0.021	-2.346	0.023
QQ3	-0.078	0.022	-3.621	0.001
Adjusted R-squared	0.994	S.D. dependent var		0.72
F-statistic	1454.79	Durbin-Watson stat		1.70

**Short-term Dynamics**

Dependent Variable: DLEXPDD

Method: Two-Stage Least Squares

Sample (adjusted): 2000Q1 2013Q1

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLEXPDD(-1)

DLYECOUNTRIES DLER DLEXPDD(-1) QQ1 QQ2 QQ3 DD105Q4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.015	0.010	-1.501	0.140
ZLEXPDD(-1)	-0.789	0.130	-6.062	0.000
DLYECOUNTRIES	5.835	0.769	7.586	0.000
YMR	-0.122	0.020	-6.043	0.000
QQ2	-0.056	0.021	-2.739	0.009
QQ3	-0.087	0.021	-4.248	0.000
DD105Q4	0.155	0.054	2.880	0.006
Adjusted R-squared	0.726	S.D. dependent var		0.10
F-statistic	23.95	Durbin-Watson stat		1.96

EXPDD

Exports in USD

YECOUNTRIES

Sum of GDP at constant USD of selected emerging market economy countries covering Argentina, Brazil, Indonesia, Korea, Mexico, South Africa, and Turkey

ER

Exchange rate (Rs. Per USD)

**Long Run Relation**

Dependent Variable: LRIMPDD

Method: Two-Stage Least Squares

Sample (adjusted): 1999Q4 2012Q3

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LER LYDCOUNTRIES LRIMPDD(-2 ) QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-8.822	1.864	-4.734	0.000
LYINDR	1.604	0.155	10.335	0.000
QQ1	-0.355	0.120	-2.954	0.005
QQ2	-0.144	0.120	-1.204	0.235
QQ3	-0.107	0.120	-0.892	0.377
Adjusted R-squared	0.697	S.D. dependent var		0.55
F-statistic	30.28	Durbin-Watson stat		1.83

**Short-term Dynamics**

Dependent Variable: DLRIMPDD

Method: Two-Stage Least Squares

Sample: 1999Q4 2012Q3

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(

-1) DLYCSPSR(-1) DLYHTTCR(-1) DLYCONSR(-1) ZLRIMPDD(-1)

DLER QQ1 QQ2 QQ3 DLRIMPDD(-4) DD109Q1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.046	0.038	1.187	0.241
ZLRIMPDD(-1)	-0.830	0.132	-6.298	0.000
QQ1	-0.564	0.110	-5.137	0.000
QQ2	0.030	0.108	0.276	0.784
QQ3	-0.109	0.108	-1.013	0.316
DD109Q1	-0.977	0.287	-3.400	0.001
Adjusted R-squared	0.672	S.D. dependent var		0.48
F-statistic	21.94	Durbin-Watson stat		2.21

RIMPDD Imports at constant prices of services derived as excess of IMPR over imports of goods

YINDR Output in mining and quarrying, manufacturing and electricity, gas and water supply

**Long Run Relation**

Dependent Variable: LREXPDD

Method: Two-Stage Least Squares

Sample: 1999Q4 2012Q3

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LYECOUNTRIES LYDCOUNTRIES QQ1 QQ2 QQ3

DD109Q3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-104.244	10.894	-9.569	0.000
LYECOUN TRIES	2.320	0.417	5.566	0.000
LYDCOU NTRIES	4.612	0.987	4.670	0.000
QQ1	-0.186	0.054	-3.417	0.001
QQ2	-0.322	0.054	-5.933	0.000
QQ3	-0.166	0.056	-2.990	0.005
DD109Q3	0.311	0.145	2.146	0.037
Adjusted R- squared	0.952	S.D. dependent var		0.63
F-statistic	169.49	Durbin-Watson stat		1.46

**Short-term Dynamics**

Dependent Variable: DLREXPDD

Method: Two-Stage Least Squares

Sample (adjusted): 2000Q1 2012Q3

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLREXPDD(-1)

QQ1 QQ2 QQ3 DLREXPDD(-4) DLYDCOUNTRIES DLYECOUNTRIES

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.009	0.025	-0.356	0.723
ZLREXPDD(-1)	-0.640	0.137	-4.662	0.000
DLYECOUN NTRIES	3.569	1.882	1.897	0.064
YMR	-0.237	0.058	-4.117	0.000
QQ2	-0.197	0.057	-3.445	0.001
QQ3	0.054	0.050	1.070	0.291
DLREXPDD(-4)	0.246	0.109	2.250	0.030
Adjusted R- squared	0.670	S.D. dependent var		0.22
F-statistic	17.95	Durbin-Watson stat		2.28

REXPDD Exports at constant prices of services derived as excess of IMPR over imports of goods  
YDCOUN Sum of GDP at constant USD of selected developed countries covering US, UK, France,  
TRIES Germany, Canada, Australia, Italy and Japan  
YECOUN Sum of GDP at constant USD of selected emerging market economy countries covering  
RIES Argentina, Brazil, Indonesia, Korea, Mexico, South Africa, and Turkey,

**Long Run Relation**

Dependent Variable: LPEXP

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q2 2013Q2

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Instrument specification: C LCTR(-1) LEXPR(-1) LGFCFR(-1) LIMPOIL(-1) LM3(-1) LYAR(-1) LYMANR(-1) LYCONSR(-1) LYEGWSR(-1) LYFRBSR(-1) LYTHTCR(-1) LPYR(-1) LPIMP(-1) LPEXP(-4) QQ1

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Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.019	0.010	1.909	0.062
LPYR(-1)	0.575	0.096	5.979	0.000
LPEXP(-4)	0.414	0.099	4.158	0.000
QQ1	-0.014	0.023	-0.580	0.564
QQ2	0.051	0.023	2.195	0.032
QQ3	0.015	0.023	0.639	0.525
Adjusted R-squared	0.925	S.D. dependent var		0.23
F-statistic	149.83	Durbin-Watson stat		1.93

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**Short-term Dynamics**

Dependent Variable: DLPEXP

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q2 2013Q2

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Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1) DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLPEXP(-1) QQ1 QQ2 QQ3 DLPEXP(-1) DLPEXP(-4) DD100Q1

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Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.011	0.008	1.418	0.162
ZLPEXP(-1)	-0.753	0.115	-6.524	0.000
QQ1	0.001	0.023	0.036	0.972
YMR	0.087	0.023	3.789	0.000
QQ3	-0.022	0.023	-0.952	0.346
DLPEXP(-4)	0.378	0.069	5.512	0.000
DD100Q1	-0.198	0.065	-3.066	0.003
Adjusted R-squared	0.744	S.D. dependent var		0.12
F-statistic	30.02	Durbin-Watson stat		1.87

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PEXP Unit value of exports

PYR Implicit price deflator of GDP at factor cost

**Long Run Relation**

Dependent Variable: LPIMP

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q2 2013Q2

Instrument specification: C LCTR(-1) LEXPR(-1) LGFCFR(-1) LIMPOIL(-1) LM3(-1) LYAR(-1) LYMANR(-1) LYCONSR(-1) LYEGWSR(-1) LYFRBSR(-1) LYTHTCR(-1) LPYR(-1) LPIMP(-1 TO -3) QQ1 QQ2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.187	0.112	-1.669	0.101
LPYR(-1)	0.427	0.106	4.042	0.000
LPIMP(-1)	0.525	0.128	4.104	0.000
LPCRUDE	0.041	0.028	1.471	0.147
QQ1	0.031	0.013	2.325	0.024
QQ2	0.019	0.013	1.471	0.147
QQ3	-0.006	0.014	-0.460	0.648
Adjusted R-squared	0.981	S.D. dependent var		0.26
F-statistic	527.08	Durbin-Watson stat		1.54

**Short-term Dynamics**

Dependent Variable: DLPIMP

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q2 2013Q3

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1) DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLPIMP(-1) DLPCRUDE DLPIMP(-4) DLPIMP(-1) QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.012	0.004	2.721	0.009
ZLPIMP(-1)	-0.510	0.111	-4.611	0.000
DLPCRUDE	0.072	0.027	2.640	0.011
YMR	-0.259	0.089	-2.900	0.006
DLPIMP(-1)	0.222	0.111	1.991	0.052
QQ1	0.021	0.012	1.793	0.079
QQ2	0.000	0.012	0.016	0.988
QQ3	-0.029	0.012	-2.451	0.018
DD105Q1	0.100	0.032	3.162	0.003
Adjusted R-squared	0.510	S.D. dependent var		0.04
F-statistic	8.04	Durbin-Watson stat		1.88

PYR                    Implicit price deflator of GDP at factor cost  
PIMP                    Implicit price deflator of imports  
PCRUDE                International crude oil price (USD per barrel)

f) Prices

1. Wholesale price index for food articles
2. Wholesale price index for primary articles
3. Wholesale price index for fuel and energy
4. Wholesale price index for food products in manufactured articles
5. Wholesale price index for non-food articles
6. Implicit price deflator for GDP at factor cost
7. Implicit price deflator for GDP at market prices
8. Consumer price index for agricultural labour
9. Consumer price index for industrial workers

**Long Run Relation**

Dependent Variable: LWPIFA

Method: Two-Stage Least Squares

Sample (adjusted): 2001Q1 2013Q2

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Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)  
LYMQR(-1) LGFOODPRICE QQ1 QQ2 QQ3 LWPIFA(-1) DD110Q2  
DD110Q4 LGFOODPRICE(-4)

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Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.063	0.049	-1.296	0.202
LGFOODPRICE(-4)	0.037	0.015	2.459	0.018
QQ1	0.073	0.006	12.007	0.000
QQ2	0.059	0.006	9.683	0.000
QQ3	0.061	0.006	9.844	0.000
LWPIFA(-1)	0.980	0.022	44.896	0.000
DD110Q4	0.039	0.016	2.500	0.016
Adjusted R-squared	0.997	S.D. dependent var		0.25
F-statistic	2362.69	Durbin-Watson stat		2.18

**Short-term Dynamics**

Dependent Variable: DLWPIFA

Method: Two-Stage Least Squares

Sample (adjusted): 2001Q2 2013Q2

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Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)  
DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLWPIFA(-1)  
DLYAR(-1 TO -4) QQ1 QQ2 QQ3 DD110Q2 DLWPIFA(-1) DD108Q3

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Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.009	0.003	2.467	0.018
ZLWPIFA(-1)	-0.277	0.125	-2.224	0.032
QQ1	0.092	0.011	8.538	0.000
QQ2	0.050	0.007	7.066	0.000
QQ3	0.057	0.007	8.279	0.000
DLWPIFA(-1)	0.400	0.148	2.701	0.010
Adjusted R-squared	0.725	S.D. dependent var		0.03
F-statistic	26.30	Durbin-Watson stat		2.09

WPIFA Wholesale price index of food articles

GFOODPRICE Index of world food price

GCOALPRICE Index of world coal price

**Long Run Relation**

Dependent Variable: LWPIPA

Method: Two-Stage Least Squares

Sample (adjusted): 2001Q4 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LWPIPA(-1) LWPIPA(-4) LYAR LGCOALPRICE DD104Q1

QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.130	0.096	-1.362	0.181
LWPIFA	0.715	0.063	11.364	0.000
LWPIPA(-1)	0.121	0.057	2.105	0.042
LWPIPA(-4)	0.213	0.046	4.664	0.000
LYAR	-0.020	0.008	-2.389	0.022
LGCOALPRICE	0.035	0.006	6.432	0.000
DD104Q1	0.041	0.011	3.824	0.001
Adjusted R-squared	0.999	S.D. dependent var		0.27
F-statistic	5572.24	Durbin-Watson stat		1.38

**Short-term Dynamics**

Dependent Variable: DLWPIPA

Method: Two-Stage Least Squares

Sample (adjusted): 2002Q1 2013Q2

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) LYTHTCR(-1) DLYCONSR(-1) ZLWPIPA(-1)

ZLWPIFA(-1) DLGCOALPRICE QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.003	0.002	1.230	0.226
DLWPIFA	0.918	0.104	8.794	0.000
ZLWPIPA(-1)	-0.367	0.138	-2.648	0.012
DLGCOALPRICE	0.039	0.008	4.576	0.000
QQ1	0.003	0.008	0.322	0.749
QQ2	-0.009	0.007	-1.335	0.190
QQ3	-0.018	0.007	-2.644	0.012
Adjusted R-squared	0.917	S.D. dependent var		0.03
F-statistic	71.18	Durbin-Watson stat		2.00

WPIPA Wholesale price index of primary articles

GCOALPRICE Index of world coal price

WPIFA Wholesale price index of food articles



**Long Run Relation**

Dependent Variable: LWPIFUEL

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LPCRUDE LWPIFUEL(-1) DD101Q3 DD109Q4 QQ1 QQ2

QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.329	0.067	4.899	0.000
LPCRUDE	0.059	0.012	5.014	0.000
LWPIFUEL(-1)	0.885	0.023	38.366	0.000
DD101Q3	0.078	0.023	3.334	0.002
DD109Q4	-0.061	0.024	-2.573	0.013
QQ1	0.010	0.008	1.176	0.245
QQ2	0.025	0.008	2.980	0.004
QQ3	0.023	0.008	2.785	0.007
Adjusted R-squared	0.996	S.D. dependent var		0.35
F-statistic	2163.59	Durbin-Watson stat		1.86

**Short-term Dynamics**

Dependent Variable: DLWPIFUEL

Method: Two-Stage Least Squares

Sample (adjusted): 1997Q3 2013Q2

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) LYTHTCR(-1) DLYCONSR(-1) DLPCRUDE

ZLWPIFUEL(-1) DLWPIFUEL(-1) DD101Q1 DD101Q3 DD109Q4 QQ1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.011	0.005	2.472	0.017
DLPCRUDE	0.059	0.021	2.765	0.008
ZLWPIFUEL(-1)	-0.183	0.101	-1.811	0.076
DD109Q4	-0.059	0.028	-2.121	0.038
DD101Q3	0.093	0.025	3.743	0.000
QQ1	0.020	0.010	2.067	0.043
QQ2	0.031	0.009	3.414	0.001
QQ3	0.025	0.009	2.809	0.007
DLWPIFUEL(-1)	0.254	0.120	2.123	0.038
Adjusted R-squared	0.483	S.D. dependent var		0.03
F-statistic	8.35	Durbin-Watson stat		2.02

WPIFUEL

Wholesale price index of fuel and power

GCOALPRICE

Index of world coal price

PCRUDE

International crude oil price (USD per barrel)

### Long Run Relation

Dependent Variable: LWPINFOOD

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LPCRUDE LWPINFOOD(-1) QQ1 QQ2 QQ3 DD106Q4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.004	0.094	-0.044	0.965
LPCRUDE	0.014	0.005	2.751	0.008
LYTHTCR	0.066	0.026	2.582	0.013
LWPINFOOD(-1)	0.818	0.052	15.703	0.000
QQ1	-0.007	0.004	-1.742	0.087
QQ2	-0.012	0.004	-2.767	0.008
QQ3	-0.007	0.003	-2.060	0.044
DD106Q4	-0.025	0.009	-2.801	0.007
Adjusted R-squared	0.998	S.D. dependent var		0.20
F-statistic	4687.40	Durbin-Watson stat		1.36

### Short-term Dynamics

Dependent Variable: DLWPINFOOD

Method: Two-Stage Least Squares

Sample (adjusted): 1997Q3 2013Q2

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLWPINFOOD(-1)

DLIDLSR(-1) DD108Q4 DD109Q2 DLWPINFOOD(-1 TO -4) QQ1 QQ2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.003	0.002	2.055	0.044
ZLWPINFOOD(-1)	-0.161	0.082	-1.973	0.053
DLYR	0.038	0.019	1.999	0.050
DLIDLSR(-1)	0.019	0.004	4.308	0.000
DD108Q4	0.022	0.009	2.444	0.018
DLWPINFOOD(-1)	0.522	0.105	4.990	0.000
QQ1	-0.008	0.004	-2.276	0.027
Adjusted R-squared	0.508	S.D. dependent var		0.01
F-statistic	11.57	Durbin-Watson stat		2.14

WPINFOOD Wholesale price index of manufactured articles other than food products

PCRUDE International crude oil price (USD per barrel)

YTHTCR GDP in trade, hotels, restaurants, transport and communications in net fixed capital formation

**Long Run Relation**

Dependent Variable: LWPIMFOOD

Method: Two-Stage Least Squares

Sample (adjusted): 2000Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LGFOODPRICE QQ1 QQ2 QQ3 LWPIMFOOD(-1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.071	0.092	0.765	0.448
LGFOODPRICE	0.057	0.021	2.670	0.010
QQ1	0.015	0.008	1.985	0.053
QQ2	0.007	0.008	0.849	0.400
QQ3	0.006	0.008	0.740	0.463
LWPIMFOOD(-1)	0.929	0.039	24.041	0.000
R-squared	0.992	Mean dependent var	0.000	4.676
Adjusted R-squared	0.991	S.D. dependent var	0.000	0.210
S.E. of regression	0.020	Sum squared resid	0.000	0.020
J-statistic	22.919	Instrument rank		13.00

**Short-term Dynamics**

Dependent Variable: DLWPIMFOOD

Method: Two-Stage Least Squares

Sample (adjusted): 2001Q1 2013Q3

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(

-1) DLYCSPSR(-1) LYTHTCR(-1) DLYCONSR(-1) ZLWPIMFOOD(-1

TO -4) DLWPIMFOOD(-4) QQ1 QQ2 QQ3 DD110Q3 DD111Q1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.007	0.003	2.701	0.010
ZLWPIMFOOD(-1)	-0.175	0.075	-2.322	0.025
DLWPIMFOOD(-4)	0.287	0.115	2.503	0.016
DD110Q3	0.046	0.017	2.658	0.011
DD104Q1	0.060	0.018	3.376	0.002
Adjusted R-squared	0.373	S.D. dependent var		0.02
F-statistic	8.42	Durbin-Watson stat		1.72

WPIMFOOD Wholesale price index of food products in the group of manufactured articles

GFOODPRICE Index of world food price

**Long Run Relation**

Dependent Variable: LPYR

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LIDLSR(-4) LYMR(-4) LPYR(-1) QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.898	0.535	-1.678	0.099
LIDLSR(-4)	-0.020	0.010	-2.081	0.042
LYR(-4)	0.084	0.041	2.037	0.047
LPYR(-1)	0.912	0.055	16.681	0.000
QQ1	0.030	0.005	5.905	0.000
QQ2	0.023	0.006	3.607	0.001
QQ3	0.018	0.004	4.630	0.000
Adjusted R-squared	0.998	S.D. dependent var		0.24
F-statistic	5089.31	Durbin-Watson stat		1.64

**Short-term Dynamics**

Dependent Variable: DLPYR

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q2 2013Q2

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLPYR(-1) QQ1

QQ2 QQ3 DD109Q4 DD109Q1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.013	0.001	10.299	0.000
ZLPYR(-1)	-0.144	0.066	-2.185	0.033
QQ1	0.025	0.004	6.882	0.000
QQ2	0.015	0.004	4.178	0.000
QQ3	0.019	0.004	5.253	0.000
DD109Q4	-0.023	0.010	-2.334	0.023
DD109Q1	0.033	0.010	3.321	0.002
Adjusted R-squared	0.593	S.D. dependent var		0.02
F-statistic	15.57	Durbin-Watson stat		1.68

PYR Implicit price deflator of GDP at factor cost

YR GDP at factor cost

IDLSR Indirect taxes net of subsidies

**Long Run Relation**

Dependent Variable: LPYMR

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LPYMR(-1) LIDLSR(-4) LPYR(-4) LPYMR(-1 TO -4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.074	0.026	-2.847	0.006
LPYR	0.946	0.024	39.956	0.000
LIDLSR(-1)-LPYR(-1)	0.007	0.002	2.799	0.007
LPYMR(-1)	0.111	0.035	3.186	0.002
LPYMR(-2)	-0.134	0.033	-4.011	0.000
LPYMR(-3)	0.086	0.021	4.076	0.000
Adjusted R-squared	1.000	S.D. dependent var		0.24
F-statistic	152432.60	Durbin-Watson stat		1.64
PYMR	Implicit price deflator of GDP at market prices			
PYR	Implicit price deflator of GDP at factor cost			
IDLSR	Indirect taxes net of subsidies			

**Long Run Relation**

Dependent Variable: LCPIAW

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LCPIAW(-1) LCPIAW(-4) QQ1 QQ2 QQ3 DD99Q4 DD110Q2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.779	0.194	-4.008	0.000
LWPIMFOOD	0.160	0.076	2.116	0.039
LIMPR	0.046	0.013	3.405	0.001
LPIMP	-0.132	0.035	-3.744	0.000
LCPIAW(-1)	0.915	0.053	17.331	0.000
QQ1	0.014	0.005	2.974	0.004
QQ2	0.030	0.005	6.554	0.000
QQ3	0.017	0.004	3.925	0.000
Adjusted R-squared	0.998	S.D. dependent var		0.26
F-statistic	4652.24	Durbin-Watson stat		1.80

**Short-term Dynamics**

Dependent Variable: DLCPIAW

Method: Two-Stage Least Squares

Sample (adjusted): 2000Q1 2013Q3

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(

-1) DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLCPIAW(-1) QQ1

QQ2 QQ3 DLCPIAW(-1) DD101Q2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.011	0.002	5.155	0.000
ZLCPIAW(-1)	-0.155	0.048	-3.198	0.003
QQ1	0.024	0.004	6.168	0.000
QQ2	0.032	0.004	9.146	0.000
QQ3	0.012	0.004	3.387	0.001
DLCPIAW(-1)	0.479	0.097	4.966	0.000
DD101Q2	-0.028	0.009	-3.045	0.004
Adjusted R-squared	0.700	S.D. dependent var		0.02
F-statistic	22.05	Durbin-Watson stat		1.91

WPINFOOD Wholesale price index of manufactured articles other than food products

PCRUDE International crude oil price (USD per barrel)

YTHTCR GDP in trade, hotels, restaurants, transport and communications in net fixed capital formation

**Long Run Relation**

Dependent Variable: LCPIIW

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2013Q2

Instrument specification: C TT LBPR LER LCNTR LCRRATIO LYAR(-1)

LYMQR(-1) LCPIIW(-1) QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.068	0.034	-2.020	0.048
LCPIIW(-1)	0.687	0.107	6.427	0.000
LM3	0.045	0.017	2.687	0.010
LWPIPA	0.194	0.065	2.978	0.004
QQ1	0.001	0.005	0.268	0.790
QQ2	0.015	0.006	2.721	0.009
QQ3	0.008	0.005	1.809	0.076
Adjusted R-squared	0.999	S.D. dependent var		0.27
F-statistic	7671.31	Durbin-Watson stat		1.63

**Short-term Dynamics**

Dependent Variable: DLCPIIW

Method: Two-Stage Least Squares

Sample (adjusted): 1998Q1 2013Q2

Instrument specification: C DLBPR DLCRRATIO DLYAR(-1) DLYEGWSR(-1)

DLYCSPSR(-1) DLYTHTCR(-1) DLYCONSR(-1) ZLCPIIW(-1)

DLCPIIW(-1) QQ1 QQ2 QQ3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004	0.002	1.734	0.089
ZLCPIIW(-1)	-0.261	0.078	-3.356	0.001
DLWPIPA	0.511	0.134	3.807	0.000
DLCPIIW(-1)	0.205	0.101	2.031	0.047
QQ1	-0.019	0.010	-1.829	0.073
QQ2	0.006	0.007	0.902	0.371
QQ3	-0.005	0.005	-0.891	0.377
Adjusted R-squared	0.761	S.D. dependent var		0.02
F-statistic	21.22	Durbin-Watson stat		2.21

WPINFOOD Wholesale price index of manufactured articles other than food products

PCRUDE International crude oil price (USD per barrel)

YTHTCR GDP in trade, hotels, restaurants, transport and communications in net fixed capital formation

## Appendix 5: Base Run Values of Exogenous Variables

<b>ASTSTATES</b>	Grown at 15% YoY, applied to respective quarters
<b>BCSVRR</b>	Kept at 1.25 up to 2013-14Q3 and at 1.2 after that.
<b>BPR</b>	Reduced to 7.5 in 2013-14 Q1 and kept at level after that.
<b>CFD/GDP</b>	Used as target variable.
<b>CRD/GDP</b>	Used as target variable.
<b>CTOTHER</b>	Other central tax revenue, grown at 10% YoY, applied to respective
<b>DISCPRR</b>	Grown at 10% YoY, applied to respective quarters
<b>ER</b>	Projected using a model outside the main model.
<b>FDFACTOR</b>	Kept at 1
<b>FDRATIO</b>	Kept at 0.07
<b>GCOALPRICE</b>	Projected using a model outside the main model.
<b>GFOODPRICE</b>	Projected using a model outside the main model.
<b>IFACTOR1</b>	Kept 0.408 based on last observed value
<b>IFACTOR2</b>	Kept 1.495 based on last observed value
<b>IVALR</b>	Grown at 15% YoY, applied to respective quarters
<b>NINVRATIO</b>	Net invisibles to GDP ratio
<b>PCRUDE</b>	Projected using a separate VAR model
<b>SIAR</b>	Kept at last observed value
<b>SICSPSR</b>	Kept at last observed value
<b>SIMQR</b>	Kept at last observed value
<b>YDCOUNTRIES</b>	Projected using a model outside the main model.
<b>YECOUNTRIES</b>	Projected using a model outside the main model.



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