Impact of India's diesel subsidy reforms and pricing policy on growth and inflation

Probal P Ghosh[1]

Integrated Research and Action for Development, New Delhi, India

[1]Dr. Probal Pratap Ghosh[*], Assistant Director

Integrated Research and Action for Development (IRADe),

C 80, Shivalik, Malviya Nagar, New Delhi 110017, India

e-mail: probal29@gmail.com, p. ghosh@irade.org, Tel: +919910457994

Corresponding Author*:

Electronic copy available at: https://ssrn.com/abstract=4019933

Impact of India's diesel subsidy reforms and pricing policy on growth and inflation

Probal P Ghosh[1]

Integrated Research and Action for Development, New Delhi, India

[1]Dr. Probal Pratap Ghosh*, Assistant Director

Integrated Research and Action for Development (IRADe),

C 80, Shivalik, Malviya Nagar, New Delhi 110017, India

e-mail: probal29@gmail.com, p. ghosh@irade.org, Tel: +919910457994

Corresponding Author*:

Electronic copy available at: https://ssrn.com/abstract=4019933

ABSTRACT

Diesel has the strongest linkages with the economy amongst all petroleum products consumed and a major contributor to inflation and fiscal deficit in India. Therefore, the diesel subsidy reforms implemented since 2012 and the diesel pricing policy implemented since 2014 by the government of India would have significant economic implications. It was expected that the diesel subsidy reforms would reduce fiscal deficit and provide for a market-based pricing which would enhance the efficiency of diesel use in the economy and therefore reducing inflation and increasing growth. However, the diesel pricing policy followed by GOI deviated from being market-based pricing. It improved the fiscal position of the government and the resources of the OMCs but economic growth during the post reforms period did not improve as was expected. India's experience of the post reform years provides us with an opportunity to assess if diesel subsidy reforms has been beneficial to India's economy and if the pricing policy adopted was the most optimal for the economy? This will have important policy lessons on reforming petroleum pricing for other developing countries who are also large importers of petroleum products. A VAR based macroeconomic model is estimated using 78 quarterly data from 1997-98 Q1 to 2016-17 Q2 covering the period of diesel subsidy reforms and pricing policy on India's economy. The impact and contribution of the reforms and pricing policy to growth and inflation in the post reforms period is assessed and the role of other macroeconomic factors in limiting the economy from benefitting from the reforms is shown. Results show that diesel subsidy reforms improved growth and helped cushion India's economy against the negative impact of slow exports growth. The analysis also shows that a market linked diesel pricing policy would have provided more growth than the pricing policy pursued.

Key words: Energy subsidies, Energy pricing policy, Inflation, Growth, Fiscal deficits, Vector Auto Regression

JEL: E170, O130, Q350, Q410, Q430, Q480

Electronic copy available at: https://ssrn.com/abstract=4019933

Impact of India's diesel subsidy reforms and pricing policy on growth and inflation

Probal Pratap Ghosh

Integrated Research and Action for Development

1. Introduction

High prices of petroleum products caused by increase in international prices of crude oil have resulted in inflation and deceleration of India's economy many times in past. The government of India (GOI) followed a policy of subsidising petroleum products to insulate the economy from the adverse impacts of international crude oil price rise. The policy resulted in high fiscal deficits during periods of high international crude oil prices leading to lower growth and inflation. Besides the macroeconomic impact, the subsidising policy also affected energy efficiency growth in the use of petroleum products due to inefficient pricing resulting in overuse of petroleum products. Based on these experiences, the GOI in the last decade, implemented petroleum products subsidy reforms and a pricing policy. Amongst all petroleum products, diesel has the strongest linkages with the economy and therefore policy changes relating to diesel pricing and consumption are likely to strongly impact the economy. This paper therefore focuses on impact of diesel policy only. Two policy changes implemented by the GOI for diesel subsidy reforms and the pricing policy for diesel adopted since removal of subsidies.

<u>Diesel subsidy reforms implemented by GOI</u>: On September 13, 2012, the government of India increased the price of diesel by Rs. 5 per litre (Press Information Bureau 2012) and adopted the policy to gradually increase the price of diesel by Rs 0.5 per month from January 2013 to slowly eliminate the burden of subsidies and make diesel prices market determined. In 2014 diesel prices were declared to be fully deregulated and market linked by the Government of India.

<u>Diesel pricing policy adopted by the GOI</u>: Unexpectedly, the international oil prices fell throughout the post diesel reforms period. Taking advantage of the falling international oil prices, the government adopted a strategy to improve the finances of the oil marketing companies (OMCs) and its own

Electronic copy available at: https://ssrn.com/abstract=4019933

finances. This was achieved by not passing on the full reduction in oil prices to the economy and instead allowing the OMCs to profit due to the price difference and increase the government's revenue collection through higher diesel prices. The pricing policy adopted by GOI is presented in detail in Jain (2018).

The diesel pricing policy followed by GOI deviated from market-based pricing mechanism. It improved the fiscal position of the government and the resources of the OMCs but economic growth during the post reforms period did not improve as was expected. It has been more than 6 years since the implementation of diesel subsidy reforms in 2012-13 and initiation of the diesel pricing policy in 2014. All through these years the international oil prices were low, domestic diesel prices remained higher than what was required, and economic growth was falling over time. Currently too India's economy is experiencing high prices of petroleum products despite international prices being lower. While high and Low levels of international oil prices are likely to occur in future too, it is important to ascertain how optimal and appropriate has been the diesel policy of the GOI which may hold lessons for the future. The experience of the post reform years provides us with an opportunity to assess if this significant policy change of diesel subsidy reforms has been beneficial to India's economy and if the pricing policy adopted was the most optimal for the economy?

This paper seeks to estimate the impact of India's diesel subsidy reforms and the subsequent pricing policy on the economy by accounting for the contribution of other macroeconomic factors in post reforms period and asses the macroeconomic optimality of the pricing strategy adopted. Specifically, we answer the following question using scenarios from an estimated econometric model.

1) What was the impact on inflation and economic growth, of the diesel subsidy reforms and the strategy to partially pass on the fall in international crude oil prices to the economy?
2) What was the contribution of other macroeconomic factors to economic growth and inflation in the post diesel price reforms period?

Electronic copy available at: https://ssrn.com/abstract=4019933

3) What would have been the impact on economic growth and inflation if government adopted an alternate policy of market linked prices and passed on the entire benefits of the lower oil prices to the economy?

2. Literature Survey

Several studies have tried to assess the impact of reducing energy subsidies on the economy. Many of these studies have employed Computable General Equilibrium (CGE) based optimisation models to assess the impact of subsidy removal. Solaymani S et.al. (2015) using a multi sectoral CGE model finds that energy subsidy reform and higher price of petroleum products reduce energy consumption and air pollution from Malaysia's transport sector. Solaymani and Kari (2014) uses a CGE model for Malaysian economy and finds that removal of energy subsidies decreases energy demand, household consumption, welfare and CO2 emissions due to lower consumption of energy commodities. Li, Shi and Su (2017) using a CGE model for the Malaysian economy with income wise disaggregated households finds that removing energy subsidies reduces budget deficits, improve economic efficiency and GDP by 0.65%. It also finds that the households would be worse off due to high prices and suggest compensating them for their losses. Breton and Mirzapour (2016) find that the energy subsidy reform in Iran which had direct compensation mechanism to support lower income households had underperformed and the feasibility of the subsidy reform depends on the initial rate of subsidization, share of energy in the consumer bundle and the contribution of energy into the price of other goods. Gharibnavaza and Waschik (2015) using a CGE model for Iran with 20 urban and rural households shows that food and energy subsidy reforms resulted in increase in government revenue and aggregate welfare gains for households and though it caused inflationary pressures but was not responsible for the fiscal and economic difficulties experienced by the economy. Elshennawy (2014) uses an intertemporal general equilibrium model for Egypt and finds that a policy of gradual elimination of energy subsides and tariffs is most optimal among several energy subsidy phasing out policies. Similarly, there have been other studies that have used Input-output (IO) based models to

Electronic copy available at: https://ssrn.com/abstract=4019933

address this issue. Saari, Dietzenbacher and Los (2016) uses a social accounting matrix (SAM) based model incorporating income distribution across different ethnic groups for Malaysia to show that distributional impacts of rising petroleum prices are regressive and effects poorer people more than richer people. Setyawan (2014) uses a 66×66 input output (I-O) based model for the Indonesian economy to show that increasing fuel prices would have a strong negative impact on the transportation sector. Allen Dennis (2016) finds that the impact of removal of fossil fuel subsidies on government is positive but negative for private households in some cases based on which the study recommends compensating the households through the fiscal gains achieved by the government.

Many studies have assessed the impact of international oil price increase and pricing of petroleum products through subsidies for India. Ghosh & Kanjilal (2014) employs a two-state Markov regime-switch VAR model to assess the impact of linear and non-linear oil price shocks on macroeconomic fundamentals of oil-importing economy like India. The study finds that inflation and foreign exchange reserve are impacted asymmetrically by oil price shocks with negative price shocks having more pronounced effect than positive shocks. Acharya and Sadath (2017) estimates long-term and short-term price and income elasticities of all energy commodities using an estimated Auto Regressive Distributed Lag Model (ARDL) and an Error Correction Model (ECM) model for India and finds that petroleum products have low price and high income elasticity and therefore subsidy reduction would increase prices and reduce real income and energy consumption. Mandal, Bhattacharyya and Bhoi (2012) estimates the pass-through impact of international oil prices on the Indian economy in the wake of deregulation of prices of petroleum products and finds that compared to global levels, there is higher pass through to inflation and industrial output since 2002. It also finds that completely deregulated prices with full pass-through could result in higher inflation and affect output while staggered adjustments would deteriorate government finances. Anand (2012) looks at various issues in the reforms for petroleum pricing and taxes and estimates the increase in total costs of public, freight and railway transport and industry due to 25% increase in diesel price. Significant number of studies conclude that petroleum product subsidy reduction would have adverse impact on welfare

Electronic copy available at: https://ssrn.com/abstract=4019933

and advocate direct compensation to the households to mitigate the adverse impact. Jain (2018) is a non-modelling study that summarizes the policies in petroleum products sector in India before and after reforms were initiated. The paper explains the petroleum products pricing including diesel pricing and the experience of reforming petroleum products subsidies in India.

A more comprehensive study for India Parikh et. al (2012) uses a VAR based macroeconomic model to show that increasing diesel prices to reduce subsidy would result in short term inflation but lower prices in the long term. The study also found that since diesel is used by more affluent households, the poorer households are unlikely to be adversely affected by the subsidy reduction policy. This paper is based on the VAR based approach in Parikh et al (2012) and tries to assess the impact of diesel reforms and pricing strategy adopted by the Government of India on the economy. However, unlike papers that use CGE approach, this paper uses an econometric approach and instead of a single equation approach of ARDL and ECM, the paper uses multi equation Vector Auto Regressions (VAR) to model the channels through which the diesel prices and subsidies are likely to impact the economy. The advantage of using a VAR approach is that the modeller need not make a choice in terms of the structural nature of the model while considering the interrelationships between various macro variables and hence the projections and policies do not suffer from modellers biases.

3. Approach

Given the increase in international oil price, domestic pricing policy has two alternative options - either prices are market determined or prices are controlled through subsidies. The alternative options for diesel pricing and channels through which domestic diesel pricing policy impacts the economy is explained through figure 1 below.

Electronic copy available at: https://ssrn.com/abstract=4019933

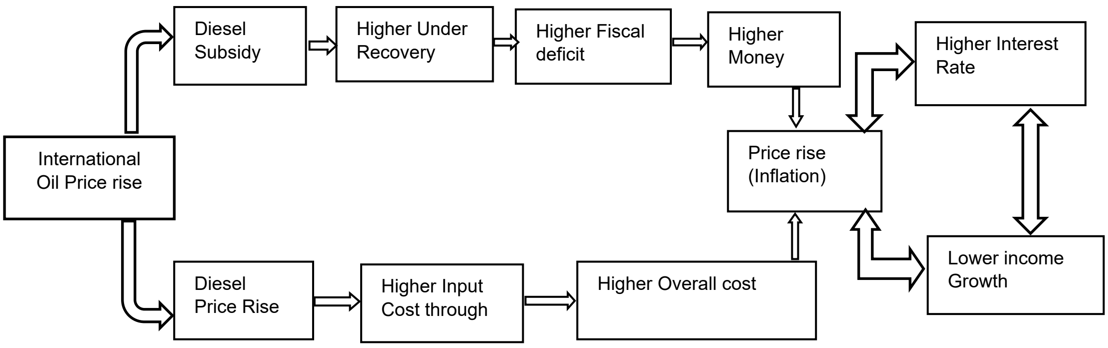

Figure 3.1:Impact of International oil price rise and domestic pricing policy

If government chooses to entirely pass through the increase in international oil price the economy, the cost of production increases raising prices, and reducing GDP at least in the short run. On the other hand, if the government chooses to subsidise diesel, then this increases subsidy burden and fiscal deficit which in turn increases money supply resulting in higher inflation and lower GDP in long term.

This paper uses an econometrically estimated macroeconomic model that considers the relationships and variables described in figure 1 above, to analyse the impact of diesel price reforms policy implemented by Government of India since 2012 (Jain 2018) and the impact of the subsequent diesel pricing strategy on India's economy. The paper also tries to quantify the contribution of each macroeconomic factor including the diesel price reforms policy on the economy in the post reforms period and identify factors that constrained the economy from benefitting from diesel price reforms policy. No research paper till date to my knowledge has tried to assess these issues. The details of the model and methodology used is provided in section below.

3.1 Methodology

As shown in figure 1, Income represented by GDP, prices represented using GDP deflator and interest rate represented by real prime lending rate (rate at which banks lend to businesses minus the inflation rate) are interdependent and effect each other and hence are considered endogenous to the system while the other variables in figure 1 are exogenous to this system. A reduced form equation of the underlying macroeconomic model in terms of income, price, and real interest rate on the lines of an

Electronic copy available at: https://ssrn.com/abstract=4019933

IS-LM relationship is estimated. The reduced form IS-LM relationships are econometrically estimated using Vector Auto Regressions (VAR) or Vector Error Correction (VEC) technique. The Fiscal sector, monetary sector, trade sector and external shocks like rainfall, diesel prices and food prices are considered exogenous. The fiscal sector is modelled using central government total expenditure and fiscal deficit while monetary sector is represented using broad money supply, statutory Liquidity Ratio, cash reserve ratio, bank rate and marginal standing facility rate. The impact of trade sector is modelled through aggregate exports. In a developing country like India, Exports increase GDP through higher external demand while imports are caused by GDP. Hence only exports are assumed in the model. The data used for each variable and method of computation of data for each variable is explained in annexure A.

3.2 Estimation of the Model

A Vector Auto Regression (VAR) or a Vector Error Correction (VEC) model is estimated with GDP, aggregate price deflator (PDFL) and real prime lending rate (RPLR) as endogenous variables and Broad money supply (M3), Bank Rate (BR), Marginal Standing Facility Rate (MSR), Statutory Liquidity Ratio (SLR), Cash Reserve Ratio (CRR), Central government total expenditure (CGTE), Wholesale Prices of Diesel (WPD), Wholesale Prices of Food (WPF) and rainfall Index (RI) as exogenous variables. The model is estimated using 78 quarterly data from 1997-98 Q1 to 2016-17 Q2. The period of estimation covers a period of significant economic growth, price increase, structural change and a period of relatively stable as well as increasing international oil prices. The model is estimated using Jmulti software version 4.24

All variables except the real interest rates, RPLR, RBR and RMSF are specified in natural logarithms prefixed by L. The stationarity levels of all the variables in the model are tested followed by tests for existence of cointegrating relationship between the endogenous variables GDP, aggregate price deflator and real prime lending rate. Optimality criteria analysis is then used to determine the optimal

Electronic copy available at: https://ssrn.com/abstract=4019933

lag length of the VAR/VEC. The optimally specified model is then estimated, and diagnostic tests are carried out to validate the model statistically.

Stationarity Tests: Unit root tests and correlogram plots are used to determine the level of integration of all the variables. Since stationarity tests have issues related to power hence for a robust assessment of the stationarity levels of each variable, multiple tests like ADF, KPSS, Philips-Schimidit, Philips-Perron, HEGY and Correlogram approach is used. The summary result of the unit root tests, and the level of integration assessed for each variable is presented in the table 3.1 below.

Table 3.1:Unit Root Tests and chosen levels of integration.

Variable	ADF	KPSS	SP	PP	HEGY	Correlogram	Chosen Level of Integration I(d,s)*
LGDP	I(1,1)	I(1,0)/I(0,1)/I(1,1)	I(0,0)	I(0,0)	I(1,1)	I(1,1)	I(1,1)
LPDFL	I(1,1)	I(1,1)	I(1,0)/I(1,1)	I(1,0)/I(1,1)	I(1,1)	I(1,1)	I(1,1)
RPLR	I(1,0)	I(1,0)/I(0,1)	I(0,0)	I(0,0)	I(1,0)	I(1,0)	I(1,0)
LM3	I(2,0)	I(1,0)	I(1,0)	I(1,0)	I(1,0)/I(2,0)/I(0,1)	I(1,0)	I(1,0)
LCGTE	I(1,0)/I(0,1)	I(1,0)/I(0,1)	I(0,0)	I(0,0)	I(1,0)/I(0,1)	I(0,1)	I(1,1)
LWPD	I(1,0)	I(1,0)/I(0,1)	I(1,0)/I(0,1)	I(1,0)/I(0,1)	I(1,0)	I(1,0)	I(1,0)
LWPF	I(1,1)	I(1,0)/I(0,1)/I(1,1)	I(1,0)/I(1,1)	I(1,0)/I(1,1)	I(1,1)	I(1,1)	I(1,1)
LRI	I(0,0)	I(0,0)	I(0,0)	I(0,0)	I(0,0)	I(0,0)	I(0,0)
LCRR	I(1,0)	I(1,0)/I(0,1)	I(1,0)/I(0,1)	I(1,0)	I(1,0)	I(1,0)	I(1,0)
LSLR	I(1,0)	I(1,0)/I(0,1)	I(1,0)	I(1,0)/I(0,1)	I(1,0)/I(0,1)	I(1,0)	I(1,0)
RBR	I(1,0)	I(1,0)/I(0,1)	I(0,0)	I(0,0)	I(1,0)/I(0,1)	I(0,0)	I(1,0)
RMSF	I(1,0)	I(1,0)/I(0,1)	I(1,0)	I(1,0)/I(0,1)	I(0,1)	I(0,0)	I(1,0)
LREXP	I(1,0)	I(1,0)	I(1,0)	I(1,0)	I(1,0)	I(1,0)	I(1,0)

* I(d,s) denotes $X_t(1-B)^d(1-B^4)^s$ is the appropriate level of differencing required to make X_t stationary

The table 3.1 above gives the combination of normal differencing and seasonal differencing required for making each variable stationary. Most of the variables require one normal differencing and a maximum of one seasonal differencing to be made stationary. To denote the transformed stationary levels of each variable the nomenclature used is that if a variable X_t is stationary after differencing d times and seasonally differencing once then the transformed variable is denoted as $DdS4X_t$ and if

Electronic copy available at: https://ssrn.com/abstract=4019933

variable X_t requires only differencing d times and no seasonal differencing, then the transformed variable is denoted as DdX_t. Thus, the transformed stationary levels for LGDPFC would be $D1S4LGDP_t$ and transformed stationary levels for LM3 is D1LM3. The stationary transformed levels for other variables are similarly named.

Co-integration Tests: The endogenous variables LGDP, LPDFL and RPLR have different orders of Integration as shown in table 3.1 above. RPLR is integrated of the order one while LGDP and LPDFL have a seasonal unit root and general unit root. Since the standard cointegration estimation procedures of Johansen and Juselius and Engle & Granger methodology requires that cointegrating variables each be integrated of the order one, hence no co integration is possible and therefore no Vector Error Correction (VEC) model is possible between the chosen group of endogenous variables LGDP, LPDFL and RPLR. The absence of cointegration is confirmed through Johansen's Trace test (JTT) and Saikonen & Luetkepohl test (SLT) reported in table B.1 in annexure B on two sets of variables, S4LGDPFC, S4LPDFL, RPLR and LGDPFC, LPDFL, RPLR. The reason for considering the two groups is that S4LGDPFC, S4LPDFL, RPLR are each integrated of the order one which allows for estimation of cointegration relation between them. While LGDP, LPDFL and RPLR are the variables of interest hence also considered to test for cointegration. The details of the results of the JTT and SLT tests provided in table B.1 in annexure B suggest that there exists no cointegrating vector between S4LGDPFC S4LPDFL and RPLR. The results of the JTT and SLT tests for LGDP, PPDFL and RPLR are also similar. JTT suggests existence of more than one co integrating vector while SLT suggests existence of one co integrating vector when only intercept is considered in the co integrating vector. However, when trend term is included either in the cointegrating vector or as orthogonal trend then both JTT and SLT suggests that there is no cointegrating vector between LGDP, LPDFL and RPLR. There does not seem to be strong evidence for existence of cointegrating vector between LGDP, LPDFL and RPLR. Thus, existence of VEC model between LGDP, LPDFL and RPLR is ruled out and instead a VAR is estimated using the stationary transformed form of the variables - D1S4LGDP, D1S4LPDFL and D1RPLR.

Electronic copy available at: https://ssrn.com/abstract=4019933

Optimal Lag length selection: The optimal lag length for estimating the VAR model is chosen based on optimality criteria. AIC and FPE suggest a lag length of 9 and 8 respectively for the estimated VAR model between in both cases of with and without constant. This is too long and will have large numbers of parameters to estimate. On the other hand, HQC and SC suggests a lag length of 4 which seems reasonable since the data at hand is also quarterly data. Details provided in table B.2 in annexure B.

Estimated Model: A VAR model of lag 4 is estimated using stationary transformations of endogenous variables LGDP, LPDFL and RPLR and exogenous variables LM3, LCGTE, LWPID, LWPIF, LRD, LCRR, LSLR, RBR, RMSF and LREXP. The model is initially estimated with no restriction on any of its parameters and subsequently the coefficients of the exogenous variables that are insignificant are restricted to zero in the final estimations. The final estimated coefficients of the VAR model and the corresponding t-values are provided in table 3.2 below.

Diagnostic tests: The estimated model satisfies tests of stability and autocorrelation. All the eigen values of the reverse characteristic polynomial are greater than one implying that the estimated VAR model is stable and the estimated impulse response functions are all converging. The estimated impulse response functions are provided in figure C.4 in annexure C. The LM test for autocorrelation is insignificant for up to 5 lags implying that the estimated model is free of autocorrelation and misspecification. The details of diagnostic tests are provided in table B.3 in annexure B. It can be concluded that the estimated model is stable and free of autocorrelation and hence can be used for projections.

Model validation: To validate the estimated VAR model we use it to simulate dynamic forecasts for the endogenous variables GDP, PDFL and RPLR from 2012-13 Q3 to 2017-18 Q4 using actual values for the exogenous variables and compare the projections to the actual values of the endogenous variables in this period. The choice of the starting from 2012-13 Q3 is because the govt of India started the process of deregulating diesel prices from September 5, 2012 i.e., in the quarter 2012-13 Q2. So, the

Electronic copy available at: https://ssrn.com/abstract=4019933

period 2012-13 Q3 to 2017-18 Q4 represents the period in which diesel reforms got implemented and which also represented a period of structural change as would be explained later. In this background, if dynamic forecasts over the period 2012-13 Q3 to 2017-18 Q4 covering 22 quarters, can closely re produce the actual values and time paths of the endogenous variables then it can be concluded that the model is able to capture the structural interrelationships accurately. The plot of the projected and actual values for GDP, PDFL and RPLR are presented in figure C.1, C.2 and C.3 in annexure C and the percentage deviation of the projected values from the actual are provided in table 3.3 below.

The projections closely approximate the actual values for GDP in the forecast period of 2012-13 Q3 to 2017-18 Q4 as shown in table 3.3 where the percentage deviations are less than 3% in most cases. In case of PDFL the projections seem to be slightly higher than the actual even though the percentage deviations are within 5% for all quarters. The percentage deviations are in fact higher only in the quarters after 2016-17 Q2 (the quarter before demonetisation, November 8, 2008). The actual values of RPLR show much more fluctuations than GDP and PDFL but the model projections capture these fluctuations quite satisfactorily up to 2016-17 Q2 as shown in figure C.3 in annexure C. The percentage deviations for RPLR in table 3.3 are all within 5% for most quarters up to 2016-17 Q2 except for two quarters. The deviations increase significantly after 2016-17 Q2 which is the quarter in which demonetisation was implemented. The model would not be capable of capturing the impact on the economy due to policy shocks like demonetisation as the actual money supply would not show a decline, but the impact would be like a reduction in money supply.

Electronic copy available at: https://ssrn.com/abstract=4019933

Table 3.2: Estimated coefficients of the VAR model

	D1S4LGDPFC$_{t-1}$	D1S4LPDFL$_{t-1}$	D1RPLR$_{t-1}$		D1S4LGDPFC$_{t-2}$	D1S4LPDFL$_{t-2}$	D1RPLR$_{t-2}$		D1S4LGDPFC$_{t-3}$	D1S4LPDFL$_{t-3}$	D1RPLR$_{t-3}$		D1S4LGDPFC $_{t-4}$	D1S4LPDFL$_{t-4}$	D1RPLR$_{t-4}$
D1S4LGDPFC$_t$	-0.35575	-1.31427	-0.01035	+	-0.3067	-0.8005	-0.00785	+	-0.2925	0.732338	0.007824	+	-0.43116	-0.46402	-0.00535
t-statistic	-3.96	-2.38	-1.94		-3.25	-1.65	-1.65		-3.23	1.44	1.56		-4.04	-0.91	-1.11
D1S4LPDFL$_t$	0.008452	-0.05332	-4.81E-07	+	-0.02162	0.19427	0.001808	+	-0.02268	0.24375	0.00213	+	0.046622	0.080479	0.00149
t-statistic	0.35	-0.40	0.00		-0.82	1.44	1.38		-0.88	1.79	1.63		1.83	0.56	1.11
D1RPLR$_t$	1.087088	35.20295	0.259333	+	2.152708	-15.5785	-0.15827	+	5.348763	2.479476	-0.01898	+	-7.53094	-21.6405	-0.28138
t-statistic	0.39	2.43	1.81		0.75	-1.05	-1.11		1.76	0.16	-0.13		-2.84	-1.37	-1.90
	D1LM3$_t$	**D1S4LCGTE$_t$**	**D1LWPID$_t$**	**D1S4LWPIF$_t$**	**LRD$_t$**	**D1LCRR$_t$**	**D1LSLR$_t$**	**D1RMSF$_t$**	**D1RBR$_t$**	**D1LREXP$_t$**					
D1S4LGDPFC$_t$	0	0	-0.05491	0.059363	0.005239	0	0	0	0	0.034108	+				
t-statistic	0.00	0.00	-3.02	1.07	0.54	0.00	0.00	0.00	0.00	1.68					
D1S4LPDFL$_t$	0	0	0.008586	0.005221	0	0	0	0	-0.00918	0.008336	+				
t-statistic	0.00	0.00	2.41	0.45	0.00	0.00	0.00	0.00	-30.44	1.58					
D1RPLR$_t$	0	0.7746	0	0	0	1.569488	0	0.058143	0.894627	-1.29806	+				
t-statistic	0.00	3.65	0.00	0.00	0.00	3.20	0.00	1.68	23.86	-2.31					
	D1LM3$_{t-1}$	**D1S4LCGTE$_{t-1}$**	**D1LWPID$_{t-1}$**	**D1S4LWPIF$_{t-1}$**	**LRD$_{t-1}$**	**D1LCRR$_{t-1}$**	**D1LSLR$_{t-1}$**	**D1RMSF$_{t-1}$**	**D1RBR$_{t-1}$**	**D1LREXP$_{t-1}$**		**CONST**	**S1$_t$**	**S2$_t$**	**S3$_t$**
D1S4LGDPFC$_t$	0	0.010593	-0.02553	0	0.035925	0.038434	0.497997	0	0	0	+	-0.18239	0.008563	0	-0.01041
t-statistic	0.00	1.24	-1.44	0.00	4.11	1.59	2.63	0.00	0.00	0.00		-3.72	2.11	0.00	-2.54
D1S4LPDFL$_t$	0.034748	0.003494	0	0	0	0	0	0	0	0	+	-0.00146	-0.00184	0	0
t-statistic	2.10	1.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		-2.06	-2.20	0.00	0.00
D1RPLR$_t$	0	0	0	0	0	0	-14.4561	0	0	0.546946	+	0.035811	0	0.111029	0
t-statistic	0.00	0.00	0.00	0.00	0.00	0.00	-3.49	0.00	0.00	1.22		0.64	0.00	1.31	0.00

Electronic copy available at: https://ssrn.com/abstract=4019933

Table 3.3:Percentage deviation of projection from actual

Year	Quarter	GDP	PDFL	RPLR
2012-13	Q4	-0.16	-0.14	-0.13
2013-14	Q1	1.09	-0.33	1.45
	Q2	0.99	0.59	-9.09
	Q3	0.36	-0.09	-0.45
	Q4	-1.74	-0.09	2.03
2014-15	Q1	1.50	-0.13	2.57
	Q2	2.25	0.77	0.28
	Q3	1.49	0.43	-2.91
	Q4	-1.73	0.03	1.13
2015-16	Q1	0.41	0.07	1.63
	Q2	2.02	0.94	1.04
	Q3	0.11	0.32	2.24
	Q4	-1.65	0.23	0.48
2016-17	Q1	0.59	-0.23	5.61
	Q2	1.86	0.55	4.11
	Q3	1.44	0.00	0.65
	Q4	-1.23	0.11	-2.71
2017-18	Q1	-1.00	-0.65	-4.68
	Q2	-1.40	-0.15	-2.15
	Q3	1.63	-0.69	-9.30
	Q4	0.19	-0.38	-13.97

Overall we see that the model can reproduce the actual movements of GDP, PDFL and RPLR over a period of 22 quarters through which the diesel price was deregulated and hence the model is

Electronic copy available at: https://ssrn.com/abstract=4019933

considered validated. The estimated VAR model is now used for future projections and policy analysis based on scenarios described in the section below.

3.3 Scenarios:

Impulse response functions (IRF) analyse the response of all the endogenous variables to an exogenous unit shock to one of the endogenous variables. The issue that this paper tries to address is about multiple simultaneous shocks to GDP, PDFL and RPLR through diesel prices or reduction in money supply due to reduction in fiscal deficit through gradual diesel subsidy removal. Clearly IRFs are not suited for the purpose at hand. The IRFs from the model are reported in figure C.4 in annexure C. Therefore, this paper instead makes comparative analysis of alternative scenarios computed using alternative assumption of exogenous variables as explained below.

The policy to increase diesel prices to reduce subsidy was announced on September 30, 2012, hence with 2012-13 Q2 as the time point of Intervention, we divide the period of analysis into two parts - pre reforms period 1997-98 Q1- 2012-13 Q2 and post reforms period 2012-13 Q3-2017-18 Q4. The purpose is to analyse the impact of the diesel subsidy reforms and diesel pricing policy on the economy in the post reforms period. We use the estimated model to simulate various scenario and policy forecasts over the post reforms period of 2012-13 Q3 to 2017-18 Q4 and compare across scenarios to assess the contribution of each policy including diesel price reforms policy and exogenous factors to economic growth and inflation.

Table 3.4:Quarterly average policy rates of exogenous variable before and after diesel price de regulation

Policy Rates	CGTE	M3	REXP	WPI	CPI
CAGR 2008-2012	5.23	3.97	2.81	1.84	2.46
CAGR 2012-2016	3.12	2.52	0.19	0.39	1.39
	WPIF	WPID	CPIF	CPID	ICOP*
CAGR 2008-2012	2.72	1.93	2.48	2.88	1.92

Electronic copy available at: https://ssrn.com/abstract=4019933

CAGR 2012-2016	1.43	-1.15	1.35	1.27	-3.85
	RD	RBR	CRR	RMSF	SLR
Average Level 2008-2012	87.47	-1.37	6.04	-0.014	24.45
Average Level 2012-2016	95.12	4.00	4.02	4.01	21.74

*International Crude Oil price (ICOP) refers to Europe Brent Spot Price FOB (Dollars per Barrel)

The table 3.4 above provides the CAGR growth rates of the exogenous variables CGTE, M3, REXP, WPI, CPI, WPIF, WPID, CPIF and CPID in the pre reforms period (2008-2012) of 20 quarters before and post reforms period (2012-2016) of 20 quarters after the diesel price increase policy was announced on September 30, 2012. For the variable RD, RBR, CRR, RMSF and SLR the table 3.4 provides average values during these periods. It shows that the major sources of growth like government expenditure (CGTE), Broad Money Supply (M3) and export demand grew much slower in the post diesel reforms period compared to the pre reforms period. Both price indicators WPI and CPI grew at a lower rate in the post diesel reforms period indicating lower inflation. The usual sources of inflation in Indian economy, the food prices (WPIF, CPIF) and fuel prices (WPID, CPID), also showed lower growth rates in the post diesel reforms period. The International crude prices (ICOP) which grew at an average growth rate of 1.92% in pre reforms period, showed negative growth rate of -3.85% in the post reforms period. The wholesale price index of diesel (WPID) shows a negative growth rate in the post diesel reforms period. The consumer price index of diesel (CPID) grows at a much slower pace which is less than half of what it grew in the pre reforms period due falling international crude prices. In the post reforms period consumer price index for food (CPIF) and wholesale price index for food (WPIF) grew at nearly half the rate of growth it experienced in the pre reforms period. On an average the rainfall (RD) was higher in the post diesel reforms period. Real bank rate (RBR) and Real marginal standing facility rate (RMSF) was held at a higher level during the post diesel reforms period but on the other hand cash reserve ratio (CRR) and statutory liquidity ratio (SLR) was reduced in the post diesel reforms period. Overall, we see a tight monetary policy, higher monetary interest rates, low external demand, and an overall lower price rise after the initiation of the diesel reforms. However, the GDP grew at a

Electronic copy available at: https://ssrn.com/abstract=4019933

slower rate of 1.72% per quarter from 2012-13 Q3 to 2017-18 Q4 while it had grown at an average growth rate of 2.14% per quarter from 2007-08 Q2 to 2012-13 Q3. This begs the question why the economy did not grow higher despite low inflation in the post diesel price reforms? To analyse this, a set of policy scenarios are designed which are conditional forecasts from the VAR model based on alternate assumption of exogenous variables and domestic diesel price strategy. The description of the scenarios and the projections of exogenous variables across scenario is explained below.

Reference scenario (REF): All exogenous variables are assumed to grow as they have in the past (pre diesel reforms period). Domestic diesel prices and international crude prices are assumed to remain at the same level as 2012-13 Q2 reflecting expectations in 2012. OPEC (2011) at the time of diesel price reforms ascribes the increase in international crude oil prices in 2011 to speculative behaviour and expected the OPEC Reference Basket price to settle in the range of $85–95/b for the2010-20 decade. Thus, in the reference scenario Oil price rise is assumed as, $g_{icop} = g_{wpd} = 0\%$ per quarter. Under recoveries also remain constant at 12.94 as on 2012-13 Q2. All other variables are assumed to grow based on growth trends in pre diesel reforms period. The REF scenario shows what GDP, prices and real interest rate would have been in the post reforms period if everything would have grown as in the past.

Actual Oil Price rise: Against expectations the international oil prices fell in the post reforms period, but the domestic price of diesel administered by the government was reduced at a much lower rate (see table 3.4) to help OMCs to profit and reduce there under recoveries and for the government to improve its finances and pass on some price reduction to the consumers (see Jain (2018)). This is captured in this scenario where actual values of diesel price (WPD), International oil prices and under recoveries to OMCs over the post reforms period are assumed. All other specifications are same as in the Reference scenario. The Actual Oil price scenarios shows the impact of diesel subsidy reforms and subsequent diesel pricing strategy of the government of India on the economy.

Electronic copy available at: https://ssrn.com/abstract=4019933

The individual impact of each macroeconomic factor or policy on the economy in the post reforms period is estimated by comparing the results of the Actual Oil price scenario with policy scenarios. Each policy scenario corresponds to an economic factor and is constructed by making changes to the Actual Oil Price rise scenario as explained below.

PolWPF: Assumes actual food price (WPF) in post reforms period.

PolM3: Assumes actual money supply (M3) in post reforms period.

PolCGTE: Assumes actual Central Government expenditure (CGTE) in post reforms period.

PolExp: Assumes actual real exports (REXP) in post reforms period.

PolIntStruct: Assumes actual value of interest rates (RBR, RMSF, CRR, SLR) in post reforms period.

Actual Outcome: This scenario assumes the actual values of all exogenous variables, domestic diesel prices, International oil prices and under recoveries in the post diesel reforms period. The difference between Actual Outcome and Actual Oil Price rise scenario is purely due to the exogenous variables. The macroeconomic policy scenarios together add up to the Actual Outcome scenario. The aggregate impact of macroeconomic factors on the economy in the post reforms period can be seen by comparing the Actual Oil Prices scenario to the Actual Outcome scenario.

Full Pass Through: This is an alternative diesel pricing strategy scenario. The scenario shows what the economic situation might have been in the post reforms period if instead the government had market linked the domestic diesel prices after implementing the reforms and passed on the entire oil price reduction to the economy. In the Full Pass Through scenario, g_{wpd} = $WPDQG_{NUR}$ for 2012-13 Q3 to 2013-14 Q2 (see table 3.5) and, g_{wpd} = g_{icop}= the actual growth rate of ICOP from 2013-14 Q3 onwards. Actual values for all other exogenous variables are assumed.

The projection of the exogenous variables into the post reforms period based on pre reforms behaviour is explained in the section below.

Electronic copy available at: https://ssrn.com/abstract=4019933

3.3.1 Projection of exogenous variables in the post diesel reforms period.

Each strategy of diesel price increase, based on the pricing policy adopted, has an implication for under recoveries and exogenous variable like fiscal deficit, central government expenditure, money supply and bank rates. The projection of domestic diesel price rise and its implication on under recoveries and the other exogenous variables in the post diesel reforms period is explained below.

3.3.1.1 Diesel Price increase and calculation of diesel demand and under recoveries of OMCs:

As shown in table 3.5 below the diesel demand in the starting period 2012-13 Q2 is 15735 thousand tons or 1851 crore litres. The under recovery per litre on diesel in 2012-13 Q2 is 12.94 Rs/litre so the total under recovery on diesel to the OMCs is Rs. 23945 Crores in 2012-13 Q2. Based on past trends, diesel demand is assumed to grow at 7.5% per annum or by 1.88% (g_d= 7.5/4) per quarter with an own price elasticity of 0.2% and a cross price elasticity of 0.3% (see Anand (2012), Ramanathan (1999) and Ghosh (2010)[1]).

Table 3.5:Price rise to make under recoveries zero

Description	Name/Formula	Value
Consumption of HSD July-September (Q2) 2012-13 in 000 tons		15735
1 tonne equivalent in litres		1176.47
Total consumption in 000 litres	D_0	18511755
Under recovery as on 16th September 2012 (Rs/Litre)	UR_0	12.94

[1] Ramanathan (1999) estimates the own and cross elasticity of petrol which is used in the transport sector only as -0.21 and -0.32. Ghosh (2010) using data from 1972-2006 find that both own and cross price elasticity are insignificant. Since 2010 petrol prices were de regulated, but diesel continued to be subsidised, resulting in diesel being priced lower than petrol and diesel substituting petrol in transport sector. Nielsen (2013) estimates that transport sector accounts for 72% of total diesel retail consumption. The estimates by Ghosh (2010 and Ramanathan (1999) have also been used by Anand (2012) a more recent study on the same topic. Therefore, for this study we use the elasticities of petrol estimated by Ramanathan (1999) for diesel.

Electronic copy available at: https://ssrn.com/abstract=4019933

Under recovery of petroleum companies on Diesel (Rs Crores) in 2012-13 Q2	TUR_0	23945
Retail Selling Price of Diesel in Delhi on 14/09/2012	RPD_0	46.95
% Price rise required for No Under recoveries	$WPDG_{NUR}$= $(RPD_0+UR_0)/RPD_0$	27.55 %
% Price rise per quarter for no under recoveries in one year (4 quarters)	$WPDQG_{NUR}$	6.27 %
WPI of HSD in 2012-13 Q2 (Q3 of 2012)	WPD_0	111
WPI of HSD for No under recovery in 2012-13 Q3	$WPD_0*(1+WPDG_{NUR})$	142
% demand reduction due to cross price elasticity with furnace oil	E_p^c	0.3
% demand due to own price elasticity	E_p^o	0.2
Total Fiscal Deficit in 2012-13 Q2 in Rs. crores	FD_0	146444
Fiscal Deficit in 2012-13 Q2 net of diesel under recoveries in Rs. crores	$NDFD_0=FD_0-TUR_0$	122499

Thus, Diesel demand is projected as

$$D_t = \left(\left(1 - g_d\right) \times D_{t-1}\right) \times \left(1 - E_p^o \times \Delta WPD_t\right) \times \left(1 - E_p^c \times \Delta WPD_t\right) \text{............ (1)}$$

for t=0,1,2,3,.... Where 0 corresponds to 2012-13 Q2.

We assume the retail selling price of Diesel at Delhi denoted by RPD_t as an representative of diesel price in the economy. The under recoveries per litre at time t is UR_t. Table 3.5 above provides the value of RPD_0 and UR_0 as reported by PPAC (2018). RPD_0 denotes the actual selling price of Diesel in Delhi and UR_0 is the actual under recovery rate at time point t=0 i.e. 2012-13 Q2. Actual price or cost (market determined) of providing diesel in the economy is therefore RPD_0+UR_0. Assuming other factors such as cost of distillation remains same, the actual price of providing diesel in the economy

Electronic copy available at: https://ssrn.com/abstract=4019933

changes at the same rate as international crude oil prices (ICOP) while the selling price of diesel (RPD_0) changes at the same rate as wholesale price of diesel (WPD).

Thus, under recoveries per litre for each year t is computed as,

$UR_t = (RPD_0 + UR_0) \times (1 + g_{icop})^t - RPD_0 \times (1 + g_{wpd})^t$ ………………… (2)

Total Under recoveries is then projected as $TUR_t = UR_t \times D_t$ ……………… (3)

The diesel demand, under recoveries and diesel price under each scenario is presented in table B.4 annexure B.

3.3.1.2 *Projection of Fiscal Deficit and Money Supply:*

Total Fiscal deficit for the starting quarter 2012-13 Q2 (FD_0) is given in table 3.5 above. Based on the calculated total under recoveries of the OMCs on account of diesel, the total fiscal deficit on account of non-diesel items is computed as $NDFD_0=FD_0-TUR_0$ and reported in table 3.5. Assuming the Non-diesel fiscal deficit ($NDFD_t$) to be constant over time (expenditures on non-diesel items are matched with increase in revenue) the total fiscal deficit at time t is computed as,

$NDFD_t = NDFD_0$ ………………….. (4) for t=0, 1, 2, 3, ……………….∞

And $FD_t = NDFD_t + TUR_t$………… (5)

With increase in diesel prices, fiscal deficit decreases as total under recoveries on diesel reduces. The reduction in fiscal deficit results in reduction in money supply. Jadav and Singh (1990) estimates elasticity of M3 with respect to fiscal deficit to be 0.9%. Additionally, it is assumed that fiscal deficit impacts money supply in four lags with a weightage of 0.4, 0.3, 0.2 and 0.1 for lags of 1, 2, 3 and 4[2]. (see Anantha Ramu & Gayithri (2017)). Money supply M3 is thus projected as,

[2] Anantha Ramu & Gayithri (2017) using a VAR based analysis finds that the Impact of a unit shock of fiscal deficit on money supply begins before first year and reaches the peak in the mid of the first year and declines thereafter. Based on this the paper assumes that the impact of fiscal deficit on money supply is distributed across four quarters and maximum impact of current fiscal deficit on money supply is for the 1st and 2nd quarters and its impacts decrease in the 3rd and 4th quarter.

Electronic copy available at: https://ssrn.com/abstract=4019933

$$M3_t = (1 - g_{m3}) \times M3_{t-1} + 0.4 \times 0.9 \times \Delta FD_{t-1} \times M3_{t-1} + 0.3 \times 0.9 \times \Delta FD_{t-2} \times M3_{t-2} + 0.2 \times 0.9 \times \Delta FD_{t-3} \times M3_{t-3} + 0.1 \times 0.9 \times \Delta FD_{t-4} \times M3_{t-4} \text{.................. (6)}$$

Where M3 is the broad money supply and g_{m3} is the quarterly growth rate of M3 in the pre reforms period provided in table 3.4.

3.3.1.3 Projections of Monetary rates

The monetary rates of RBR, RMSF, CRR and SLR show a stochastic pattern of movement. So instead of past growth rates, dynamic forecasts from econometrically estimated equations are used to project these variables in the post diesel reforms period. Except for RBR, the equations are estimated based on data in the period 2007-08 Q2 to 2017-18 Q4 to reflect current trends.

The data on RBR shows stochasticity and changing trend around the time of initiation of diesel price reforms which makes it difficult to project into the future. RBR shows a falling stochastic trend from 1997-98 Q1 to 2009-10 Q2. A trend equation fitted between any two points in this period shows a falling trend. However, a trend equation fitted from 2009-10 Q3 to 2011-12 Q4 reported in table 3.6 below, shows a positive trend with trend coefficient of 0.23 implying that since 2009-10 Q3, India's Central bank, the RBI has been increasing the real bank rate at an average rate of 23 basis points each quarter. Based on this equation we assume that RBI increases RBR by 25 basis points to 3.73 (which is close to the maximum value of RBR in the period 2007-08 Q2 to 2012-13 Q2) and holds it at that point (assuming it does not increase beyond what it has in the past). RMSF is projected same as RBR based on RBI policy and actual data.

Table 3.6:Econometrically estimated behavioural equations for Monetary Rates.

	CONS	TR	R^2
RBR	-6.23	0.23	0.21
t-values	-2.54	1.45	
	CONS	AR(1)	DW-Stat
D1LCRR	-0.01	0.28	1.88

Electronic copy available at: https://ssrn.com/abstract=4019933

t-values	-0.45	1.92	
	CONS	AR(1)	DW-Stat
D1LSLR	-0.006	0.307	1.89
t-values	-2.27	1.95	

3.3.1.4 *Projection of other exogenous variables*

The other remaining exogenous variables rainfall index (RI), central government total expenditure (CGTE), real exports (REXP) and wholesale price of food (WPF) show deterministic growth path but with seasonal variations. In fact, CGTE and WPF have a seasonal unit root as reported in table 3.1.

Table 3.7:Growth rates of Government Expenditure, Exports and Food Prices in the pre reforms and post reform period

		Q1	Q2	Q3	Q4
REXP	CAGR 2007-08 to 2012-13	13.03	11.72	10.01	10.21
	CAGR 2012-13 to 2016-17	-0.52	0.36	0.78	-0.60
WPIF	CAGR 2007-08 to 2012-13	11.18	11.32	11.53	12.27
	CAGR 2012-13 to 2016-17	5.23	5.85	5.83	4.08
CGTE	CAGR 2007-08 to 2012-13	11.61	22.61	13.70	11.94
	CAGR 2012-13 to 2016-17	15.87	5.44	13.10	1.14

The average year on year growth rate for each quarter during the period 2007-08 to 2012-13 shown in table 3.7 above is used to project CGTE, WPIF and REXP for each quarter in the period of 2012-13 to 2017-18. In the case of CGTE, additionally the reduction in fiscal deficit due to lower under recoveries is also deducted. Rainfall is projected to be normal.

Based on the scenario construction as illustrated in table 3.8, either projected values or actual values of exogenous variables are assumed in each of the scenarios.

Electronic copy available at: https://ssrn.com/abstract=4019933

Table 3.8Schematic construction of scenarios

<table>
<tr><td></td><td>REF</td><td>Actual Oil price</td><td>Actual Outcome</td><td>Full Pass Thru</td></tr>
<tr><td>ICOP</td><td>international oil price assumed to remain stable at 2012-13 Q2 value</td><td colspan="3">International Oil price reduces to historical low as in the Actual data</td></tr>
<tr><td>WPD</td><td>Domestic diesel price assumed to remain same as 2012-13 Q2 value. gicop = gwpd = 0% per quarter</td><td rowspan="2">Actual Data</td><td rowspan="13">Actual Data</td><td>Price increased until consistent and linked with international Oil prices thereafter market linked, gwpd = WPDQGNUR for 2012-13 Q3 to 2013-14 Q2 and, gwpd = gicop= the actual growth rate of ICOP from 2013-14 Q3 onwards</td></tr>
<tr><td>TUR</td><td>projected through eq 2, UR reduced till zero and remains zero</td><td>projected through eq 2, UR reduced till zero and remains zero</td></tr>
<tr><td>WPF</td><td colspan="2">Based on Pre reforms growth rate</td><td rowspan="11">Actual Data</td></tr>
<tr><td>FD</td><td colspan="2">FD changes as in eq 5</td></tr>
<tr><td>M3</td><td colspan="2">M3 changes as in eq 6</td></tr>
<tr><td>RBR</td><td colspan="2" rowspan="4">Pre reforms behaviour-based Projection based eq in table 3.9</td></tr>
<tr><td>RMSF</td></tr>
<tr><td>CRR</td></tr>
<tr><td>SLR</td></tr>
<tr><td>REXP</td><td colspan="2" rowspan="3">Based on Pre reforms Quarter to Quarter growth rate as in table 3.10</td></tr>
<tr><td>WPIF</td></tr>
<tr><td>CGTE</td></tr>
<tr><td>RI</td><td colspan="2">Assumed Normal=100</td></tr>
</table>

Electronic copy available at: https://ssrn.com/abstract=4019933

Rainfall index, when projected is assumed to be 100. The projected diesel prices, diesel demand and under recoveries in various scenarios are presented in table B.4 in annexure B. The estimated VAR model is used to simulate the scenarios discussed above and analysed for their impacts on Price, GDP and interest rate in the section below.

4. Results

The Impact of diesel subsidy reforms and change in domestic diesel pricing policy on Inflation and economy is analysed across the scenarios and presented through figures 2-5 and table 4.1. The impact on inflation is discussed through figures 2 and 3. Figure 2 below shows the percentage change in price deflator in the Actual Oil price compared to REF scenario while figure 3 plots the trajectories of price deflator in the Actual Oil price scenario, Individual macroeconomic policy scenarios, Actual Outcome scenario and the Full Pass Through scenario. It also shows the individual and combined contribution macroeconomic policies in changing the price levels from Actual Oil price scenario to that of the Actual Outcome scenario. Figure 4 shows the impact on real interest rate and nominal interest rate (prime lending rate) and Figure 5 shows the impact on the quarterly GDP. Finally, table 4.1 summarises the results across scenarios on annual GDP growth rates, inflation rates and nominal interest rates.

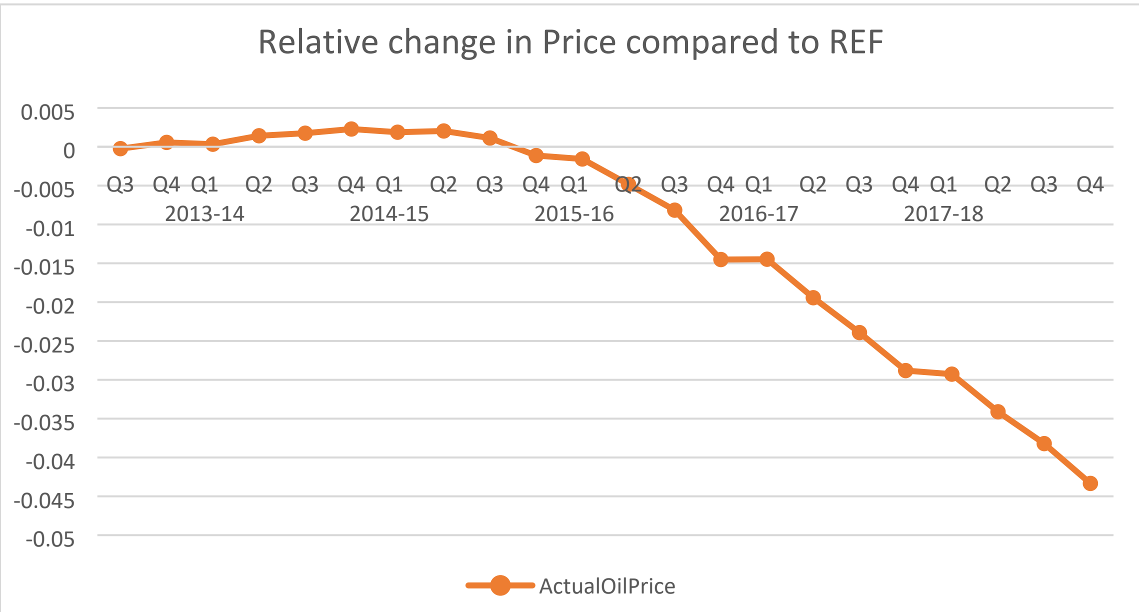

Figure 4.1:Relative increase in price compared to REF

Electronic copy available at: https://ssrn.com/abstract=4019933

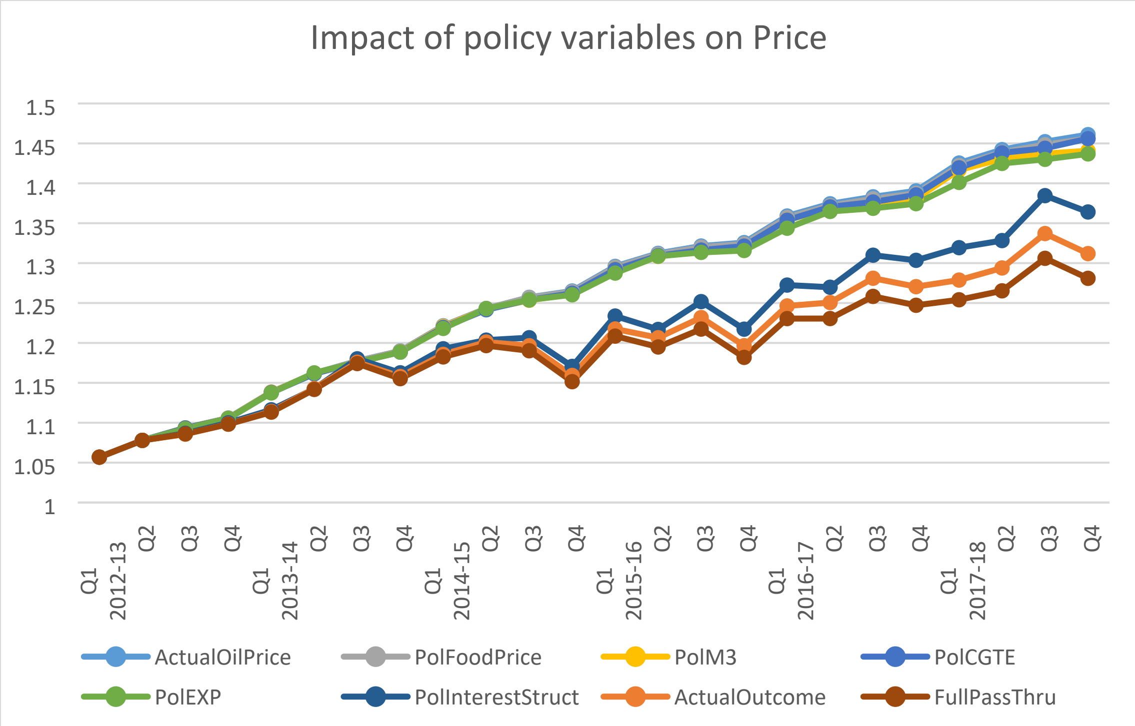

Figure 4.2:Impact of policy scenarios on Price

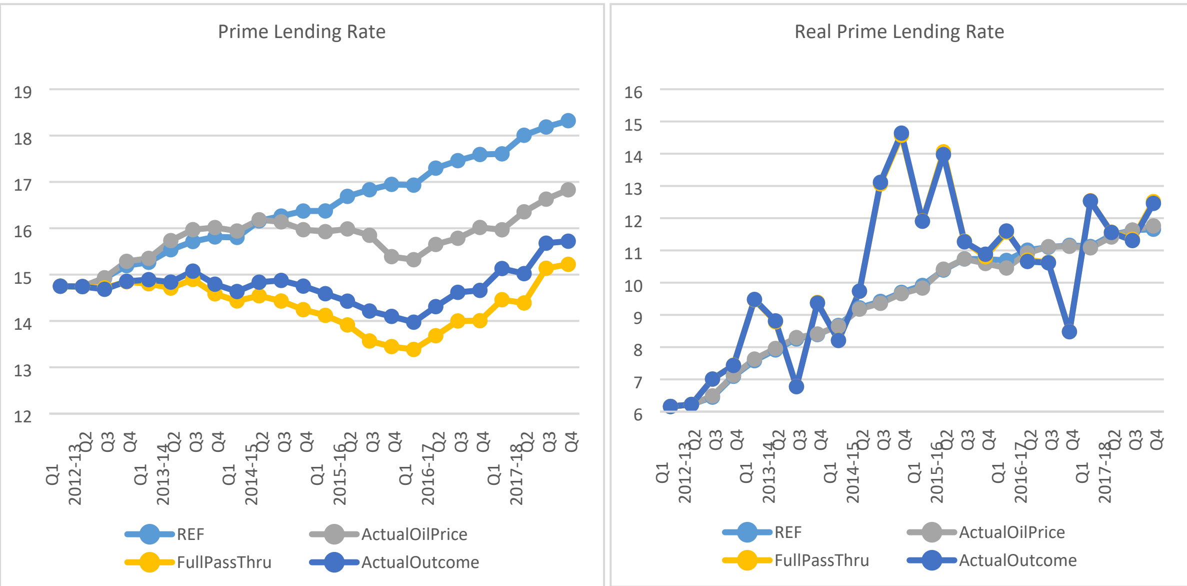

Figure 4.3:Impact of policy scenario on real interest rate

Electronic copy available at: https://ssrn.com/abstract=4019933

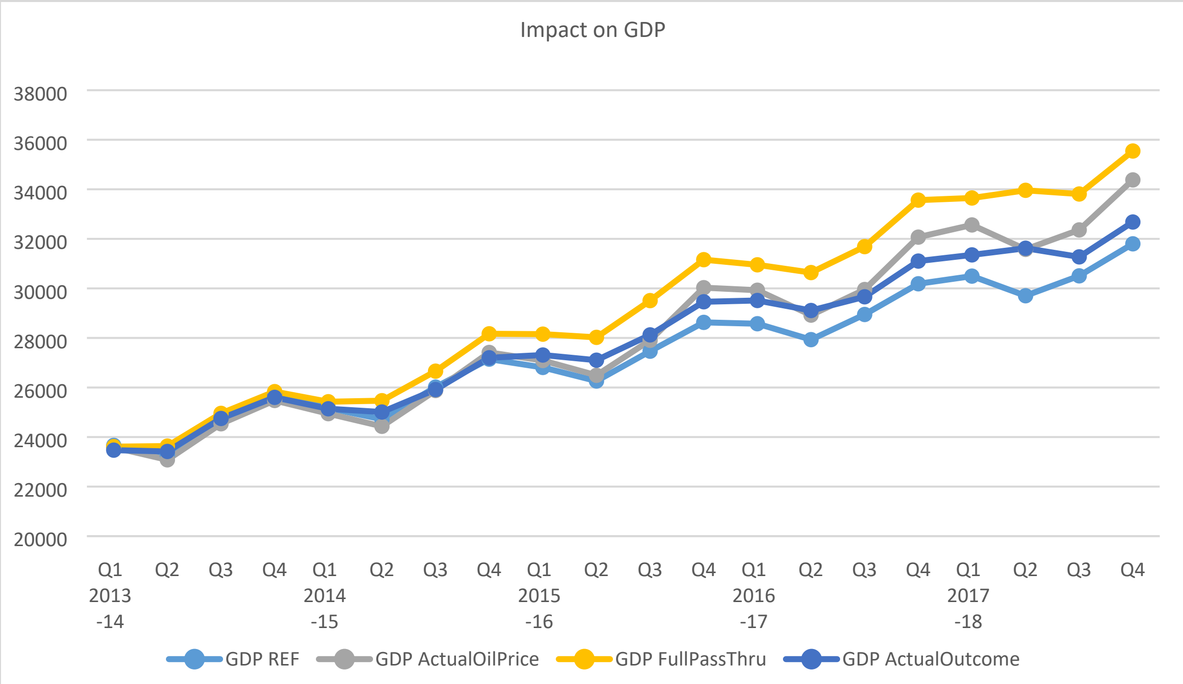

Figure 4.4:Impact of policy scenarios on GDP

Table 4.1 growth in GDP and Prices and prime lending rate levels in the economy

	CAGR 2011-12 to 2017-18		Projected values of prime lending rate					
	GDP	Price	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
REF	5.80	6.99	14.90	15.58	16.15	16.71	17.32	18.03
ActualOilPrice	6.97	6.33	14.93	15.77	16.06	15.79	15.69	16.45
PolFoodPrice	6.86	6.29	14.92	15.77	16.01	15.71	15.62	16.35
PolM3	7.11	6.16	14.92	15.69	15.94	15.58	15.58	15.90
PolCGTE	7.03	6.26	14.84	15.65	15.87	15.63	15.62	16.37
PolEXP	6.55	6.06	14.93	15.75	16.04	15.69	15.53	16.26
PolInterestStruct	7.98	5.12	14.85	15.12	15.13	14.90	14.92	16.35
ActualOutcome	6.42	4.54	14.76	14.90	14.77	14.33	14.39	15.39

Electronic copy available at: https://ssrn.com/abstract=4019933

FullPassThru	7.78	4.15	14.76	14.75	14.41	13.76	13.77	14.80

4.1 Impact of diesel subsidy reforms and the diesel pricing strategy on the economy in in the post diesel reforms period.

The oil price outlook drastically changed in the post diesel price reforms period. The international crude oil price that was expected to hold on to the high levels, fell to historically low levels. Government of India chose to lower the domestic price of diesel less than proportionate to the reduction in international oil prices, thereby passing some of the benefits of the lower international prices to the OMCs and increasing its own revenues and benefiting households partially. The impact of the Government strategy is assessed by comparing the REF with the Actual Oil Price scenario. This is shown in figure 2 above. In the two scenarios only the domestic diesel prices change, and all other macroeconomic policies and factors are assumed to grow as in the past. Both international oil price and domestic diesel price declines faster (see table 3.8) in the Actual Oil Price scenario than compared to REF scenario and hence domestic aggregate prices declines steeply too. Inflation over the period 2011-12 to 2017-18 (see table 4.1) reduces (by 0.66%) in the Actual oil price scenario to 6.33% compared to 6.99% in REF scenario. Prime lending rate (figure 4) in the actual oil price scenario reduces by 1.5-1.6% points compared to REF in the post diesel reforms period. The lower interest rates, lower domestic diesel price and lower inflation rate result in higher GDP in figure 5. The GDP growth rate in the Actual oil price scenario over the period 2011-12 to 2017-18 (see table 4.1) increases to 6.97% p.a. compared to 5.8% p.a. in REF scenario. Thus, the diesel subsidy reforms, and subsequently adopted diesel pricing strategy of partially passing on the fall in international oil prices should have benefitted the economy if other factors continued to grow as in the past. However, Economy grew much slower at 6.42% p.a. over the period 2011-12 to 2017-18. What was the contribution of other macroeconomic factors in reducing the impact of reforms and lower oil prices on the economy? Would an alternative strategy of completely passing on the international oil price reduction to the consumers been better for the economy? This is answered later.

Electronic copy available at: https://ssrn.com/abstract=4019933

4.2 Impact of the changed macroeconomic policies and factors on the economy in the post diesel price reforms period.

What are these factors that interfered with the economy benefiting from the oil price reforms? This is shown in table 4.1, by comparing the GDP, prices and interest rates between Actual Oil prices, Policy scenarios and Actual Outcome scenarios. The policy scenarios show the individual impact of each macroeconomic policy variable as it changed from how it grew in the pre reforms period to how it grew in the post reforms period. GDP growth rate in Actual Oil Price scenario is 6.97%, while in the Actual Outcome scenario, GDP growth rate reduces by 0.5% to 6.47%. The domestic, international oil prices and under recoveries are same in all the scenarios hence reduction in growth rate of GDP must be ascribed to other exogenous macroeconomic factors only.

Results from table 4.1 show that compared to the Actual Oil price scenario with annual GDP growth rate at 6.97% and annual inflation rate at 6.33%, Lower money supply by the central bank increased growth rate to 7.11% and brought down the inflation rate to 6.16%. Lower money supply reduced price more than proportionate resulting in higher real money supply and higher GDP. The interest rate policy (PolInterestStruct) followed by the central bank in the post diesel reforms period had a stronger impact of increasing GDP growth rate to 7.98% and brought down the inflation rate to 5.12%. Thus, one can say that the monetary policies followed by the central bank helped to promote growth and would have helped achieve an 8% GDP growth rate had other factors remain same as earlier. The lower government expenditure (PolCGTE) due to the government policy to contain fiscal deficit also led to increased GDP growth rate of 7.03% through reduced inflation rate of 6.26%. Food prices (PolFoodPrice) reduced GDP growth by 0.1% and inflation by 0.04% during the post diesel reforms period. The slow growth in the world economy led to a significantly lower demand for India's exports (PolEXP) in the post diesel reforms period. Real exports which grew at an average growth rate of 2.81% in the pre reforms period had a very flat growth rate of 0.19% in the post reforms period (see table 3.4). This had a significant impact of reducing GDP growth rate to 6.55% and Inflation rate to 6.06%

Electronic copy available at: https://ssrn.com/abstract=4019933

through lower aggregate demand. A combination of all these policies in the Actual outcome scenario led to the GDP growth rate reducing to 6.42% and inflation rate to 4.54%. Low export can therefore be considered as singularly responsible for lower economic growth in the post reforms period as all other factors had a positive impact on the economy. Thus, the diesel subsidy reforms, and the domestic diesel pricing strategy reduced inflation and improved growth prospects, but the sustained reduction in exports demand in the post diesel price reforms period impeded the economy from benefitting from diesel price reforms.

4.3 Impact on the economy if instead government had fully passed on the benefits of the lower oil prices to domestic consumers?

This is a -what if- scenario of alternative domestic diesel pricing strategy in the post reforms period, where after implanting diesel subsidy reforms, the government instead passes on the complete benefits of international oil price reduction to the economy and other macroeconomic factors are assumed as per the actual data in the post reforms period. The impact of the alternative diesel pricing policy is estimated by comparing the Actual outcome scenario and Full Pass Through scenario which differ only in terms of diesel price assumption. Figure 3 shows that in the Full Pass Through scenario, the aggregate prices fall more sharply and Inflation over the period 2011-12 to 2017-18 (see table 4.1) reduce drastically to 5.8% compared to 6.42% in the Actual Outcome scenario. Figure 4 shows that real interest rates remain constant and hence prime lending rates decrease by 0.15-0.6% compared to Actual Outcome scenario in the long run. lower inflation and lower prime lending rates result in higher GDP in the Full Pass Through scenario as shown in figure 5. The GDP growth rate over the period 2011-12 to 2017-18 (see table 4.1) increases to 7.78% compared to 6.42% in the Actual Outcome scenario over the same period. This shows that the economy would have gained significantly despite the fall in exports had the domestic prices of diesel been market linked after removal of all subsidies i.e. government had passed on the entire lower international oil prices completely to the economy.

Electronic copy available at: https://ssrn.com/abstract=4019933

5. Conclusion and Policy Implications

The post diesel subsidy reforms period was marked by International Crude oil price falling to historical low and India's exports stagnating with near zero growth rate of 0.19%. India's diesel subsidy reforms and the domestic diesel pricing strategy adopted by the government of India could have increased the GDP growth rate to near 7% with an inflation rate of 6.33% in 2011-12 to 2017-18 had exports and other macroeconomic factors grown as in the past. The near flat growth in India's exports demand had a significant negative impact and reduced GDP growth rate to 6.55% in the period 2011-12 to 2017-18. The positive impact of the diesel price reforms on the economy was outdone by the negative impact of slow growth in exports. The diesel subsidy reforms, the diesel pricing policy adopted by the government, the tight monetary policies of the central bank and the government's policy to reduce expenditure and contain fiscal deficit helped cushion the economy against negative impact of fall in export growth. Overall, the economy could achieve a growth rate of 6.42% only. Instead, if the government had fully passed on the reduction in international oil prices to the consumers, the economy would have benefitted even more with a 7.78% average GDP growth rate and a 4.15% inflation rate in the post reforms period despite falling exports growth and other macroeconomic factors.

The fall in international crude oil prices and fall in India's exports demand, which can both be attributed to the slowdown in the world economy, provided an opportunity and challenge to India's economy. While India took advantage of the opportunity provided by the falling oil prices, to reform its petroleum sector it overlooked the problem of falling exports. India's economy could have been in a much better position with a near 8% growth rate and 4.15% inflation rate had it chosen to keep the diesel prices market linked and passed on fully the benefits of the falling crude oil prices to the economy. A more prudent diesel pricing policy would be to keep the diesel prices market determined.

Electronic copy available at: https://ssrn.com/abstract=4019933

6. Acknowledgements

I am grateful to Dr. Kirit S. Parikh for his inputs, support, and encouragement in writing this paper. I also thank the staff at IRADe for their support and cooperation.

7. Funding Sources:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

8. References

Abeer Elshennawy (2014), “The implications of phasing out energy subsidies in Egypt”, Journal of Policy Modeling, Elsevier, vol. 36(5), pages 855-866. DOI: 10.1016/j.jpolmod.2014.09.001

Allen Dennis (2016), “Household welfare implications of fossil fuel subsidy reforms in developing countries” Energy Policy, vol. 96 (2016), pp:597–606

Anil K. Jain (2018), “A fine balance: Lessons from India's experience with petroleum subsidy reforms”, Energy Policy 119 (2018), pp:242–249

Controller General of Accounts, Ministry of Finance, Government of India (2018), Retrieved from http://cga.nic.in/NSD/Published/list.aspx

Dhani Setyawan (2014), “The Impacts of the Domestic Fuel Increases on Prices of the Indonesian Economic Sectors”, Energy Procedia 47 (2014) pp: 47 – 55

Mohammad Reza Gharibnavaz and Robert Waschik (2015), “Food and energy subsidy reforms in Iran: A general equilibrium analysis”, Journal of Policy Modeling, Elsevier, vol. 37(5), pages 726-741. DOI: 10.1016/j.jpolmod.2015.07.002

Narendra Jadhav and Bolwant Singh (1990), “Fiscal-Monetary Dynamic Nexus in India-An Econometric Model”, Special Articles, Economic and Political Weekly, January 20, pp-159-165, 1990

Electronic copy available at: https://ssrn.com/abstract=4019933

PPAC (2018), Retrieved from http://www.ppac.org.in/content/149_1_PricesPetroleum.aspx on 28/09/2018

Press Information Bureau (September 2012), Retrieved from http://pib.nic.in/newsite/PrintRelease.aspx?relid=87740

Kirit S. Parikh, Jyoti Parikh, Probal Pratap Ghosh, Rajiv Ratna Panda and Arvinder Kaur (2012), "Taming Diesel Subsidy to curtail inflation and foster economic growth", IRADe Project report PR-33-2012 for Shakti Sustainable Energy Foundation, 2012.

Kumarjit Mandal, Indranil Bhattacharyya and Binod B. Bhoi (2012), "Is the oil price pass-through in India any different?", Journal of Policy Modeling, Elsevier, vol. 34(6), pages 832-848. DOI: 10.1016/j.jpolmod.2012.06.001

Michèle Breton, Hossein Mirzapour (2016), "Welfare implication of reforming energy consumption subsidies", Energy Policy, vol. 98 (2016), pp:232–240

Ministry of Agriculture & Farmer Welfare (2017), "Agricultural Statistics at a Glance 2016", Ministry of Agriculture & Farmers Welfare, Department of Agriculture, Cooperation & Farmers Welfare, Directorate of Economics and Statistics, 2017, Retrieved from https://eands.dacnet.nic.in/PDF/Glance-2016.pdf

Ministry of Statistics and Programme Implementation, "Energy Statistics 2012", Issue-19, Central Statistics Office, Ministry of Statistics and Programme Implementation, Government of India, 2012

Ministry of Statistics and Programme Implementation, "Energy Statistics 2017", Issue-24, Central Statistics Office, Ministry of Statistics and Programme Implementation, Government of India, 2017

Electronic copy available at: https://ssrn.com/abstract=4019933

M. R. Anantha Ramu and K. Gayithri (2017), "Fiscal deficit and inflation linkages in India: tracking the transmission channels", Journal of Social and Economic Development, Springer; Institute for Social and Economic Change, vol. 19(1), pages 1-24, April. DOI 10.1007/s40847-017-0042-2

Mukesh Anand (2012), "Diesel Pricing in India: Entangled in Policy Maze", National Institute of Public Finance and Policy, August 2012 (https://www.nipfp.org.in/media/medialibrary/2013/04/Diesel%20Price%20Reform.pdf)

M. Yusof Saari, Erik Dietzenbacher and Bart Los (2016), "The impacts of petroleum price fluctuations on income distribution across ethnic groups in Malaysia", Ecological Economics, Vol-130, pp:25–36, 2016

OPEC (2011), "World Oil Outlook 2011", Organisation of Petroleum Exporting Countries, OPEC Secretariat, 2011, ISBN 978-3-9502722-2-2 (https://www.opec.org/opec_web/static_files_project/media/downloads/publications/WOO_2011.pdf)

Rajesh H. Acharya, Anver C. Sadath (2017),"Implications of energy subsidy reform in India", Energy Policy, vol. 102 (2017) pp: 453–462.

R. Ramanathan (1999),"Short- and long-run elasticities of gasoline demand in India: An empirical analysis using cointegration techniques", Energy Economics, Elsevier, vol. 21(4), pages 321-330, August. (RePEc:eee:eneeco:v:21:y:1999:i:4:p:321-330)

Reserve Bank of India (2018), "Handbook of Statistics on Indian Economy", Reserve Bank of India, 2018, Retrieved from https://rbi.org.in/Scripts/AnnualPublications.aspx?head=Handbook+of+Statistics+on+Indian+Economy

Reuters (2018), Retrieved from https://in.reuters.com/article/table-india-prime-lending-rates-of-banks/table-india-prime-lending-rates-of-banks-idINL4N1RF26V

Electronic copy available at: https://ssrn.com/abstract=4019933

Sajal Ghosh (2010), "High speed diesel consumption and economic growth in India" Energy, Elsevier, vol. 35(4), pages 1794-1798. DOI: 10.1016/j.energy.2009.12.031

Sajal Ghosh & Kakali Kanjilal (2014), "Oil price shocks on Indian economy: evidence from Toda Yamamoto and Markov regime-switching VAR", Macroeconomics and Finance in Emerging Market Economies, 7:1, 122-139, DOI: 10.1080/17520843.2013.856333 (http://dx.doi.org/10.1080/17520843.2013.856333)

Saeed Solaymani, FatimahKari (2014), "Impacts of energy subsidy reformon the Malaysian economy and transportation sector", Energy Policy, vol. 70 (2014), pp: 115–125

Saeed Solaymani , Roozbeh Kardooni , Fatimah Kari, Sumiani Binti Yusoff (2015), "Economic and environmental impacts of energy subsidy reform and oil price shock on the Malaysian transport sector", Travel Behaviour and Society 2 (2015) 65–77

Yingzhu Li, Xunpeng Shi and Bin Su (2017), "Economic, social and environmental impacts of fuel subsidies: A revisit of Malaysia", Energy Policy 110 (2017) 51–61

Electronic copy available at: https://ssrn.com/abstract=4019933

A. Annexure: Data

Quarterly data from 1997-98 Q1 to 2016-17 Q2 is considered. Quarter 1 (Q1) for a financial year corresponds to the months April-May June, Quarter 2 (Q2) corresponds to July-August-September, Quarter 3 (Q3) corresponds to months of October-November-December and Quarter 4 (Q4) corresponds to January-February-March.

Endogenous variables: The real sector variables GDP at factor cost and aggregate price deflator is computed using the GDP at factor cost data in constant and current prices from national accounts data from the Handbook of statistics on Indian economy and national accounts statistics (NAS) 2016. Quarterly GDP at factor cost data in constant and current prices was collected from 1997-98 Q1 to 2009-10 Q2 for the base year 1999-2000 and from 2004-05 Q1 to 2014-15 Q2 for the base year 2004-05 from the handbook of Statistics on Indian economy 2018. Quarterly GDP at basic prices data in constant and current prices was collected from 2011-12 Q1 to 2017-18 Q4 for the base year 2011-12. The quarterly values of GDP at factor prices for the base year 2011-12 is computed by adding indirect taxes net of subsidies to the GDP at basic prices. The quarterly values of indirect taxes net of subsidies are obtained by allocating the annual values of indirect taxes net of subsidies obtained from NAS 2016 in proportion to the quarters GDP at basic prices. The GDP at factor cost (GDPFC) in 2011-12 prices from 1997-98 Q1 to 2016-17 Q2 is the computed by converting the GDP at factor cost in constant prices from 1999-200 and 2004-05 base year to a common base year of 2011-12 and splicing together the converted data to a common 2011-12 base year. The price deflator (PDFL) is computed by taking the ratio of the GDP at factor cost as obtained from above, in current prices to 2011-12 constant prices data. The data on prime lending rate of SBI is computed from 1997-98 Q1 to 2018-19 Q1 as reported by Reuters (Reuters 2018). The real prime lending rate (RPLR) is computed as the difference between nominal prime lending rate of SBI and annual Inflation rate for the quarter.

Exogenous variables: The quarterly data on Central Government total expenditure is computed by aggregating month wise expenditure data reported in the website of the Controller General of

Electronic copy available at: https://ssrn.com/abstract=4019933

Accounts, Ministry of Finance, Government of India (CGA 2018). Data on monetary variables like Broad money supply (M3), Bank Rate (BR), Marginal Standing Facility Rate (MSR), Statutory Liquidity Ratio (SLR) and Cash Reserve Ratio (CRR) have been computed using month wise data from the Handbook of Statistics on Indian Economy (RBI 2018). Real interest rates RBR and RMSF have been computed like RPLR by deducting the value of inflation in PDFL from BR and MSF respectively. Data on India's total exports has also been taken from the Handbook of Statistics on Indian Economy (RBI 2018). Data on quarterly Rainfall index has been computed from the season wise monthly rainfall data reported in the Agricultural Statistics at a Glance 2016 (MOA&FW 2016). The quarterly data on Wholesale prices of Diesel and Wholesale prices of Food have been computed from the monthly WPI data on diesel and food articles reported by Office of the Economic Adviser, Ministry of Commerce and Industry, Government of India. GDPFC and exports have been included in the model as real variables (or at constant prices). Interest rates such a prime lending rate, bank rate, standing marginal facility rate have also been included in real terms i.e. the nominal value minus the annual inflation rate for the quarter. Broad Money supply and Central government total expenditure has been specified in nominal terms. All other remaining variables like wholesale prices index of diesel, food and rainfall are specified as index. Statutory Liquidity ratio and Cash reserve ratio are included as ratios.

Electronic copy available at: https://ssrn.com/abstract=4019933

B. Annexure: Tables

Table B.1: Co-integration Tests Results

Variables: S4LGDPFC S4LPDFL RPLR						Variables: LGDPFC LPDFL RPLR					
Johansen Trace Test						included lags (levels): 5					
intercept included						intercept included					
r0	LR	pval	90%	95%	99%	r0	LR	pval	90%	95%	99%
0	20.95	0.6669	32.25	35.07	40.78	0	41.72	0.0075	32.25	35.07	40.78
1	9.41	0.7001	17.98	20.16	24.69	1	20.29	0.0479	17.98	20.16	24.69
2	3.62	0.4837	7.6	9.14	12.53	2	3.83	0.4493	7.6	9.14	12.53
trend and intercept included						trend and intercept included					
r0	LR	pval	90%	95%	99%	r0	LR	pval	90%	95%	99%
0	35.69	0.2208	39.73	42.77	48.87	0	37.04	0.1723	39.73	42.77	48.87
1	16.69	0.4469	23.32	25.73	30.67	1	14.78	0.5991	23.32	25.73	30.67
2	5.24	0.5701	10.68	12.45	16.22	2	5.47	0.5394	10.68	12.45	16.22
trend orthogonal to cointegration relation						trend orthogonal to cointegration relation					
r0	LR	pval	90%	95%	99%	r0	LR	pval	90%	95%	99%
0	20.43	0.4051	27.16	29.8	35.21	0	24.31	0.1936	27.16	29.8	35.21
1	8.9	0.3821	13.42	15.41	19.62	1	6.24	0.6717	13.42	15.41	19.62
S&L Test						S&L Test					
intercept included						intercept included					
r0	LR	pval	90%	95%	99%	r0	LR	pval	90%	95%	99%
0	19.86	0.1645	21.76	24.16	29.11	0	25.79	0.0302	21.76	24.16	29.11
1	8.25	0.2213	10.47	12.26	16.1	1	4.32	0.6661	10.47	12.26	16.1
2	2.71	0.1183	2.98	4.13	6.93	2	1.76	0.2167	2.98	4.13	6.93
trend and intercept included						trend and intercept included					
r0	LR	pval	90%	95%	99%	r0	LR	pval	90%	95%	99%
0	15.18	0.7541	26.07	28.52	33.5	0	15.47	0.734	26.07	28.52	33.5
1	6.5	0.7199	13.88	15.76	19.71	1	6.52	0.7181	13.88	15.76	19.71
2	0.4	0.9427	5.47	6.79	9.73	2	0.09	0.9946	5.47	6.79	9.73
trend orthogonal to cointegration relation						trend orthogonal to cointegration relation					
r0	LR	pval	90%	95%	99%	r0	LR	pval	90%	95%	99%
0	20.4	0.0596	18.67	20.96	25.71	0	8.2	0.8234	18.67	20.96	25.71
1	8.64	0.083	8.18	9.84	13.48	1	5.26	0.3076	8.18	9.84	13.48

Electronic copy available at: https://ssrn.com/abstract=4019933

Optimal Endogenous lags from information criteria				lags searched up to = 12 lags of levels			
AIC	9	FPE	9	AIC	12	FPE	5
HQC	5	SC	5	HQC	5	SC	4

Table B.2 Optimal Endogenous Lags from Information Criteria

Endogenous variables: D1S4LGDPFC, D1S4LPDFL, D1RPLR			
sample range: [2000 Q4, 2016 Q2], T = 63			
Optimality Criteria	No. of lags Searched	Optimal No. Lags	
		With Intercept	Without Intercept
Akaike Info Criterion (AIC)	10	9	9
Final Prediction Error (FPE)	10	8	8
Hannan-Quinn Criterion (HQC)	10	4	4
Schwarz Criterion (SC)	10	4	4

Table B.3:Stability and autocorrelation test for the estimated VAR

Modulus of the eigenvalues of the reverse characteristic polynomial											
1.1991	1.1991	1.2172	1.2172	1.5556	1.5556	2.159	2.159	1.6511	1.6511	3.3798	1.5758
LM-TYPE TEST FOR AUTOCORRELATION											
Lag	1	2	3	4	5						
LM-statistic	9.7172	13.9876	29.0288	36.1515	57.0334						
p-value	0.3739	0.7299	0.3595	0.4616	0.1076						
df	9	18	27	36	45						

Table B.4:Projected Diesel demand, Prices and Under recoveries per litre

Year/ Quarter	Diesel Demand	WPD	UR (Rs per litre)

Electronic copy available at: https://ssrn.com/abstract=4019933

		(crore Litre)								
		REF	REF	No Diesel Subsidy	Full Pass Through	Actual Oil Price	REF	No Diesel Subsidy	Full Pass Through	Actual Oil Price
2012-13	Q1									
	Q2	1851	111	111	111	111	12.94	12.94	12.94	12.94
	Q3	1868	111	118	112	108	12.94	9.99	10.25	9.51
	Q4	1885	111	126	114	116	12.94	6.86	8.17	9.15
2013-14	Q1	1902	111	134	104	115	12.94	3.53	0.00	5.49
	Q2	1919	111	142	112	128	12.94	0.00	0.00	11.02
	Q3	1936	111	142	111	131	12.94	0.00	0.00	9.89
	Q4	1953	111	142	110	132	12.94	0.00	0.00	7.61
2014-15	Q1	1971	111	142	111	130	12.94	0.00	0.00	4.05
	Q2	1989	111	142	103	131	12.94	0.00	0.00	0.57
	Q3	2007	111	142	78	114	12.94	0.00	0.00	-3.56
	Q4	2025	111	142	55	85	12.94	0.00	0.00	0.00
2015-16	Q1	2043	111	142	63	89	12.94	0.00	0.00	0.00
	Q2	2061	111	142	51	77	12.94	0.00	0.00	0.00
	Q3	2080	111	142	44	73	12.94	0.00	0.00	0.00
	Q4	2098	111	142	34	54	12.94	0.00	0.00	0.00
2016-17	Q1	2117	111	142	46	67	12.94	0.00	0.00	0.00
	Q2	2136	111	142	46	71	12.94	0.00	0.00	0.00
	Q3	2155	111	142	50	75	12.94	0.00	0.00	0.00
	Q4	2175	111	142	54	84	12.94	0.00	0.00	0.00
2017-18	Q1	2194	111	142	50	81	12.94	0.00	0.00	0.00
	Q2	2214	111	142	53	81	12.94	0.00	0.00	0.00

Electronic copy available at: https://ssrn.com/abstract=4019933

	Q3	2234	111	142	62	86	12.94	0.00	0.00	0.00
	Q4	2254	111	142	68	90	12.94	0.00	0.00	0.00

Electronic copy available at: https://ssrn.com/abstract=4019933

C. Annexure: Figures

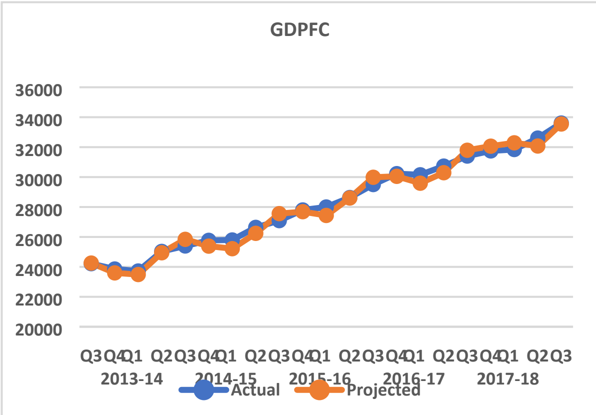

Figure C.1:Projected and actual values of GDP

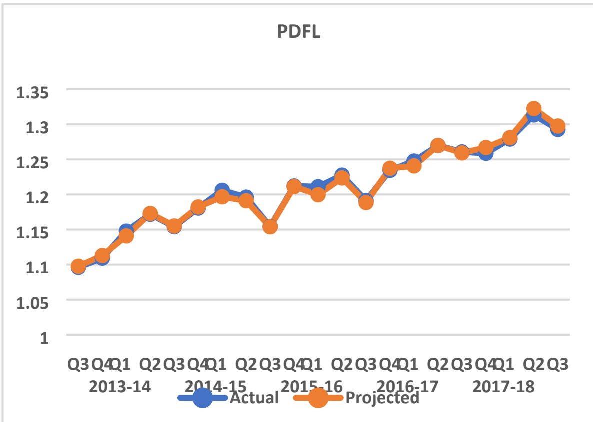

Figure C.2:projected and actual values of PDFL

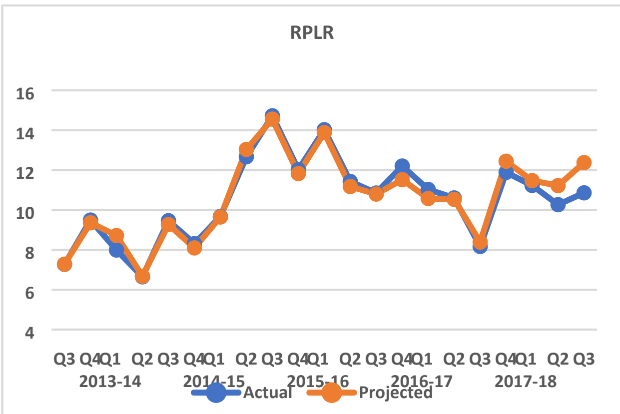

Figure C.3:Actual and projected values for RPLR

Electronic copy available at: https://ssrn.com/abstract=4019933

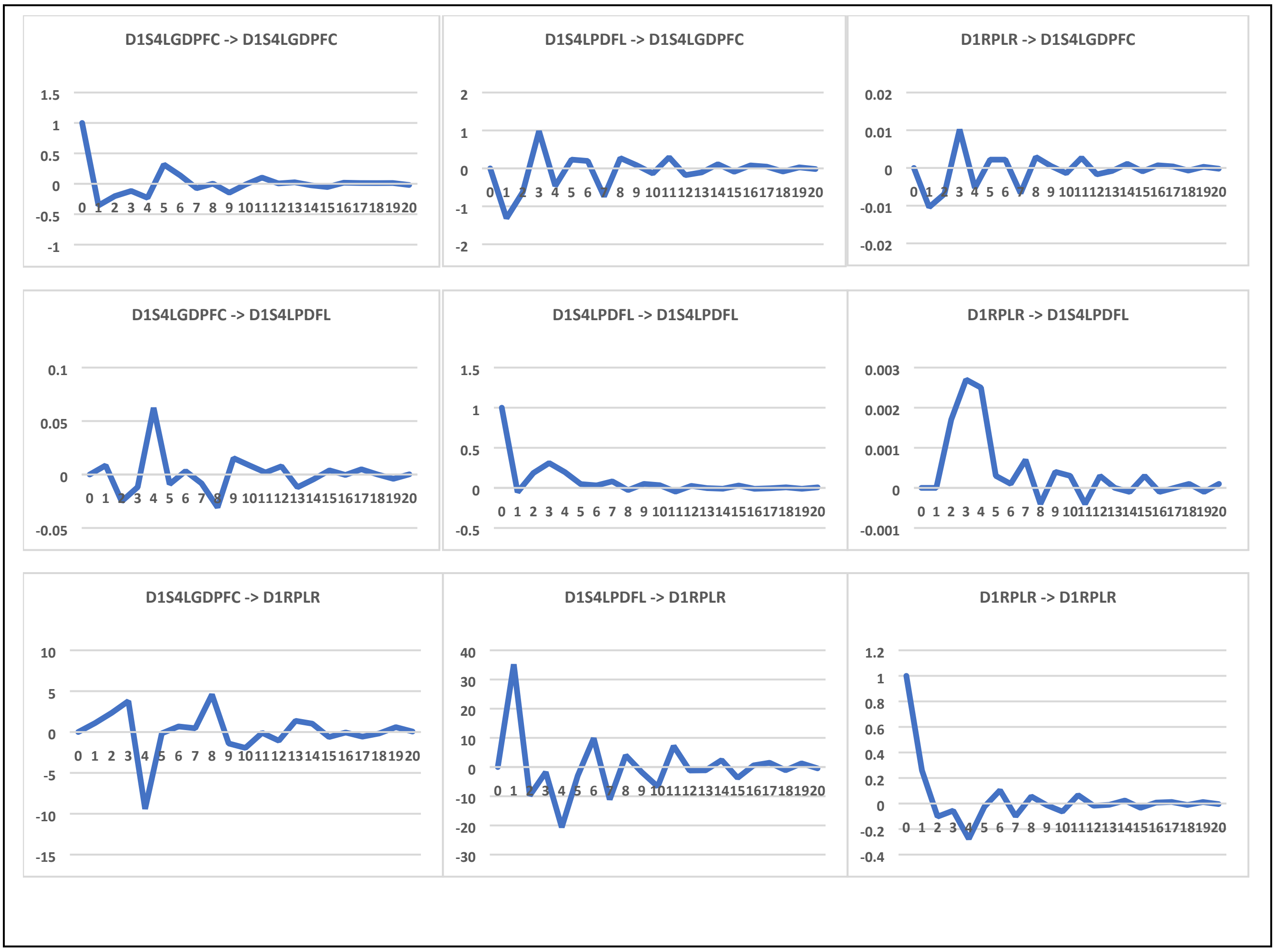

Figure C.4: Impulse Response Function of the Estimated VAR

Electronic copy available at: https://ssrn.com/abstract=4019933

Electronic copy available at: https://ssrn.com/abstract=4019933