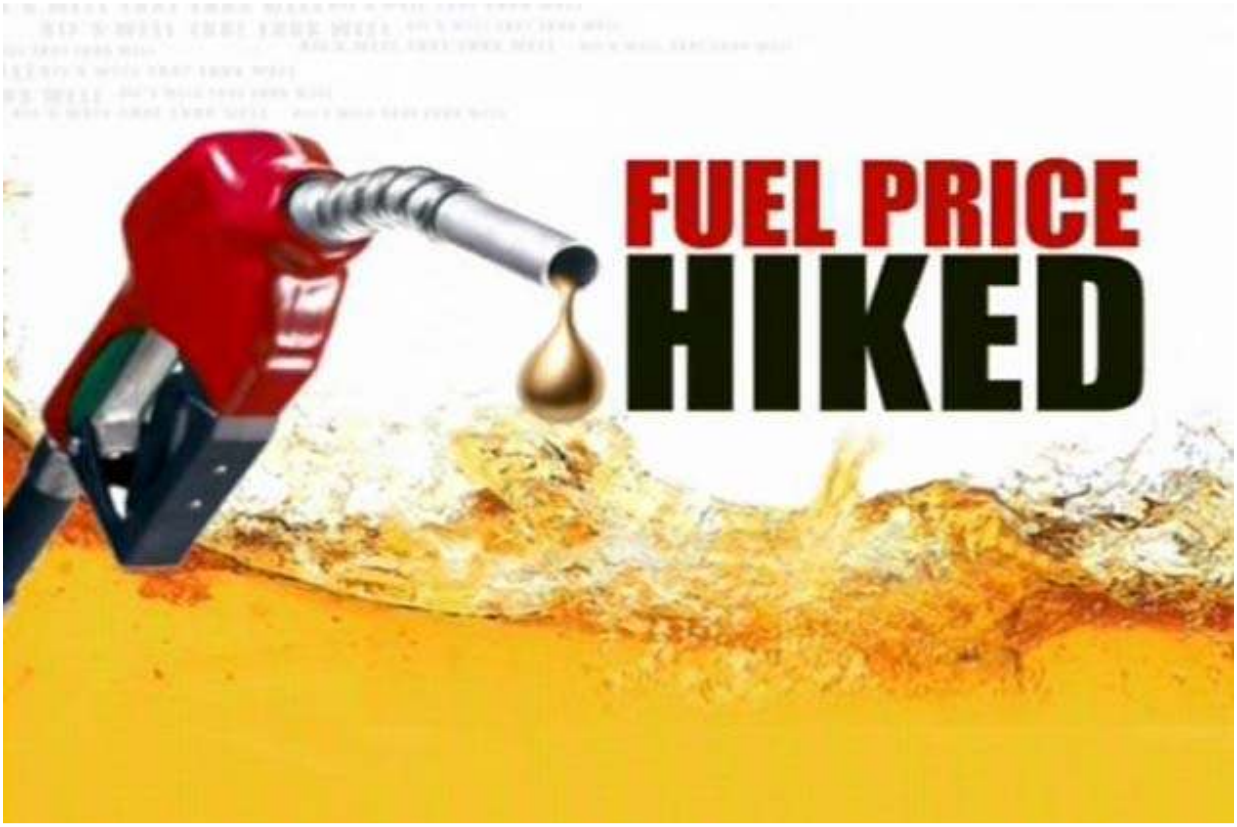
IRADe-PR-45 (2014)

Assessing the Impacts of Diesel Subsidy Reform since January 2013



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Abbreviations

ARDL	Auto Regressive Distributed Lag
BTU	British Thermal Unit
CPI	Consumer Price Index
EU	European Union
FY	Financial Year
GDP	Gross Domestic Products
GoI	Government of India
HCV	Heavy Commercial Vehicles
HSD	High Speed Diesel
LCV	Light Commercial Vehicles
MoPNG	Ministry of Petroleum and Natural Gas
MTOE	Million Tonnes of Oil Equivalent
MT	Metric Tonne
MMT	Million Metric Tonne
KGOE	Kilogram of Oil Equivalent
OMCs	Oil Marketing Companies
ONGC	Oil and Natural Gas Corporation Limited
PPAC	Petroleum & Planning Analysis Cell
RBI	Reserve Bank of India
REER	Real Effective Exchange Rate
RID	Rainfall Index of India
RM3	Real Broad Money Supply
RSBIALR	Real State Bank of India Advanced Lending Rate
SIAM	Society of Indian Automobile Manufacturers
SRTCs	State Road Transport Companies
TE	Total Expenditure
USD	United States Dollar
UVs	Utility Vehicles
WPI	Wholesale Price Index

Executive Summary

Diesel is one of the most important fuels. Diesel accounted for 39.55% out of total petroleum products consumption in India in 2012-13. The OMCs were facing all time high under recoveries in 2012 which forced Cabinet Committee on Political Affairs to declare an increase in prices of diesel. In May 2014 oil prices on the international market started falling, and the subsidy on diesel disappeared. Thus in October 2014 the government decontrolled diesel.

Major Diesel consuming sectors are transport and non-transport. Share of diesel consumption by transport sector is around 70% whereas rest of the diesel is consumed by non transport sector. Since 2010-11 to 2013-14 (P), the transport sector has seen a negative annual growth rate of around 56%. Before diesel price increase in 2012 petrol was deregulated while diesel wasn't, this was leading to the high demand for diesel models in most of the passenger vehicle segments and contributed to higher demand for diesel. Diesel subsidy reforms reversed the pattern of switching from petrol to diesel cars.

Non transport sector has also seen a very slow (almost zero) or negative growth rate of diesel consumption from 2010-11 2013-14(P). Only power generation aluminum and fertilizers sectors have a positive growth rate of 7%, 22% and 24% respectively.

A cyclical pattern for the under recoveries and governments cash assistance in line with the quarterly behavior of the GDP was observed during the study. After the government's move to gradually increase diesel prices there is a general tendency to decline after 2012-13. In the first quarter of FY 2012-13 cash assistance was 180.35 billion whereas by the end of first quarter of FY 2013-14 it came down to 53.40 billion. In a similar fashion as the cash assistance, under recoveries of OMCs too show a cyclical pattern however there is a general downward trend post 2012-13. Decrease in diesel consumption can be only partly attributed to the increase in prices. The general slowing down of the economy is also responsible for it. The income effect seems to be more responsible in bringing down the consumption of diesel.

The monthly diesel price increase led to apprehensions about causing inflation. The period in which diesel prices were increased was a period of slowing down of economic growth and situation of general inflation. This led to apprehension that diesel prices increase led to the inflationary situation in country. However IRADe report "Taming diesel subsidy to curtail inflation and foster economic growth" (October 2012) had argued that increasing diesel prices would reduce fiscal deficit of diesel subsidy and would lead to high inflation in the short term and a lower inflation and higher growth in the long run. The Model results when compared to model forecasts using the actual diesel prices and subsidy reductions shows that The RBIs changing from WPI targeting to CPI targeting and the persistently high CPI inflation was responsible for slowing down of the economy rather than diesel prices rise. A analysis of what causes WPI and CPI inflation showed that diesel prices do not have sustained impact on overall inflation and there impacts get mitigated over time. The analysis of household class wise consumer data also showed that poorer classes spend very marginal amounts on diesel and hence a diesel price rise would not affect even the bottom 50% of population. Hence no income effect through lowering of disposable income is expected due to diesel price rise.

1. Background

1.1 Importance of Diesel to the Economy

More than 70% of India's crude oil needs and part of the petroleum products are met from imports; India has developed ample processing capacity over the years to produce different petroleum products so as to become a net exporter of petroleum products. During the year 2012-13, consumption of petroleum products was 156 MMT. (Report on Indian Petroleum & natural Gas Statistics 2012-13).

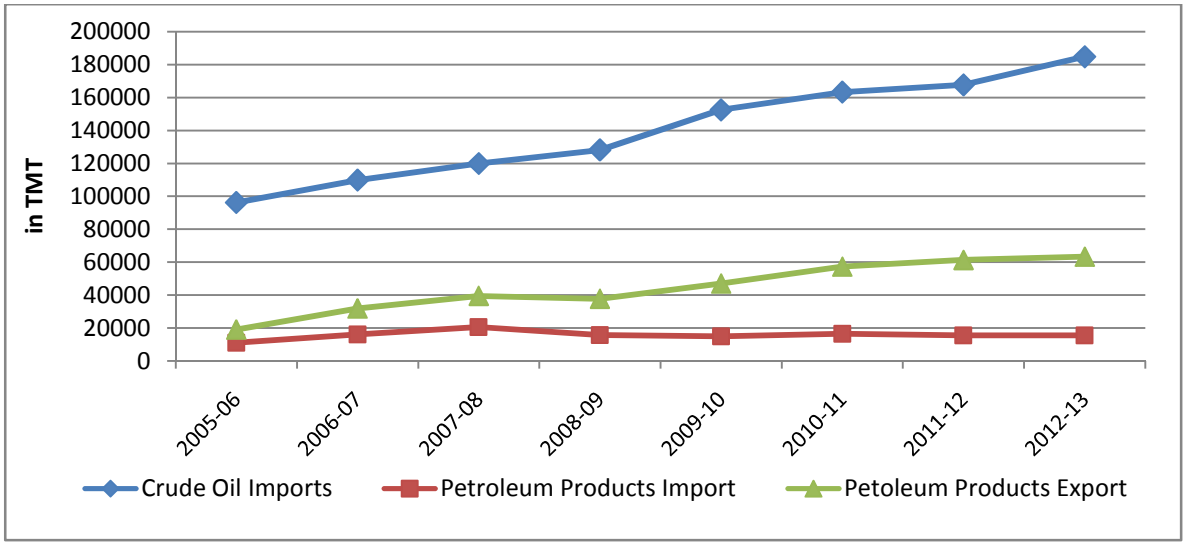

Figure 1 Import / Export of Crude Oil and Petroleum Products

Source: Indian Petroleum & natural Gas Statistics 2013-14

India's total imports value was Rs 2673 billion in the year 2012-13 out of which imports of crude oil and petroleum products was Rs 881 billion which is almost 33% of the total imports (Indian Petroleum & natural Gas Statistics 2012-13). Diesel accounted for 39.55% out of total petroleum products consumption in India in 2012-13 (Energy Statistics 2014). This makes diesel a very important petroleum product whose consumption and pricing has major macro economic implications. The government of India controls prices of sensitive petroleum products sold to bulk/retail consumers through Oil Marketing Companies (OMCs). Part of the cost of these fuels are subsidized by the government, part is borne by the OMCs and part by upstream companies such as ONGC. The difference between the actual cost and the

price at which it is sold being the under recovery to the OMC. The OMCs were facing all time high under recoveries in 2012. On the top of that the increase in prices of these sensitive products was not fully compensated by the Government of India. The situation became worse when oil prices sharply increased and value of Indian rupee decreased in comparison to USD. This made imported crude and diesel costlier and consequently the cost of domestically produced diesel also went up without a proportionate increase in the retail prices of diesel sold in the country leading to huge under recoveries for the OMCs and higher subsidy burden for the government of India.

1.2 Measures taken for diesel price de regulation

The rising burden of subsidies and under recoveries of OMCs forced Cabinet Committee on Political Affairs to declare an increase in prices of diesel by Rs 5 in September 2012 for bulk consumers and Rs 0.50 each month for retail consumers from the month of January 2013, until under recoveries were covered.

In May 2014 oil prices on the international market started falling, and the subsidy on diesel had almost diminished to zero. Taking this opportunity, in October 2014 the government decontrolled diesel prices.

1.3 Share of various sectors in diesel consumption

Diesel is one of the most important fuels, derived from the fractional distillation of crude oil. It is obtained below petrol and kerosene in the distillation chamber so is heavier than both and has the higher boiling point.

Diesel consuming sectors are both transport and non-transport. Transport sector mainly covers private and commercial cars, UVs, rail & roadways and trucking industry whereas non-transport sector covers agriculture (tractors, agricultural pumps and implements), diesel generator sets and mobile towers.

2. Impact of diesel price rise on different stakeholders in the economy

2.1. Government's finances

Government of India provides cash assistance to OMCs to compensate their losses for selling at a lower price. The Cash assistance from government partly covers the under recoveries. The figure 2 below shows the cash assistance from the government and the total under recovery of the OMCs from Quarter 1 2011-12 to Quarter 4 2013-14. We observe a cyclical pattern for the under recoveries and governments cash assistance in line with the quarterly behavior of the GDP. However there is a general tendency to decline after 2012-13 i.e. after the government's move to gradually increase diesel prices. In the first quarter of FY 2012-13 cash assistance was 180.35 billion whereas by the end of first quarter of FY 2013-14 it came down to 53.40 billion, which is moving simultaneously in line with the under recoveries.

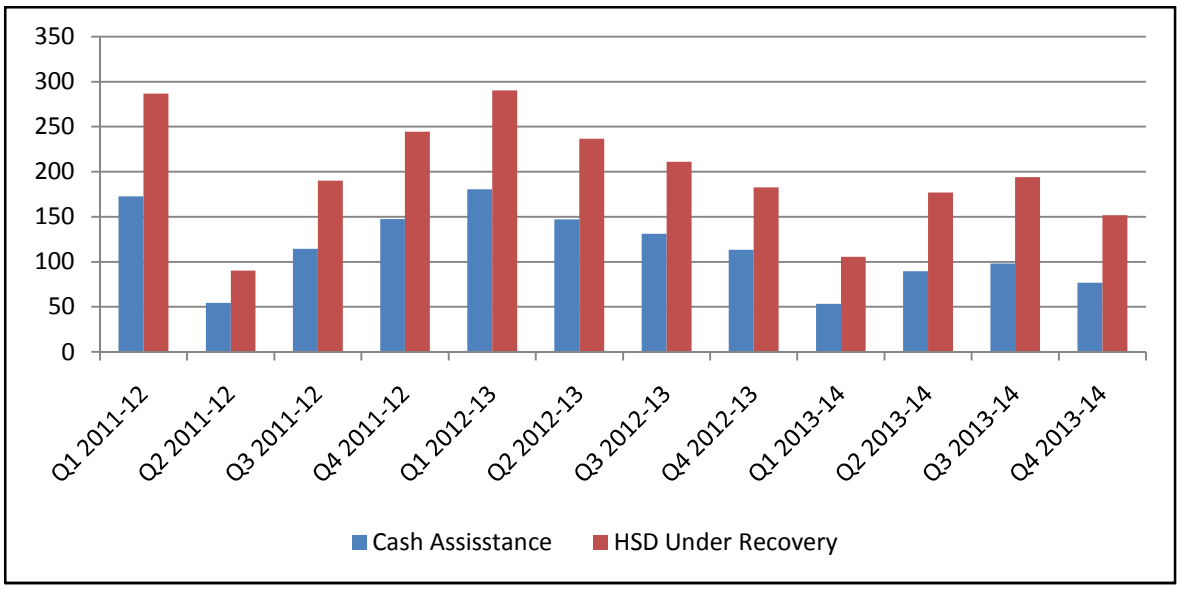

Figure 2 Cash Assistance by GoI and HSD Under Recoveries

Source: MoPNG

2.2. Oil Marketing Companies

In a similar fashion as the cash assistance from the Government, under recoveries of OMCs too show a cyclical pattern however there is a general downward trend post 2012-13 as shown in the figure above.

Losses of Oil Marketing Companies were at all time high until the first quarter of the FY 2012-13, after reforms in diesel prices in the month of September 2012, second quarter of the FY 2012-13, it started coming down sharply until the first quarter of FY 2013-14 (105.54 billion) and There was rising trend again because of movements in global crude prices, exchange rate and revision in administered prices (economic survey of India, 2013-14).

Due to diesel price reforms OMCs reduced the major part (more than half) of the under recoveries (fig. 4) which was Rs. 290.42 billion by the end of Q1 2012-13 but came down to Rs. 151.82 billion by the end of Q4 2013-14.

While domestic prices went up, consumption of diesel came down; both helped to reduce under recoveries. The impact of diesel price rise shows up after a few quarters because while domestic price was going up at the rate of 0.5 Rs/month the international prices too has been increasing and consumption of diesel started coming down only after a period of time. The quarterly consumption of diesel and under recoveries of OMCs is plotted in figure 3 below and they show a cyclical pattern related to the GDP.

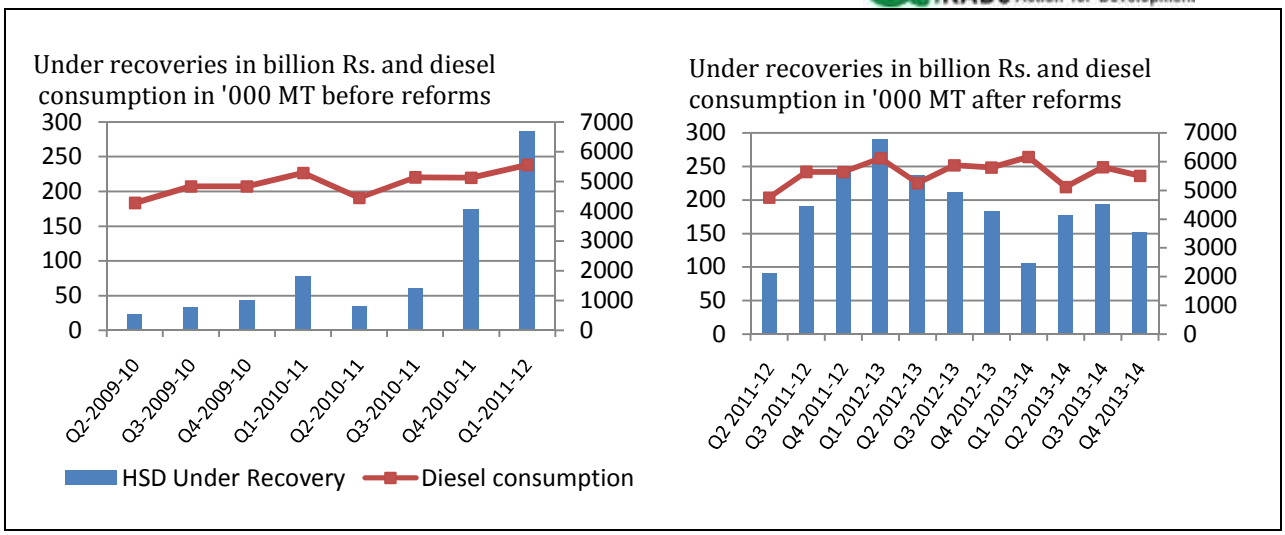

Figure 3 Diesel consumption and Under Recoveries before and after reforms

Source: PPAC

The growth rate of diesel consumption before the reforms was around 1.9% and after that the graph for diesel consumption is flat or showing a downward trend also. Consumption of diesel has been increasing at a very low growth rate of around 2% (Oct 13-Dec 13).

If the annual diesel consumption over time is compared, then one finds that in 2013-14 the annual diesel consumption shows a negative annual growth rate for the first time. This has never been the case. However, decrease in diesel consumption can be only partly attributed to the increase in prices. The general slowing down of the economy is also responsible for it. This is illustrated in the equation presented in the table below.

Table 1 Regression of diesel consumption on GDP, diesel relative prices and petrol relative prices

Commodity group	Model Type	Equation	DW and R^2 Test
Diesel Consumption	ARDL	Log(Diesel consumption)= -1.319+0.379#log(GDP)-0.188*Log(Diesel Relative Price)+0.250#Log(Petrol Relative Price)+0.591#Log(Diesel consumption$_{t-1}$)+0.087#D1-0.082*D2+0.096#D3	DW=2.345 R^2=0.993

insignificance

*** Level of Significance at 10%

** Level of Significance at 5%

* Level of Significance at 1%

D1, D2 and D3 are dummies, where D1 represents first quarter, D2 represents second quarter and D3 represents third quarter. The results of the equation show that **elasticity of diesel consumption with respect to GDP is 0.37 and elasticity of consumption with respect to relative price of diesel (relative to total GDP deflator) is -0.18. Thus *the income effect seems to have been more responsible in bringing down the consumption of diesel***.

2.3. Transport sector

Reform in diesel subsidy policy significantly impacted the sector. It is used by private and commercial cars, utility vehicles, auto rickshaws, roadways and railways. In 2013, out of total, around 70% diesel was consumed by transport sector. The share of diesel consumption by cars, utility vehicles and 3-wheeler sector is the highest and consumes around 28.48%. Private cars and UVs account for 13.15%, Commercial cars and UVs 8.94% and 3-wheelers 6.39% of the total diesel consumption. Trucks (HCV/LCV) account for 28.25% of the diesel consumption. Buses consume about 9.55% and railways about 3.24%. (http://pib.nic.in/newsite/PrintRelease.aspx?relid=102799) The figures show a rising trend for diesel consumption before Quarter 1 of 2012-13 . Consumption of diesel has come down drastically. Since 2010-11 to 2013-14(P), the sector has seen an annual negative growth rate of around 56[1]%.

[1] Calculated on the basis of data provided in Indian Petroleum and Natural Gas Statistics (MoPNG) 2013-14 http://petroleum.nic.in/docs/pngstat.pdf

Table 2 Sector-wise (end use) Consumption of Selected Petroleum Products in India

('000 tonnes)

Sector	2010-11	%age	2011-12	%age	2012-13	%age	2013-14 (P)	%age	CAGR	Year on Year change
TRANSPORT										
Road Transport	2483	4.03	2558	3.84	2207.17	3.23	205.85	0.30	-56.40	-0.92
Aviation	1	0.00	1	0.00	1.36	0.00	1.23	0.00	7.14	0.23
Shipping	561	0.91	540	0.81	413.09	0.60	365.21	0.54	-13.33	-0.35
Railways	2371	3.85	2429	3.65	2538.31	3.71	2630.8	3.89	3.53	0.11
Agriculture	**616**	1.00	**684**	1.03	617.31	0.90	429.24	0.64	-11.34	-0.30
Power Generation	166	0.27	168	0.25	214.34	0.31	204.42	0.30	7.19	0.23
Mining & Quarrying	1366	2.22	1181	1.77	1073.28	1.57	873.12	1.29	-13.86	-0.36
Manufacture Industry	1440.04	2.34	1649.15	2.48	1627.59	2.38	686.93	1.02	-21.86	-0.52
Iron & Steel(Metallur.)	255	0.41	311	0.47	263.03	0.38	153.83	0.23	-15.50	-0.40
Textile	188	0.31	156	0.23	241.77	0.35	46.33	0.07	-37.30	-0.75
Cement	211.56	0.34	226.18	0.34	213.02	0.31	124.68	0.18	-16.16	-0.41
Ceramic & Glass	17.07	0.03	20.58	0.03	62.09	0.09	5.5	0.01	-31.44	-0.68
Chemicals & Allied	143	0.23	163	0.24	183.2	0.27	103.38	0.15	-10.25	-0.28
Aluminium	15.43	0.03	20.83	0.03	26.37	0.04	28.19	0.04	22.25	0.83
Civil Engineering	568	0.92	645	0.97	316.08	0.46	68.32	0.10	-50.64	-0.88
(Elec./ Electronics)	35	0.06	39	0.06	54.17	0.08	26.48	0.04	-8.88	-0.24
Mechanical	106	0.17	200	0.30	137.56	0.20	70.08	0.10	-12.88	-0.34
Fertilizers	7.62	0.01	10.06	0.02	8.62	0.01	14.83	0.02	24.85	0.95
Other Consumer & Indus.)	145	0.24	135	0.20	121.67	0.18	45.3	0.07	-32.15	-0.69
Misc. Services										
(including retails)	50874	82.63	55478	83.28	58021.31	84.90	61464.81	90.99	6.51	0.21
Total	61569.72	100	66614.8	100	68341.34	100	67548.53	100	3.14	0.10

Source: PNG Stat 2012-13

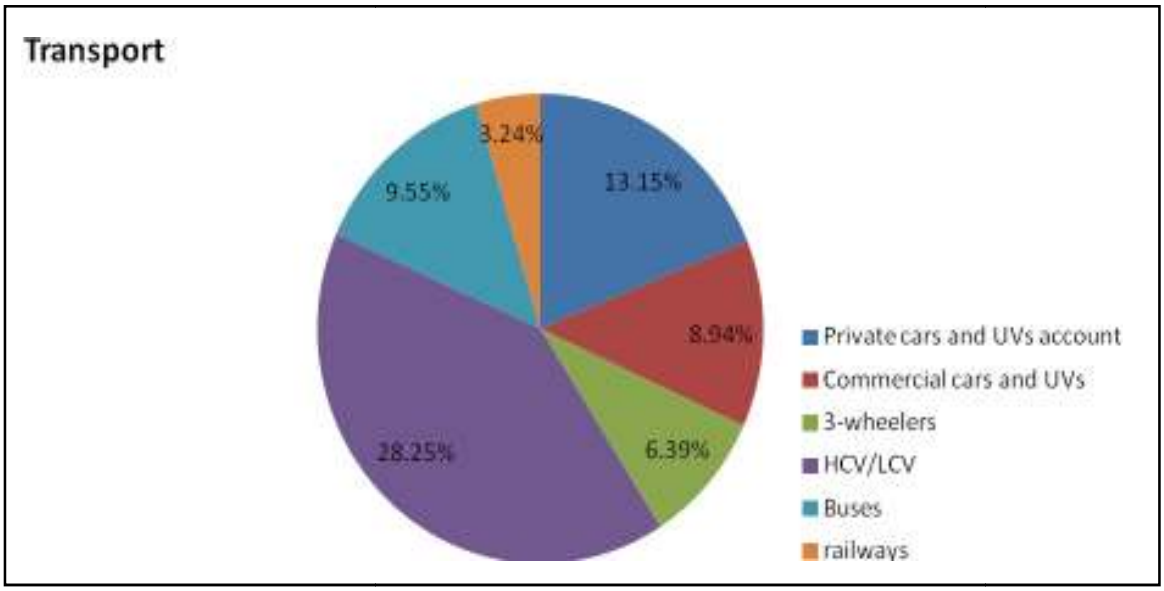

Figure 4 Share division of diesel consumption in different segments under transport sectors 2013
Source: Press Information Bureau

2.3.1. Auto Industry

Before diesel price increase in 2012 the automobile industry was faced with a situation where petrol was deregulated while diesel wasn't. Diesel was cheaper than petrol. This led to a rise in the demand for diesel models in most of the passenger vehicle segments and contributed to higher demand for diesel and diesel cars. The Industry was faced with a dilemma of weather to increase their production of diesel cars assuming diesel would continue to be cheaper or to assume that the earlier trend of petrol cars being more in demand to re start? Diesel subsidy reforms reversed the pattern of switching from petrol to diesel cars. After the decision of increasing diesel prices a general lowering of sales of diesel cars is observed in the domestic sale of passenger vehicles. The lowering of demand is observed mainly from the month of October 2013, Since April 2012 to March 2014 share of diesel car sale dropped from 47% to 38% and share of petrol cars is increased from 53% to 62% for the same time period. In general Diesel is a more polluting fuel than petrol and hence a rising share of diesel cars is highly undesirable from the point of view of environment and health.

Considering lags in this field, it could be expected that this share would go down further. High quality expensive diesel is mandated in EU to reduce CO_2 and other emissions. India will have to eventually do this to reduce serious urban air pollution.

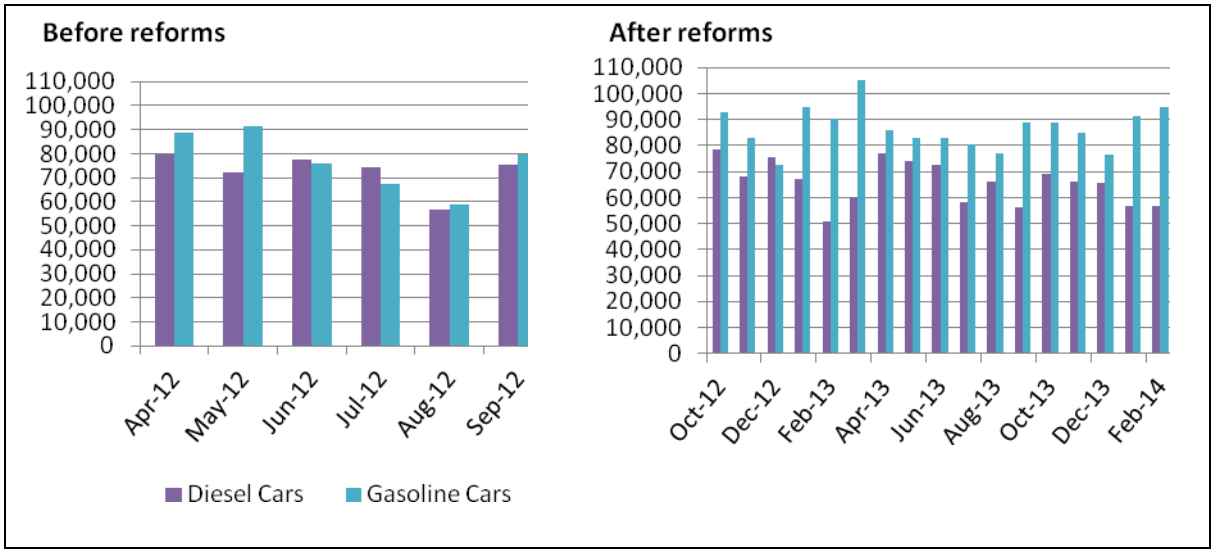

Figure 5 Sale of Diesel Cars/Petrol Cars in absolute numbers before and after reforms
Source: SIAM

According to the Society of Indian Automobile Manufacturers (SIAM), the proportion of diesel car sales to total sales had steadily risen from 21.4% in the year 2008 to 28.42% in 2011. In 2012, around 40% of the total cars sold in the country ran on diesel. Post diesel price rise there was a massive drop in the absolute number of diesel cars sold in India from 79,472 in April 2012 to 65,879 in March 2014 (SIAM).

A comparison between diesel and petrol variants of different cars is analyzed in table 1.

Table 3: Comparison of diesel and petrol variants of different cars

Parameters	Maruti Suzuki Swift (Small car)	Maruti Suzuki Swift Dzire (Sedan)	Honda Mobilio (UV)	Skoda Superb Elegance (Luxury car)
Car Price (Diesel Variant) Rs. in lakh	5.46	5.79	7.89	25.09
Car Price (Petrol Variant) Rs. in lakh	4.42	4.85	6.49	22.23
Distance travelled per annum	10000	10000	10000	10000

Diesel Price per litre	58.97	58.97	58.97	58.97
Petrol price per litre	67.86	67.86	67.86	67.86
Fuel price difference	8.89	8.89	8.89	8.89
Mileage petrol variant	18.6	19.1	17.3	13.7
Mileage diesel variant	22.9	23.4	24.5	17.2
Price differential (Rs lakh)	1.04	0.94	1.4	2.86
Savings on diesel (Rs. per annum)	10733	10328	14858	17517
Years to recover the extra cost of diesel engine (in years) at zero discount rate	9.7	9.1	9.2	18.8

Source: IRADe research[2]

Earlier automobile industries were charging premium towards capital cost from diesel vehicles because there was a large gap between the price of diesel & petrol and consumers were rushing towards diesel variants of the vehicles to reduce the running cost of the cars. But as per today's scenario the situation is reversed, price gap between diesel and petrol is reduced and recovery time of premium cost paid by consumers to purchase diesel cars is increased, impact of this is visible on the sale of cars and the reduction in price of diesel cars compare to that of petrol cars.

Among the major consumers in the transport sector apart from the auto industry is the Indian Railways and State Road Transport Companies who despite being major diesel consuming (bulk consumers) sectors in 2013, were required to pay the higher price for diesel, Railways and SRTCs did not increase the fares at all after this reform. In place SRTCs decided to refuel the buses from refueling stations directly to cut down the cost. At present only railways and defense are bulk consumers of diesel in transport sectors.

[2] Cars and fuel prices are latest ex-showroom price and current fuel prices respectively as on October 2014, Mileage are taken from the manufacturers specifications, Savings on diesel is the difference between the fuel expenses involved in running a diesel car and a petrol car and maintenance costs assumed to be similar. Recovery period does not take into consideration the resale value of the cars.

2.4. Non -Transport sector

Non transport sector consumed around the rest 30% of the total diesel in 2013. The agriculture sector is a major consumer of diesel with about 13% of the total 30%. Within agriculture, tractors consume 7.4%, pump-sets 2.9% and agriculture implements 2.7%. Tractors have a higher consumption because they are also used for non-agricultural purposes like transportation of construction material, crops and people in rural areas. Diesel consumption by other segments is 17%. This comprises of industry 9.02% (of which industry gen-sets is 4.06% and others for industrial purposes is 4.96%), mobile towers 1.54% and others 6.45% comprising of gen-sets for non-industrial purposes, civil construction, etc. (http://pib.nic.in/newsite/PrintRelease.aspx?relid=102799). Bulk consumers under non transport sector are industries like power plants, cement plants and chemical plants etc. Non transport sector has also seen a very slow (almost zero) or negative growth rate of diesel consumption from 2010-11 2013-14(P). Only power generation aluminum and fertilizers sectors have a positive growth rate of 7%, 22% and 24% respectively (PNG Stat 2013-14).

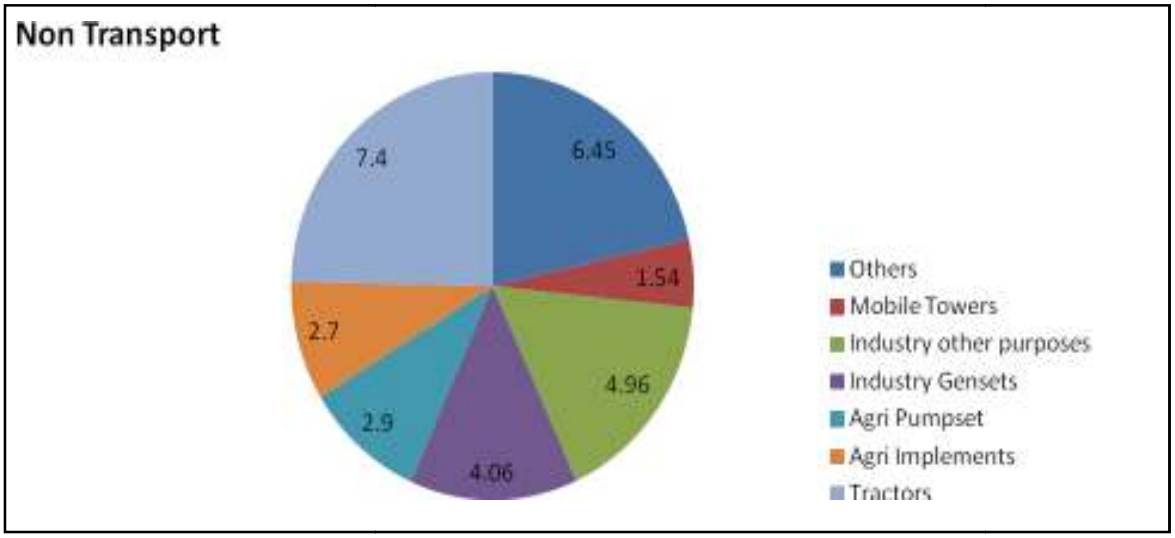

Figure 6 Share division of diesel consumption in different segments under non transport sectors
Source: Press Information Bureau

2.4.1. Tractors and Agricultural-implements

As per the report published by PPAC (prepared by Nielson) in 2013, tractors and agricultural implements consume around 10.1% (7.4% and 2.7% respectively) from total share of agriculture of 13%. Share of diesel consumption by tractors is large because, apart from agricultural purposes like harvesting and irrigation, land reclamation, drawing water, powering agricultural implements, tractors are also used for the haulage of agricultural crops, mode of transportation in rural areas, haulage in construction and infrastructure projects etc.

2.4.2. Generators

Industry gen-sets and other gen-sets for non-industrial purposes, civil construction consumes 4.06% and 6.45% (total 10.51%) respectively out of 17% consumption from other diesel consuming sectors in 2013. Generators also hold a big share from others sector since India has a huge power shortage of the order of around 8.7 to 8.9% during off peak hours and around 10.5% during peak hours in FY 2012-13 (http://natgrp.org/2013/04/13/power-shortage-and-its-impact-on-the-indian-economy/)

2.4.3. Agricultural-pumps

Agricultural pump sets consumes around 2.9% out of 13% share of agriculture in total diesel consumption. Agriculture sector is major user of pump sets. Their efficiency is very low at around 20-35% (http://www.iitk.ac.in/ime/anoops/for12/7%20-%20Mr.%20Sarabjot%20Singh%20Saini%20-%20BEE%20-%20%20AGDSM%20-%20IIT%20K.pdf)

2.4.4. Mobile Towers

Mobile towers use around 1.54% out of 30% of non transport sector. Network towers in rural and other remote areas largely depend upon diesel gen-sets for their power needs.

3. Concerns and costs to the Economy due to Diesel price rise

The monthly diesel price increase led to apprehensions about causing inflation. The period in which diesel prices were increased was a period of slowing down of economic growth and situation of general inflation. This led to apprehension that diesel prices increase led to the inflationary situation in country. IRADe report "Taming diesel subsidy to curtail inflation and foster economic growth" (October 2012) had argued that increasing diesel prices would reduce fiscal deficit of diesel subsidy and would lead to high inflation in the short term and a lower inflation and higher growth in the long run. However what we see currently after 2 years (8 quarters) is that of prevalence of general inflation and very low growth. We explore below the actual dynamics over this period and try to assess the impact of change in diesel price. We use the same model.

The Model used estimates a statistical relation between the three major economic variables i.e. prices represented by aggregate whole sale price index (WPI), Income denoted by GDP and real interest rate denoted by Real State Bank of India Advanced lending rate (RSBIALR) along with exogenous influences such a whole sale price of diesel (WDI), money supply (RM3), real exchange rate (REER), rainfall (RID) and total government expenditure (TE). The model relations need to be seen in the IS-LM[3] framework. The prices or WPI in the model increases with higher prices of diesel and real money supply. So as diesel price rise WPI raises and as real money supply increases there is increase in aggregate price index WPI. In real life the RBI influences the interest rates through various monetary measures and is a control variable. The equation for RSBIALR is like a reaction function of the RBI to changes in the prices (WPI) and output (GDP). Thus as WPI inflation increases the RBI responds by increasing the real interest rates. This results in decrease in GDP through lowering of aggregate demand. We use the model to make two projections whose values are compared to the actual data. We choose the 4 quarter rise scenario from the earlier

[3] The Keynesian framework of Investment-Savings and Liquidity-Money Demand relationship.

IRADe study “taming diesel subsidy to curtail inflation and foster economic growth” because that is the scenario closer to the reality of the 0.50 Rs/month rise in diesel prices.

Projection 1: refers to the 4 quarter rise scenario assumed in the IRADe study “taming diesel subsidy to curtail inflation and foster economic growth”
Projection 2 refers to what the VAR model predicted when actual values of whole sale prices of diesel, Fiscal deficit were plugged in up to Quarter 1 of 2014-15.

Projection 1 gives what was expected to happen with the 4 quarter rise in diesel prices and projection 2 gives what the model values are when the actual diesel price rise and consequent fall in under recoveries are factored in.

The figures below provides comparison of projections and actual from the IRADe's econometric model

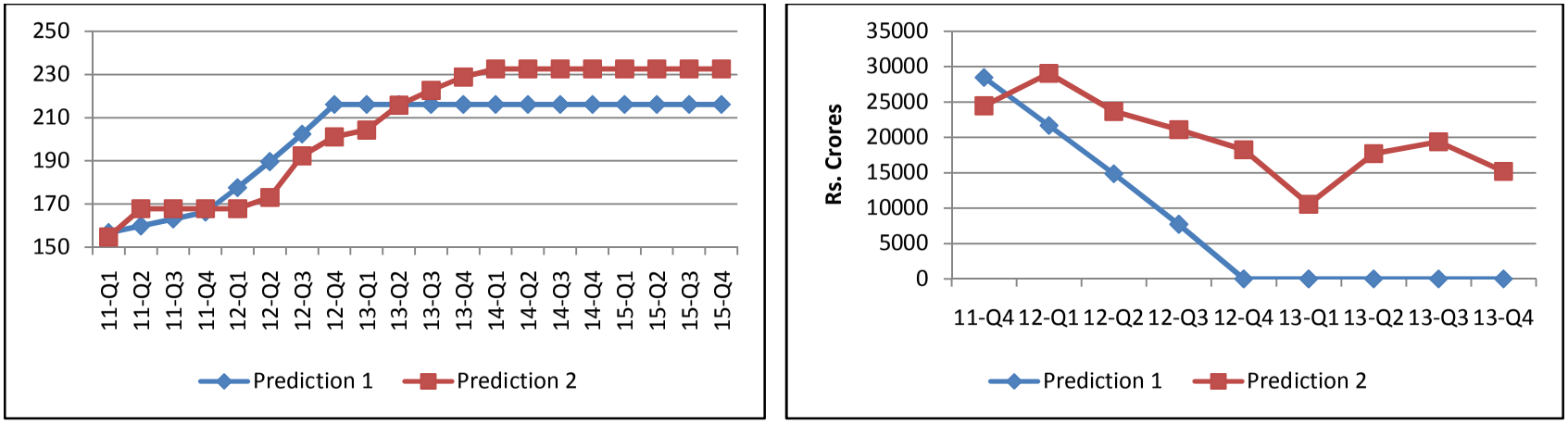

Figure 7 Wholesale price of Diesel and Under Recoveries

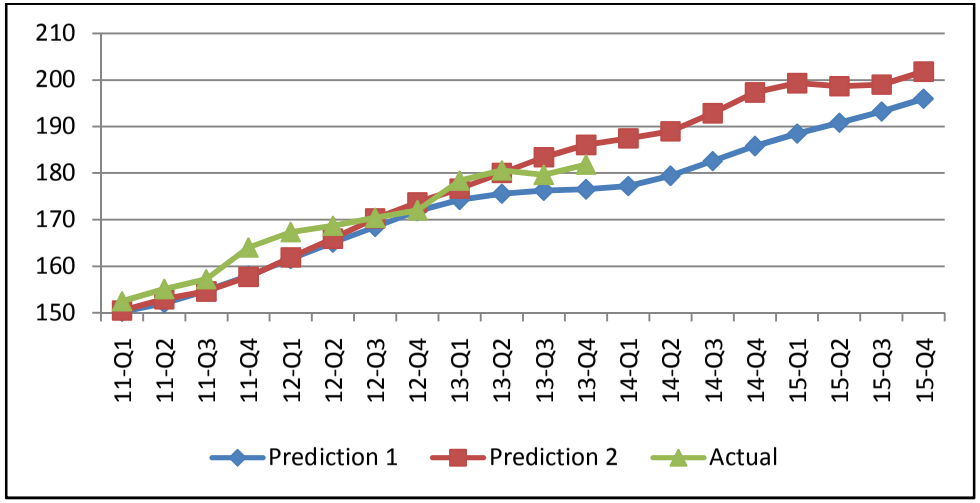

Figure 8 Wholesale Price index

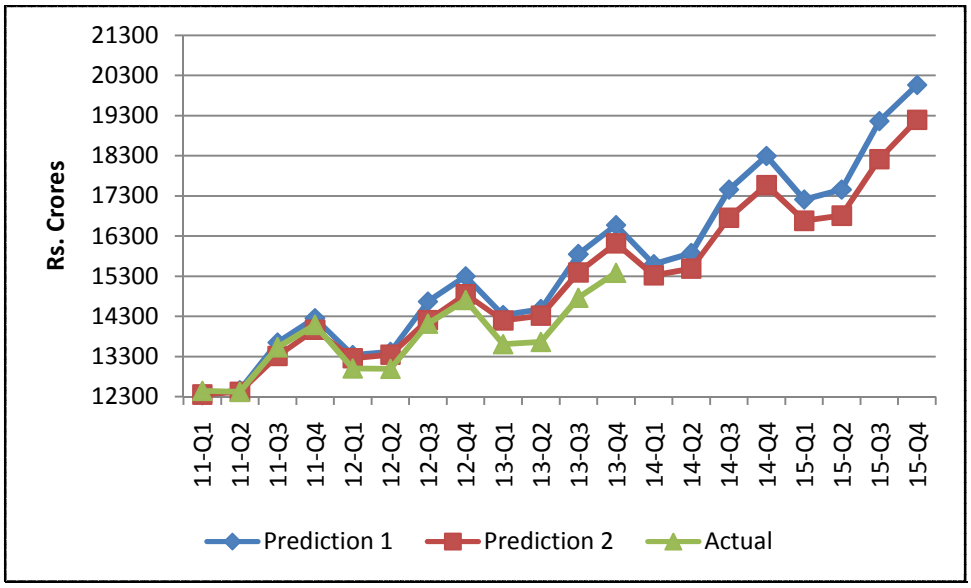

Figure 9 Gross Domestic Product

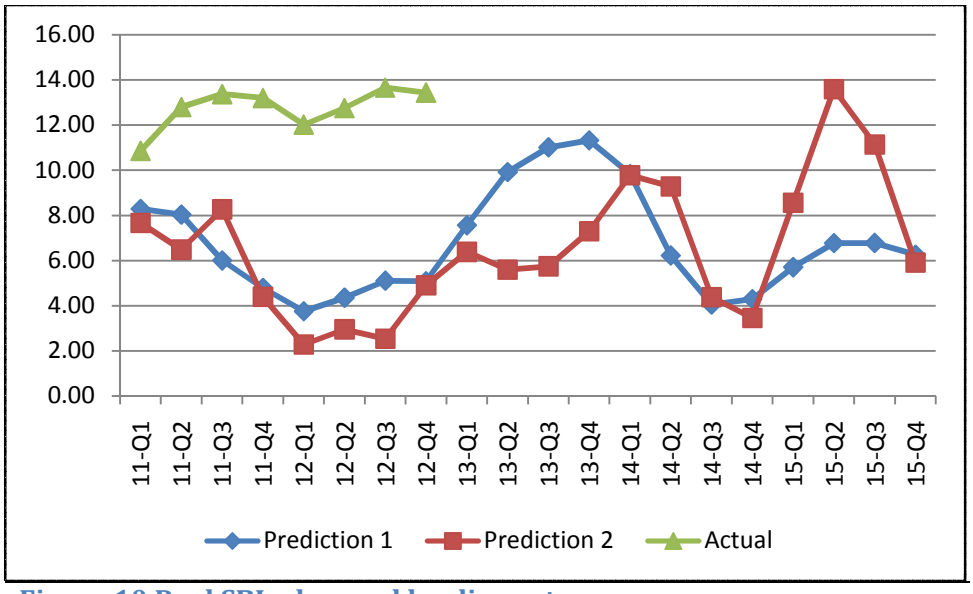

Figure 10 Real SBI advanced lending rate

A comparison of projections 1&2 for WDP, under recoveries, WPI, GDP and Real interest rates shows that whole sale prices of diesel rose higher than what was expected after 2013-14 Q3. This showed up through higher prices in projection 2 from 2013-14 Q3

Consequently the Real interest rate showed an upward trend from 2013-14 Q3 and was generally higher in projection 2 than expected (projection 1) from 2014-15 Q2. This implied that the RBI responded with higher interest rate than expected to a WPI inflationary situation that was higher than expected. This reflected on the GDP with the GDP being lower than expected from 2013-14 Q3. However if one compares the two projections to the actual values of WPI, GDP, RSBIALR one would find that though the WPI numbers compare closely to what has been the actual data, The actual GDP data shows much lower growth and much higher values for real interest rates. This is because though WPI inflation has come down in recent times as was expected in line with the two projections but however the RBI has changed its inflation targeting strategy from WPI targeting to CPI targeting and while WPI inflation has come down CPI inflation has continued to be persistently high. This implied that though WPI inflation came down the RBI did not respond with lower inflation rates and which resulted in lowering of aggregated demand and slowing down of economy. Because of the slowing down of the economy has resulted in lower growth rate of GDP which has further pulled down the growth rate of real disposable income and resulted in consumer welfare deduction. Thus one can observe that income effect dominates the price effect. Therefore one might want to question as to what is causing this current inflation in CPI. Does diesel price increase have some role to play in the persistently high CPI inflation? The question is answered in the subsequent section.

4. Impact of Diesel Price rise on Inflation

4.1. What is causing the current inflation?

In general two broad measures of inflation are Wholesale Price Index (WPI) and Consumer Price Index (CPI)[4]. In India, WPI is used as a measure of inflation and

[4] WPI is the price index representing the wholesale prices of a basket of goods while CPI is the average price paid by the households for a basket of goods and services.

since April, 2014 CPI[5] is used as the key measure of inflation for all policy purposes related to monetary management of the country.

4.2. Wholesale Price level

In 2012-13, the level of inflation varied significantly. The inflation of primary articles (having weight of 20.12% in WPI), after declining to 6.7% in Q4 2011-12, increased in first 3 quarters (because of inflation in onions and potatoes). Inflation for group "fuel and power" was caused (with weight of 14.91% in WPI (source: Economic survey of India 2012-13)) because of increase in price of electricity across states and the increase in price of diesel. WPI inflation in 2013-14, has moderated to around 5.98% (weak post crisis global demand, lower international global prices, and sharp seasonal correction in vegetable prices). WPI food inflation has remained high due to high inflation in cereals, vegetables etc. and fuel inflation remained in double digits in last 3 quarters, largely because of fluctuations in global crude prices, exchange rates and revision in administered prices.

[5] CPI (rural, urban and combined) earlier CPI was calculated for industrial workers, agricultural workers and rural labours.

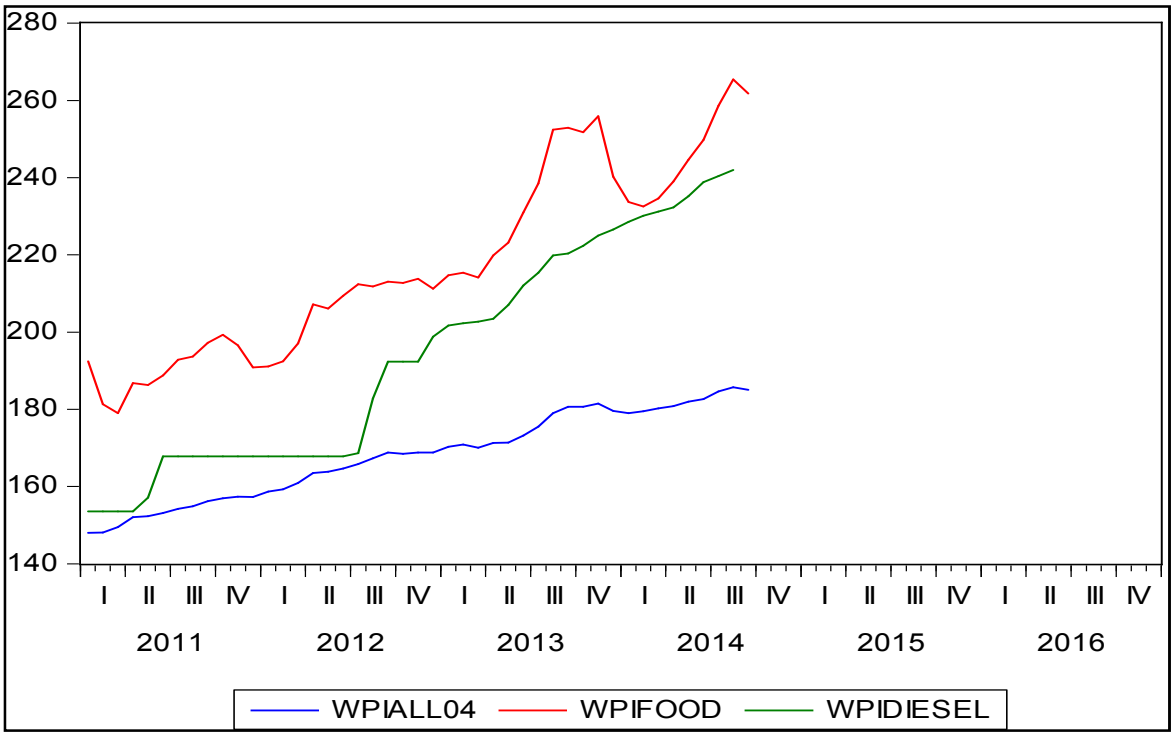

Figure 11 Wholesale Price Index for all commodities, food articles (cereals and pulses) and fuel (fuel and power)

Source: Office of Economic Advisor

The important sectors that contribute to WPI inflation are food (with weight of 14.34%), non-food commodity (with weight of 4.26%) and manufacture products (with weight of 64.97%). From January 2011 till June 2014, Overall WPI inflation has been falling and the fuel inflation has been rising over the periods. With fuel inflation, there has been overall increase in inflation but the impact has disseminated with time as it is temporary in nature and other factors have contributed to the falling WPI inflation(from later 2013). We try to analyze the contributions to WPI inflation by various factors through a set of regression presented below.

We consider Aggregate WPI and its components, WPI of Food, Non Food, Electricity, Diesel, and Manufacture. Wholesale price index of electricity and Diesel are largely administered price and also WPI food to a certain extent. Diesel and electricity are

used as intermediate inputs in various industrial processes and thus have impact on the cost of production across sectors. Diesel is a primary fuel for transportation requirements of industries and commercial activities. Food prices are relevant for agro processing industries and any rise in prices of food will have an impact on the cost of agro processing industries. Therefore we estimate the WPI of food, non food and manufacturing as functions of its own lags and lags of WPI of diesel, food and electricity. Thus For this, ARDL methodology is followed and the models have been prepared with WPI overall (dependent variable), WPI Food, WPI Non Food, WPI Manufacture (as independent variables). We present four sets of equation

1. $\log(wpiall04) = c + \beta_1 \log(wpidiesel) + \mu_1 \log(wpifood) + ¥_1 \log(wpielectricity) + \alpha_1 \log(wpimanufacture) + ę$

Table 4 Regression of WPI on its major components

Commodity group	Model Type	Equation	DW and R^2 Test
Wholesale price index aggregate	ARDL	Log(WPIALL)= -1.041+0.089**log(WPI Diesel)+0.265#Log(WPI Food)+0.638 *Log(WPI Electricity)+0.267 *Log(WPI manufacturing)	DW=0.471 R^2=0.984

insignificance

*** Level of Significance at 10%

** Level of Significance at 5%

* Level of Significance at 1%

WPI has various components, which makes it a weighted aggregate of many heterogeneous components. It is difficult estimate a causal function for aggregate WPI relating it to its own lags and WPI of food, diesel and electricity as each of these components might behave quite differently from each other. Therefore the above equation is used only to estimate the elasticities of aggregate WPI with respect to food, diesel and electricity.

The results show much lower elasticity for diesel (0.09) and much higher elasticity for electricity (0.63) followed by manufacturing (0.27) and food

(0.26). Thus confirming that diesel prices have only transient impact on overall WPI inflation. Each of the individual major components of the WPI is explained in the estimated equations below.

4.3. Wholesale Price index of Food:

Estimated Equation is of the form as shown below and the estimated coefficients are reported in the table below.

2. log(wpifood) = c+ β_1 log(wpidiesel) + μ_1 rainfallindex(-1)+ ¥$_1$ log(wpifood(-12)) + ar(1) + ę

Table 5: Regression of food on its causal factor

Commodity group of Wholesale price index	Model Type	Equation	DW and R^2 Test
Food	ARDL	Log(WPI Food)= -1.175+0.124#log(WPI Diesel)-0.0008**Rainfall Index$_{t-1}$+0.689**Log(WPI Food$_{t-12}$)+0.560*AR(1)	DW=1.146 R^2=0.942

insignificance

*** Level of Significance at 10%

** Level of Significance at 5%

* Level of Significance at 1%

As shown in the estimated equation above for WPI of Food, the wholesale price of Diesel plays rather an insignificant role. WPI food is rather more influenced by rainfall and lagged value of prices. The 12th lag and first lag turn out to be significant. The significance of the 12th lag implies seasonal impact on food prices, as the data used to estimate was monthly WPI. The lagged values of the dependent variables can be interpreted as representing price expectations or market forces. **Thus wholesale prices of food turn out to be influenced by rainfall, seasonal impacts and market forces**.

4.4. Wholesale price index of non food

The form of the estimated equation is shown below and the estimated coefficients are reported in the table below.

3. Log (wpinonfood) = c+ β_1 log(wpidiesel) + μ_1 log(wpinonfood(-1)) + ę

Table 6: Regression of non food on WPI diesel

Commodity group of Wholesale price index	Model Type	Equation	DW and R^2 Test
Non Food	ARDL	Log(WPI Non Food)= 0.081+0.124**log(WPI Diesel)+0.844*Log(WPI Non Food$_{t-1}$)	DW=1.809 R^2=0.983

insignificance

*** Level of Significance at 10%

** Level of Significance at 5%

* Level of Significance at 1%

The results of the above estimated equation show that diesel has a significant impact on wholesale prices of non-food commodities. Market forces and price expectations represented by the lagged value of wholesale price of non-food also play a major part in determining the wholesale price of non-food items. **Elasticity of non-food with respect to diesel is 0.1244**.

4.5. Wholesale Price of Manufacturing

The form of the estimated equation is shown below and the estimated coefficients are reported in the table below.

4. log(wpimanufacture) = c + β_1 log(wpidiesel) + μ_1 log(wpielectricity) +¥$_1$ log(wpicoal) + α_1 log(wpimanufacture(-12) + ma(1) + ę

Table 7: Regression of manufacturing on WPI major components

Commodity group of	Model Type	Equation	DW and R^2 Test

Wholesale price index			
Manufacturing	ARDL	Log(WPI Manufacture)= 1.074+0.0899**log(WPI Diesel)+0.0815#Log(WPI electricity)+0.169*Log(WPI Coal)+0.423*Log(WPI manufacture$_{t-12}$)+0.914*MA(1)	DW=1.719 R^2=0.990

insignificance

*** Level of Significance at 10%

** Level of Significance at 5%

* Level of Significance at 1%

The results of the estimated equation for wholesale prices of manufacturing show that impact on WPI manufacturing of WPI diesel and WPI coal. **The elasticity of WPI manufacturing w.r.t WPI diesel is 0.089 and w.r.t WPI coal is 0.17**. The 12th lag of WPI manufacturing and the moving average term turning out to be significant implies that WPI manufacturing is influenced by seasonal factors and market forces of price expectation and price correction.

4.6. Consumer Price Level

The overall CPI has been rising since January 2011 .The most important sector that contributes to CPI inflation is food (with weight of 49%). In the current scenario CPI inflation has been persistently high while WPI inflation has come down to a large extent. There has always been some divergence in the trends of CPI and WPI. One of the reasons is the commodities covered under the two categories. The Whole sale price index consists of agricultural commodities, processed agricultural commodities, mineral fuels of which diesel is one of the commodities and a large list of industrial manufactured products but no services item is a part of WPI. While on the other hand CPI apart from agricultural commodities, manufactured commodities and fuels like diesel and power also considers services to consumers like transport, communication, medical services, educational services all which are important to

consumers and which impinge on the consumer's ability to buy. What is then important is to establish whether the diesel price rise had any role to play in CPI inflation because of the presence of services cost in the CPI index.

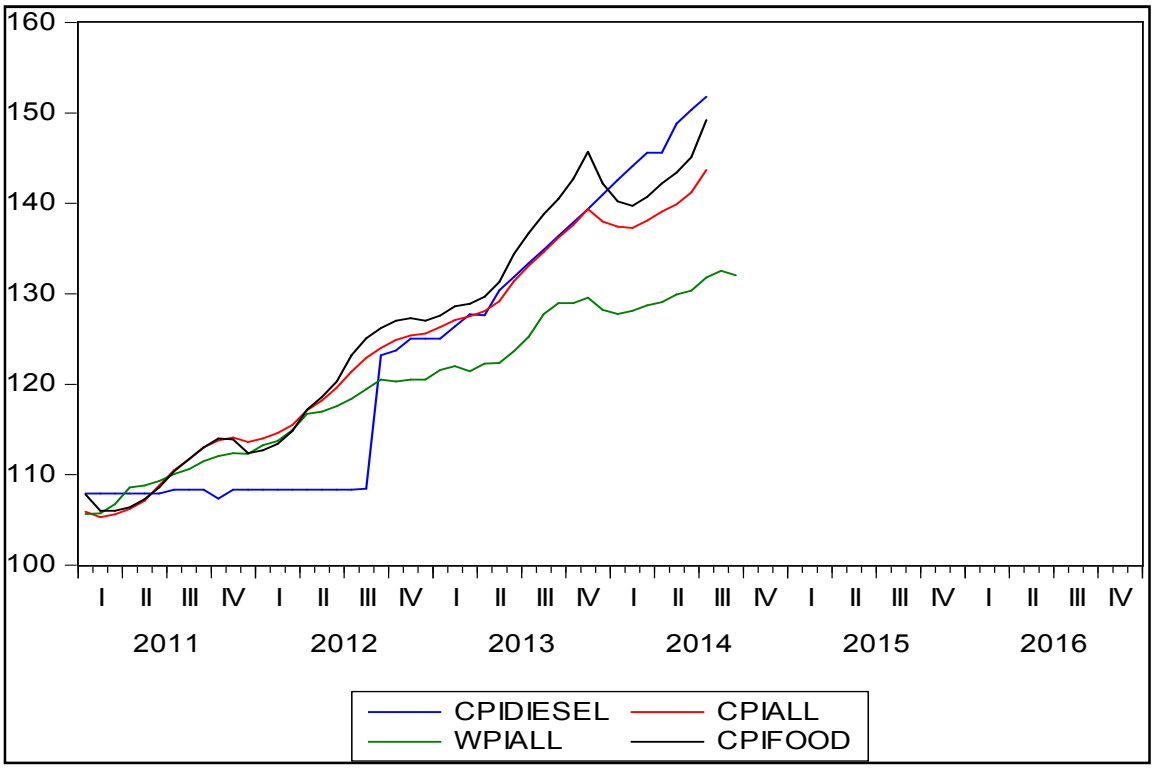

Figure 12 Wholesale price inflation and Consumer Price Inflation
Source: office of economic advisor

We again as in the earlier section use the ARDL methodology to estimate two relations. The first one pertains to aggregate CPI (CPIALL) estimated as a function of WPI aggregate, CPI Food and CPI diesel. The functional form of the equation is given below and estimated coefficients reported in the table below

5. $\log(cpiall) = c + \beta_1 \log(wpiall) + \mu_1 \log(cpifood) + ¥_1 \log(cpidiesel) + ę$

Table 8: Regression of CPI on WPI, CPI food and diesel

Commodity group	Model Type	Equation	DW and R^2 Test

Consumer price index aggregate	ARDL	Log(CPIALL)= -0.6222+0.636*log(WPI ALL)+0.458*Log(CPI Food)+0.0386***log(CPI Diesel)	DW=0.528 R^2=0.997

insignificance

*** Level of Significance at 10%

** Level of Significance at 5%

* Level of Significance at 1%

The results of the regression show that aggregate CPI is significantly related to the aggregate price index (the WPI commodities are all a sub set of the CPI commodities), CPI of food and CPI of diesel. However diesel elasticity is much lower at 0.04 compared to the elasticity of CPI food which is 0.45 and aggregate WPI which is 0.63. The above equation shows low DW. However we do not interpret this equation as a cause and effect relation rather it is used to estimate elasticities of aggregate CPI with respect to aggregate WPI, CPI food, CPI diesel.

Since CPI food is such an important contributor to CPI inflation hence we estimate a functional relationship for CPI food by relating it to its own lags, and WPI food and its lags and CPI diesel. However CPI diesel did not turn to be significant in the final form of the equation which is shown below. The estimated coefficients are reported in the table below.

6. $\log(cpifood) = c + \beta_1 \log(cpifood(-1)) + \mu_1 \log(wpifood2010) + ¥_1 \log(wpifood2010(-1)) + ę$

Table 9: Regression of CPI food on its causal factor

Commodity group of CPI	Model Type	Equation	DW and R^2 Test

Food	ARDL	Log(CPIFOOD)= -0.027+0.846*log(CPIFood$_{t-1}$)+0.3958*Log(WPI Food2010)-0.2355*Log(WPI Food2010$_{t-1)}$	DW=1.538 R^2=0.997

insignificance

*** Level of Significance at 10%

** Level of Significance at 5%

* Level of Significance at 1%

The above estimated equation suggests that CPI food is influenced by its own lag which indicates role of price expectations and market forces and WPI food and its lags. WPI food as was explained earlier showed a strong relationship with rainfall and market expectations. Thus one can conclude that diesel price by itself does contribute to inflation but does not have a very significant persistent effect and the current inflationary situation prevailing in the country is more due to structural reasons and market forces like price expectation, rainfall and there exist a marginal correlation between food prices and diesel prices.

5. Importance of Diesel for private households:

Apart from the inflationary situation the economy is also faced with a slowing down of the economy. It has been discussed in the earlier section that this slowing down of the economy has resulted in negative annual growth rate but the slowing down of the economy has a lot to do with slowing down of demand where consumer demand is a important constituent. It is also important to see is increase in diesel prices impact consumer spending by reducing the expenditure on other commodities? We analyze the NSS data from Household Consumption of various goods and services in India 2011-12. The Table below shows the proportion of expenditure on diesel, petrol and public transport by different expenditure classes in Rural and Urban areas

Table 9 A

MPCE class for Rural Areas	1	2	3	4	5	6
Total expenditure	521	666	783	905	1018	1136
Population Proportion	5	5	10	10	10	10
Diesel as a proportion of total	0.004	0.002	0.005	0.007	0.024	0.016
Petrol as a proportion of total	0.002	0.150	0.188	0.314	0.515	0.758
Conveyance as aproportion of total	1.534	1.532	1.741	1.817	1.977	2.145

Table 9 B

MPCE class for Rural Areas	7	8	9	10	11	12
Total expenditure	1266	1427	1645	2007	2556	4481
Population Proportion	10	10	10	10	5	5
Diesel as a proportion of total	0.058	0.037	0.075	0.140	0.235	0.403
Petrol as a proportion of total	0.895	1.317	1.568	2.288	2.955	3.028
Conveyance as aproportion of total	2.328	2.551	2.685	2.839	3.008	3.084

Table 10 A

MPCE class in Urban Areas	1	2	3	4	5	6
Total expenditure	701	909	1118	1363	1625	1888
Population Proportion	5	5	10	10	10	10
Diesel as a proportion of total	0.011	0.002	0.010	0.024	0.017	0.039
Petrol as a proportion of total	0.161	0.317	0.719	1.346	1.778	2.319
Conveyance as aproportion of total	1.408	1.607	2.074	2.334	2.595	2.835

Table 10 B

MPCE class in Urban Areas	7	8	9	10	11	12
Total expenditure	2181	2548	3063	3893	5350	10282
Population Proportion	10	10	10	10	5	5
Diesel as a proportion of total	0.119	0.089	0.130	0.280	0.463	0.602
Petrol as a proportion of total	2.703	3.302	3.577	3.751	4.339	4.545
Conveyance as aproportion of total	2.878	2.961	3.079	3.045	3.315	3.943

The Table 9-10 above show for each expenditure class as reported in the NSS report Household Consumption of various goods and services in India 2011-12, the total expenditure, % proportion of people in class and the share of expenditure on diesel,

petrol and Public transport. Public transport here consists of air, train bus, auto rickshaw taxi etc. The results from the NSS survey data suggests that expenditure on diesel forms a very small percentage of total expenditure at least for the bottom 50% of the population rather the bottom 50% has much higher proportion of expenditure on use of public transport. With increase in diesel prices the cost of diesel for private use will increase. The cost of public transport also would increase but if one considers the view that public transport for the bottom 30% or 50% would be majorly by government owned public busses then there prices are not revised by as much amount as has been the rise in diesel prices. This has been discussed in the section for auto industry. Thus though diesel prices have gone up it would not have substantially affected the expenditure on other commodities and hence disposable income of the households would show very less sensitivity to diesel price rise. The bottom 20% which would comprise the BPL classes hardly has any expenditure on diesel.

6. Stakeholder Issues

Conclusions from discussions with Truckers: During the course of this study IRADe researchers met with local stakeholders like truckers and industry people to take their views. Owners of Sabharwal Road Carriers, Grandways Roadlines and individual truck drivers provided their views on overall impact of diesel price rise on trucking industry and on individual drivers. Transporters finalize fixed per kilometer charges in their contract with the clients and due to fluctuation in the diesel prices, the percent of profit gets affected.

Truck drivers also get fixed wages so they also do not get affected because of rise in diesel prices.

Generally a new, medium to large truck gives a mileage of around 3.5 to 4.5 km/ltr. whereas an old truck gives an average of around 3.5-2.5 km/ltr., so efficiency of the truck is one more parameter which affect the profit of trucking industry.

Waiting at toll gates and railway crossings are also the parameters which add in the wastage of diesel and subsequently the affect the profitability.

Standing cost of any truck is also an addition to the losses as per day cost considering the different parameters, it comes to around INR 2000.

Most of the time vehicle returns empty after delivering the goods which adds to the wastage of diesel but not to the loses to transporters because they charge for return trips from the clients.

So diesel price rise does not incur losses to trucking industry.

Conclusions from stakeholder conference: IRADe organized a stakeholder conference on 14th November 2014 inviting participants from across the industry, government and agriculture to provide their views on diesel price increase. The major opinions and suggestion from the conference is listed below.

Shri B.P. Mohanty who represented the ministry of petroleum and natural gas made the following points about diesel price rise

- The diesel price hike has income effect. The entire effect is income effect. Petrol was also deregulated as it had income effect in 2010. With growth in cars production, the growth in petrol consumption is found to be only 50%.Also past cars (which are produced) and running the economy adds more to income effect.

- Trucking industry is vulnerable one. Trucking industry is more elastic with respect to GDP.

- It is a myth that “Diesel price hike impacts trucking industry “.

- The Excise duty should be reduced and demand is to be managed

Mr. Vijay Duggal of Bharat Petroleum Corporation Limited had the following

- Agriculture sector can survive without diesel usage.
- Power sector reforms are extremely important to reduce the dependency on diesel gen sets
- Efficiency in operation, the oil companies are investing in infrastructutre. We can't afford to waste energy.
- By deregulating , increase in excise duty will result in increase in diesel price but trend is changing today.
- Prices are low today, decisions can be made with more ease.

V.V. Sadamate former advisor, agriculture, Planning Commission of India made the following points about impact of diesel prices on agriculture

- In agriculture sector, parts of eastern U.P., Bihar are largely irrigated using pump sets (because of lack of electrification supported).During peak seasons, pumps runs for 6-8 hrs. per day , the demand-supply during peak periods is disturbed so need to be managed.
- Training of commerce, mechanization pumping of operations, bringing role of Krishi Vidhya Kendre, farmers training centre's.
- We need not fix the prices but fix the behavior of prices.

Prof. Kirit S. Parikh, Chairman of IRADe and chairman of petroleum pricing committee had the following observations

- Small truckers had one time increase and not gradual increase, thus less benefited as compared to large trucks.

- Individual solar pumps are of huge cost thus mini grid level is a solution, farmers with multiple holdings would benefited out of it.
- Diesel and petrol prices should be market regulated.
- Increase in excise duty on Diesel should be considered.

7. Conclusion

Diesel subsidy reforms have had a positive impact on government's finances. The under recoveries of the Oil Marketing Companies have gone down, thus substantially improving their financial health. The additional demand for diesel arising out of trend of using diesel cars compared to petrol cars has checked. Overall diesel consumption has come down but this is more due to economic slowdown and less due to increase in diesel prices. The initial inflation due to diesel price rise has been transient and the diesel price rise has negligible role to play in the current CPI inflation. The economy is likely to enjoy the macro benefits of removal of diesel subsidy once the CPI inflation is contained after which interest rates can start coming down providing impetus to growth and investment

8. Annexure-1

Data sources

The information about Wholesale price index and Consumer price index is taken from economic survey of India (2011-12, 2012-13, 2013-14).

The wholesale prices are taken with base year 2004-05, i.e. wholesale price index (overall), wholesale price of diesel and wholesale price of food all are taken with base year 2004-05.

In order to add Wholesale price index to Consumer price index model, Wholesale price index series is spliced and converted with 2010 base year.

Index of Consumer price for diesel is taken by Diesel retail price series in order to separate the effect of 'fuel and light' from only fuel.

Nomenclature of variables used

WPIAll04 =aggregate wholesale price index with base year 2004

WPI Food =Food commodity group of Wholesale price index

WPI Diesel =Diesel commodity group of Wholesale price index

WPI Electricity = Electricity commodity group of Wholesale price index

WPI Manufacture=manufacturing commodity group of Wholesale price index

WPINON Food = NON Food commodity group of Wholesale price index

WPI Coal= Coal commodity group of Wholesale price index

CPI All= aggregate consumer price index with base year 2010

CPIFOOD= Food commodity group of consumer price index

WPIFOOD2010=Food commodity group of wholesale price index with 2010 as base year

ę=error term