

A STUDY OF THE IMPACT OF CRUDE OIL PRICES ON THE INDIAN ECONOMY

A Dissertation submitted in
Partial Fulfilment of the
Honours Degree of
Bachelors in Business Economics

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CERTIFICATE

This is to certify that the dissertation entitled “**A Study of the Impact of Crude oil prices on the Indian economy**” is the project work carried out by the students of *Sri Guru Nanak Dev Khalsa College, University of Delhi*. This report has not been submitted to any other College/Institute for the award of any Degree/Diploma.

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EXECUTIVE SUMMARY

Economic development around the world has seen an upsurge in the demand for energy. Two-thirds of India's energy demand consists of crude oil and coal. Nearly eighty percent of crude oil requirements of India are fulfilled through imports.

In the research undertaken, the focus is on finding the relationship between the crude oil prices and the Wholesale Price Index. The various tests conducted on the data collected have shown that there indeed exists a positive relationship between the crude oil prices and WPI. One percent increase in the crude oil price does lead to 0.57 percent increase in the WPI of the commodity.

Along with this, a second model has also been studied which included the impact of inflation rate on the GDP growth rate of India. Quarter-wise data of past five years has been recorded and the relationship between the two variables has been conveniently established. There exists a positive relationship between inflation rate and GDP growth rate implying that they are positively correlated. One percent increase in the inflation rate leads to 0.3001 increase in the GDP growth rate.

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INTRODUCTION

Energy is the prerequisite for sustaining economic growth of a country and vital for the sustenance of a modern economy. For any developing economy, an effective strategy for the energy sector is an important element of its overall economic strategy.

With rapid economic development, there has been a rampant increase in the energy demand in the country. Crude oil and coal account for nearly two thirds for the total energy demand in India.

Crude oil, often called 'Black Gold' is naturally occurring unrefined petroleum products consists of hydrocarbon deposits and other organic materials. Crude oil is refined and processed into other products such as gasoline, diesel and different forms of petrochemicals.

Today, India has become the fourth largest consumer of oil in the world. India meets majority of its oil demand, nearly eighty percent through imports and therefore, any fluctuation in the global market has a disproportionate impact on the macro-economic variables which highlights the economy's performance.

The oil and gas industry is one of India's six core industries. India is the fourth largest consumer of crude oil and petroleum products in the world. In 2013, only US, China, and Japan were ahead of India in the import of these products. It's a net importer of crude oil. India's import dependency is almost 80%. In the context of domestic consumption, it requires imports of almost 77% of demand.

Composition of Crude Oil:

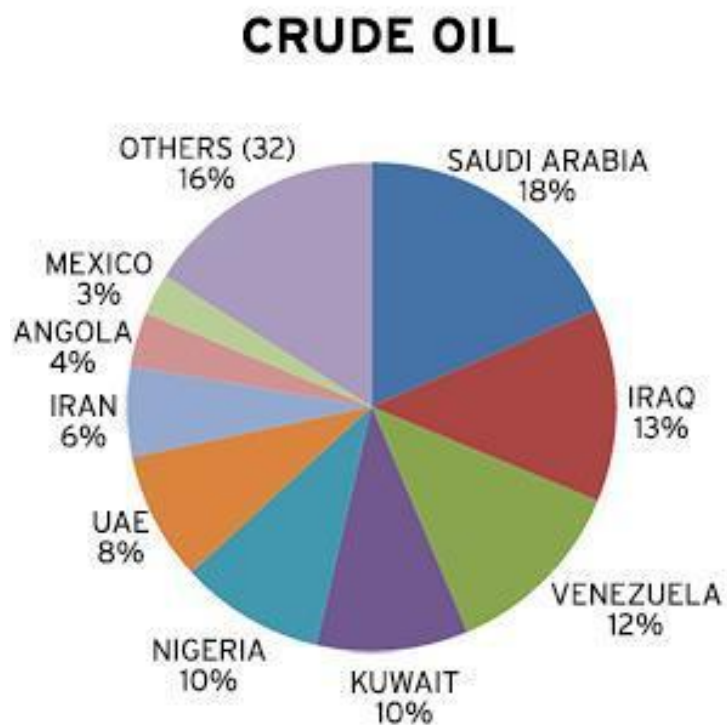
| Element | Weight | Hydrocarbon | Weight |
|----------|----------|-------------|--------|
| Carbon | 83-87% | Paraffins | 30% |
| Hydrogen | 10 - 14% | Naphthenes | 49% |
| Nitrogen | 0.1-2% | Aromatics | 15% |
| Oxygen | 0.1-1.5% | Asphaltics | 6% |
| Sulphur | 0.5-6% | | |
| Metals | <0.1% | | |

The hydrocarbon weight % values are averages.

The exports of Crude Oil in India in 2015 are as follows:

| Month (2015) | Imports of Crude Oil (in Million Tonne) |
|--------------|---|
| January | 17.56 |
| February | 12.99 |
| March | 16.49 |
| April | 15.53 |
| May | 17.45 |
| June | 15.62 |
| July | 17.73 |
| August | 17.23 |
| September | 15.79 |
| October | 15.57 |
| November | 16.51 |
| December | 17.97 |

Indian Imports of Crude Oil (Country-wise)



Impact of falling Crude Oil prices on India :-

1. Current Account Deficit

India largely relies on oil imports in order to satisfy its crude oil needs be it crude petroleum or mineral oils. Almost 80 percent of its oil needs are met by imports which accounts for about one third of India's total imports. The fall in the price of crude oil significantly affect India since it drives down the value of its imports. In turn it leads to reduction in the Current Account deficit which accounts for the money India owes to the world in foreign currency. As per the report in Livemint, "A fall in oil prices by \$10 helps reduce the current account deficit by \$9.2 billion" which is nearly equal to 0.43 percent of the Gross Domestic Product of the country.

2. Inflation

Oil is a core commodity and any fluctuation in its price affects the whole economy of the country. It has various uses including its use in the transportation of goods and services. Therefore, any change in the price of crude oil has a direct and significant impact on the prices of goods and services. Economy as a whole is impacted when petrol and diesel prices rises as it further leads to a rise in inflation. A very high inflation is extremely dangerous for any country's country. The fall in the global crude oil price is a boom for an oil importing country such as India. According to a report in Moneycontrol, "Every \$10 barrel fall in crude oil price helps reduce retail inflation by 0.2 percent and wholesale price inflation by 0.5 percent."

3. Relationship between oil subsidy and fiscal deficit

The fuel prices are fixed by the government at a subsidized rate throughout the country. The losses suffered by the companies due to selling the fuel at lower rates are compensated by the government. These losses are called the under-recoveries. Falling oil prices helps in reducing the fiscal deficit by reducing the losses suffered by the company and reducing the oil subsidy.

However, due to the recent deregulation of diesel prices, the fall in the oil prices might not affect government's fiscal deficit significantly. Also, the government is bound to pay the previous under-recoveries. The gains from the present situation will be offset by the previous incurred amounts.

4. Rupee Exchange Rate

The value of Rupee depends on the fluctuations in the currency market which impacts its demand. It relies greatly on the current account deficit. A high deficit implies more rupees to be sold in exchange of dollars to pay bill. This depreciates the value of rupee. Fall in the crude oil prices globally thus, have a positive impact on the rupee since the current account deficits are declining.

However, falling crude oil prices also strengthens the dollar which in turn negates any benefit which arises from the fall in the current account deficit.

5. Fall in Indian exports

Any rise or fall in the global crude oil prices has an impact on the exports of a country. A large number of India's trading partner countries are net exporters of oil such as Saudi Arabia, United Arab Emirates etc. A fall in the oil prices has negatively impacted the economies of these countries and as a result, the demand for the Indian export products has also fallen. This has both directly and indirectly impacted India and its companies. India is already running in trade deficit and at a time when it is imperative to have high exports and low imports, a fall in the exports is not good.

LITERATURE REVIEW

Zied Ftiti, Aviral Tiwari, Ibrahim Fatnassi (2014): Oil price and macro economy in India: An evolutionary co-spectral coherence approach (Working paper in IPAG Business School, Paris, France)

The working paper focused on determining whether a relationship is present between crude oil prices and macro economic variables such as industrial production, inflation measured by Wholesale Price Index, Trade deficit, external account sustainability and India-US exchange rate. As per the research conducted the result is that the degree of co-movement between the oil price index and the overall macroeconomic variables exhibit different patterns across the macroeconomic indicators. However, a common feature among the calculated co-movements is that they are higher in the short-term than in long-term. As economic implication, this later traduces that an oil shocks has lower long-run effect (weak persistent effect) on the India macro economy.

Pankaj Bhattacharjee (2013): A study of the impact of crude oil prices on Indian economy (Working paper in Padamshree Dr. D.Y. Patil University, Department of Business Management)

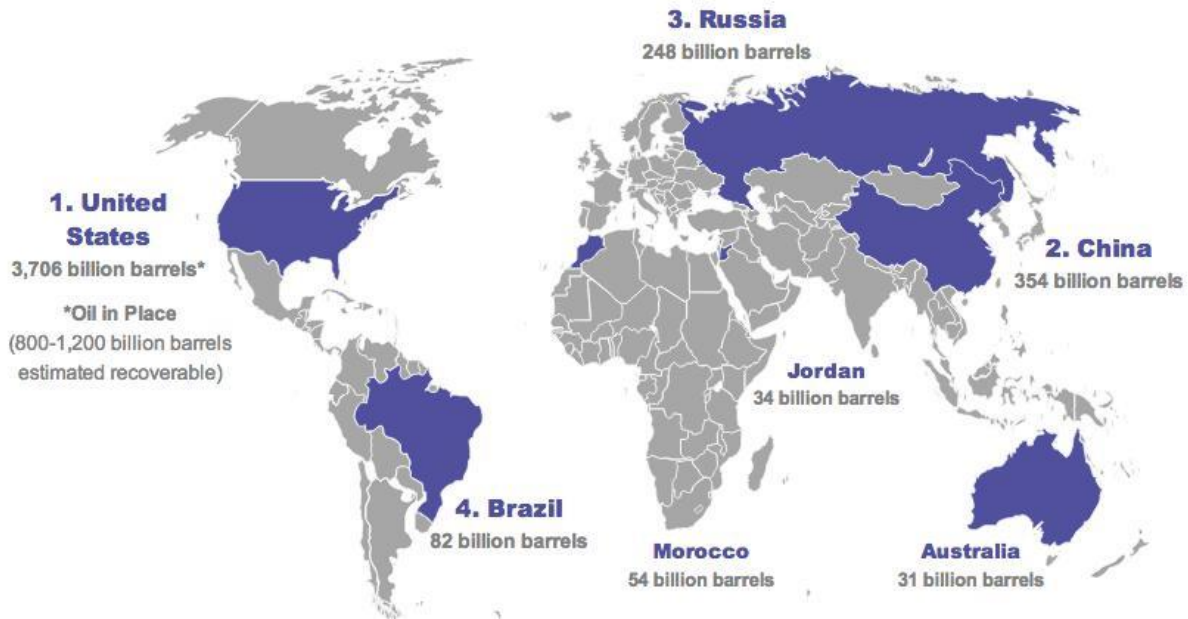
The study reveals that the crude oil prices have a significant inflationary impact on the rising whole sale price index of the Indian economy. With the tests conducted on the data collected such as the calculation of the Karl Pearson's Coefficient of Correlation, it is shown that there exists a positive relationship between the Crude oil prices and the Wholesale Price Index (WPI). Along with this, it is also established in the research that inflation extensively impacts the falling GDP of India. The study also shows that the time series data of the variables which are crude oil price change rate, inflation rate and GDP growth are constant or stationary with respect to unit root test for both Crude oil price change rate and GDP growth respectively.

The research paper also shows the steps which can be taken up by Refiners and explorers to meet the requirements of Crude oil. Certain steps which have been discussed in the research paper are that the availability of resources for sustainable development should be ensured, accessibility for resources for growth should be ensured, initiative for strategic reserve should be undertaken. Also, in terms of the corporate sector, Diversification strategy has been discussed which implies that the companies in the oil sector should diversify into becoming conglomerates delaing in

Nuclear energy, Renewable energy like tidal energy, solar energy, biomass energy, wind energy through alliance or collaboration with domain expert for Green energy.

Adam Lyons, Michael Hurley, John Hawksworth, William Zimmern (2013): Shale oil: The next energy revolution, the long term impact of shale oil on the global energy sector and the economy (PwC UK)

Oil Shale Reserves in the World:



The research undertaken focused on discovering the long term impacts of the shale on the global energy sector as well as the economy. Shale oil is rapidly emerging as a significant and comparatively cheaper resource in the US. Shale oil is a highly potential resource of crude oil production to spread globally over the next few decades. If shale oil production is promoted globally, then, it is capable of providing long term energy security at a lower cost for various countries. The research analyses that the shale oil production has the potential to reach 14 billion barrels oil per day by 2035. It also visualizes the fact that the fall in the prices of oil due to exceeding supply will help boost the GDP of net oil importing countries such as India and Japan by 4-7 percent, while US, UK, the Euro zone and China might gain by 2-5 percent.

As per the research conducted, the results are “At a global level, shale oil has the potential to reshape the global economy, increasing energy security, independence and affordability in the long term. The effects of a lower oil price resonate along the entire energy value chain, and investment choices based on long-term predictions of a steady increase in real oil prices may need to be reassessed. The potential magnitude of the impact of shale oil makes it a profound force for change in energy markets and the wider global economy. It is therefore critical for companies and policy-makers to consider the strategic implications of these changes now.

OBJECTIVES OF THE RESEARCH

1. To closely monitor the change in the crude oil prices over the years.

Brent crude oil prices, January 2014 - January 2016



Source: Bloomberg



CLJ06 - Crude Oil WTI (NYMEX)



2. The impact of crude oil prices on the Wholesale Price Index of the products.

The Wholesale Price Index is an index which is used that measures and tracks the change in price of goods which are sold in bulk at a wholesale level, i.e., they are traded between the organizations rather than individuals. Wholesale Price Index is an important measure of inflation in various economies.

In the research project undertaken, the Wholesale Price Index is taken up for the sum of the commodities such as the crude petroleum and mineral oils. The mineral oil category consists of LPG, petrol, kerosene, aviation turbine fuel, high speed diesel, bitumen, furnace oil and lubricants.

3. The impact of inflation on the GDP growth rate of India.

Gross domestic Product (GDP) refers to the monetary value of all finished goods and services produced in the domestic territories of a country over a period of time be it quarterly or on yearly basis. GDP of a country is an important indicator of the health of the country.

In the research project undertaken, the Gross Domestic Product Growth rate is taken on a quarterly basis.

VARIABLES OF STUDY

Model 1:

1. **Independent variable**: Crude oil price
2. **Dependent variables**: Wholesale Price Index

Model 2:

1. **Independent variable**: Quarterly Inflation rate (WPI based)
2. **Dependent variable**: Quarterly GDP Growth Rate

HYPOTHESIS

Hypothesis 1:

H₀: Crude oil prices have no significant impact on the Wholesale Price Index of the country.

H₁: Crude oil prices play a significant role in the Wholesale Price Index of the country.

Hypothesis 2:

H₀: Inflation Rate has no significant impact on the GDP Growth Rate of the country.

H₁: Inflation Rate has a significant impact on the GDP Growth Rate of the country.

RESEARCH METHODOLOGY

The research undertaken has different areas of research such as econometric and analytical. These areas of research make use of secondary data. The sources of the data are the publications of various bodies such as the Ministry of Commerce and Industry, Reserve Bank of India and so on.

The various methods which will be used are:

Karl Pearson's Coefficient of Correlation:

The aim of this method is to find out the correlation between independent and dependent variables. In other words, it finds out the correlation between explanatory and response variables. It also aims to ascertain the direction of correlation, i.e., positive or negative.

Merits of Karl Pearson's Method of Correlation:

1. This method of Correlation determines the presence or absence of Correlation.
2. This method finds out the exact degree of Correlation.
3. This method helps in ascertaining the direction of Correlation whether positive or negative.
4. This method has various algebraic properties and helps in obtaining the values of other determinants such as the coefficient of correlation and so on.

Demerits of Karl Pearson's Method of Correlation:

1. This method is more difficult and complex to calculate in comparison to other methods.
2. This method gets affected by extreme values in calculation.
3. This method is based on various assumptions such as linear relationship, cause and effect relationship etc. which not always hold true.
4. In cases of homogeneous data, this can be misinterpreted.

The formula for calculating the Karl Pearson's Coefficient of Correlation is as follows:

$$r = \frac{\sum XY - \frac{\sum X \sum Y}{N}}{\sqrt{(\sum X^2 - \frac{(\sum X)^2}{N})(\sum Y^2 - \frac{(\sum Y)^2}{N})}}$$

Where,

N = Number of observations

$\sum X$ = Sum of X variables

$\sum Y$ = Sum of Y variables

$\sum XY$ = Sum of product of paired variables

$\sum X^2$ = Sum of X squared variables

$\sum Y^2$ = Sum of Y squared variables

Scatter Plot

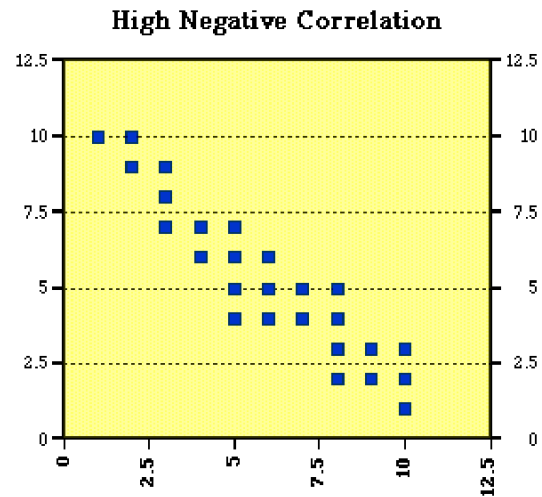
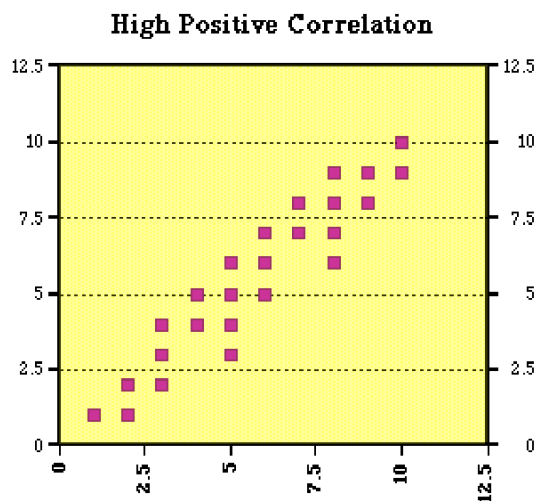
Scatter Plot is a plot which represents the values of Y to the corresponding values of X on a graph. They display how one data is affected by other data.

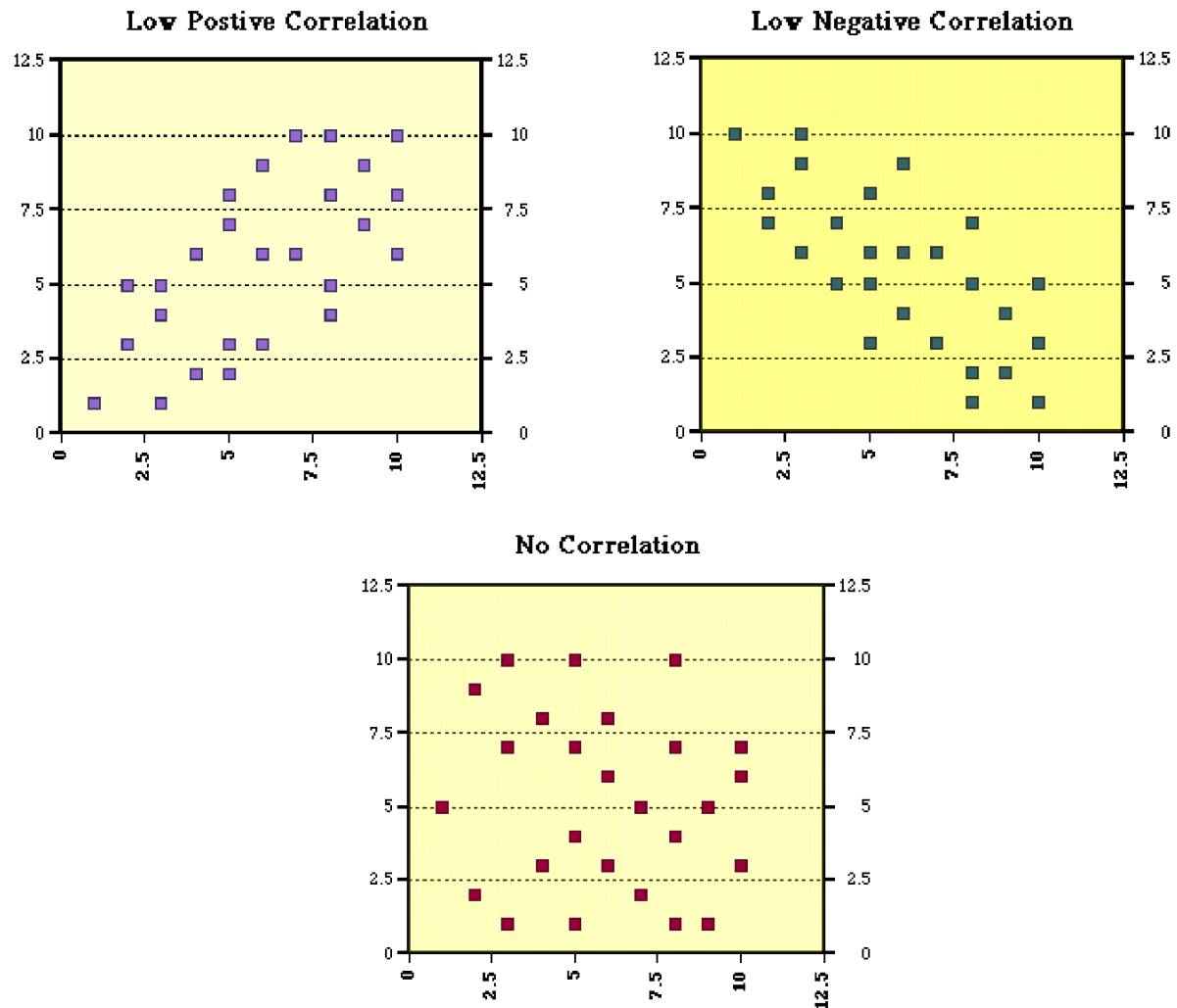
X Axis: The values on the X-axis represent the values of the independent variable. This variable is also called the Explanatory Variable.

Y Axis: The values on the Y-axis represent the values of the dependant variable. This variable is also called the Response Variable.

Scatter Plots are also called Scatter Charts, Scatter diagrams or Scatter Graphs.

There are different types of Scatter Plots which depict different degree of Correlation:





Two-variable Linear Regression

A model is said to be linear if the variable Y which is the response variable is a linear function of every variable X which is the explanatory variable. A model is said to be linear if each parameter involved in it is raised to the power of one only and is also not multiplied or divided by any other parameter. In other words, a linear regression model is linear in its parameters.

$$Y_t = a + bX + u_t$$

Where,

Y_t = denotes the dependant variable or response variable

a = denotes constant quantity, i.e., the intercept on the line on Y-axis

b = denotes the coefficient of X

X = denotes the independent variable or explanatory variable

u_t = denotes the residual or error term of the model

Coefficient of Determination (R^2 or R-squared)

The coefficient of determination is the statistical toll which indicates how well the data is fitted to the statistical model. The coefficient of determination is denoted by R^2 or r^2 .

$R^2 = 1$, regression line perfectly fits the data

$R^2 = 0$, regression line does not fit the data

R^2 is a statistic which gives information regarding the goodness of fit of the model. The closer the value of R^2 to 1, the model is a good fit and the closer the value of R^2 to 0, the model is a bad fit.

$$R^2 = \frac{\text{Explained Variation in Y}}{\text{Total variation in Y}}$$

$$\text{Explained variation in Y} = \sum_{t=1}^n (Y_t^{\wedge} - \bar{Y})^2$$

$$\text{Total variation in Y} = \sum_{t=1}^n (Y_t - \bar{Y})^2$$

$$R^2 = \frac{\sum_{t=1}^n (Y_t^{\wedge} - \bar{Y})^2}{\sum_{t=1}^n (Y_t - \bar{Y})^2}$$

Adjusted R-squared

Adjusted R-squared is a modified version of R-squared adjusted against the number of terms present in the model. Major difference which lies between R-squared and Adjusted R-squared is that the value of R-squared increases when a new value or data is added to the model whereas, the value of Adjusted r-squared increases only if the new value or data term added improves the model than was expected by chance.

$$\bar{R}^2 = 1 - \frac{SS_{res}/df_e}{SS_{tot}/df_t}$$

ANOVA

ANOVA is a statistical tool which stands for Analysis of Variance which was developed by Ronald Fischer in 1918.

Total Sum of Squares (SST): It implies sum of the squared differences between actual Y and its mean $E(Y)$

Regression Sum of Squares (SSR): It implies the sum of squared differences between the predicted value of Y and its mean $E(Y)$

Error Sum of Squares (SSE): it implies the sum of squared differences between the actual Y and the predicted Y^{\wedge}

Assumptions used in ANOVA are:

1. The expected value of the errors is zero.
2. The variances of all errors are equal to each-other.
3. The errors in the model are independent.
4. The errors are normally distributed.

| ANOVA type | Model and design properties |
|----------------------|--|
| One-way | One fixed factor (levels set by investigator) which can have either an unequal (unbalanced) or equal (balanced) number of observations per treatment. |
| Balanced | Model may contain any number of fixed and random factors (levels are randomly selected), and crossed and nested factors, but requires a balanced design. |
| General linear model | Expands on Balanced ANOVAs by allowing unbalanced designs and covariates (continuous variables). |

F-test

The main purpose of F-test is to compare the factors of the total deviation.

$$F = \frac{\{(\text{Explained variation}) / (k - 1)\}}{\{(\text{Unexplained variation}) / (N - k)\}}$$

Where,

k= number of estimated parameters,

N = number of observations.

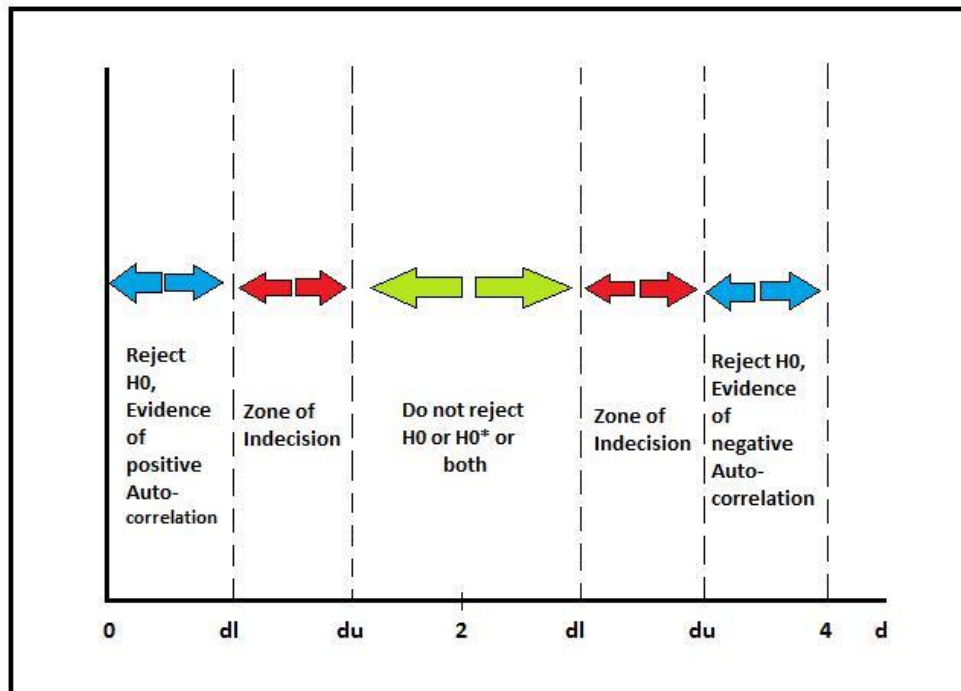
P-Value test

The probability that the value of the test statistics is at least as extreme as its computed value on the basis of the sample data under the null hypothesis is called P-value.

If P-value is greater than alpha, then the null hypothesis at alpha level of significance is rejected.

If P-value is less than alpha, then the null hypothesis at alpha level of significance is not rejected.

Durbin-Watson Test



MODEL 1:

KARL PEARSON'S REGRESSION COEFFICIENT (r):

$$r = \frac{\sum XY - \frac{\sum X \sum Y}{N}}{\sqrt{(\sum X^2 - \frac{(\sum X)^2}{N})(\sum Y^2 - \frac{(\sum Y)^2}{N})}}$$

Note: Wholesale Price Index = WPI of Crude Petroleum + WPI of Mineral oil (LPG, Petrol, kerosene, Aviation Turbine Fuel, High Speed Diesel, Bitumen, Furnace Oil, Lubricants)

(Making use of Appendix Table 1)

$$r = 0.551897$$

$$r^2 = 0.304$$

TIME SERIES REGRESSION EQUATION

$$Y_t = a + bX + u_t$$

Where,

Y_t = denotes the Wholesale Price Index (base year 2004-05)

a = denotes constant quantity, i.e., the intercept on the line on Y-axis

b = denotes the coefficient of X

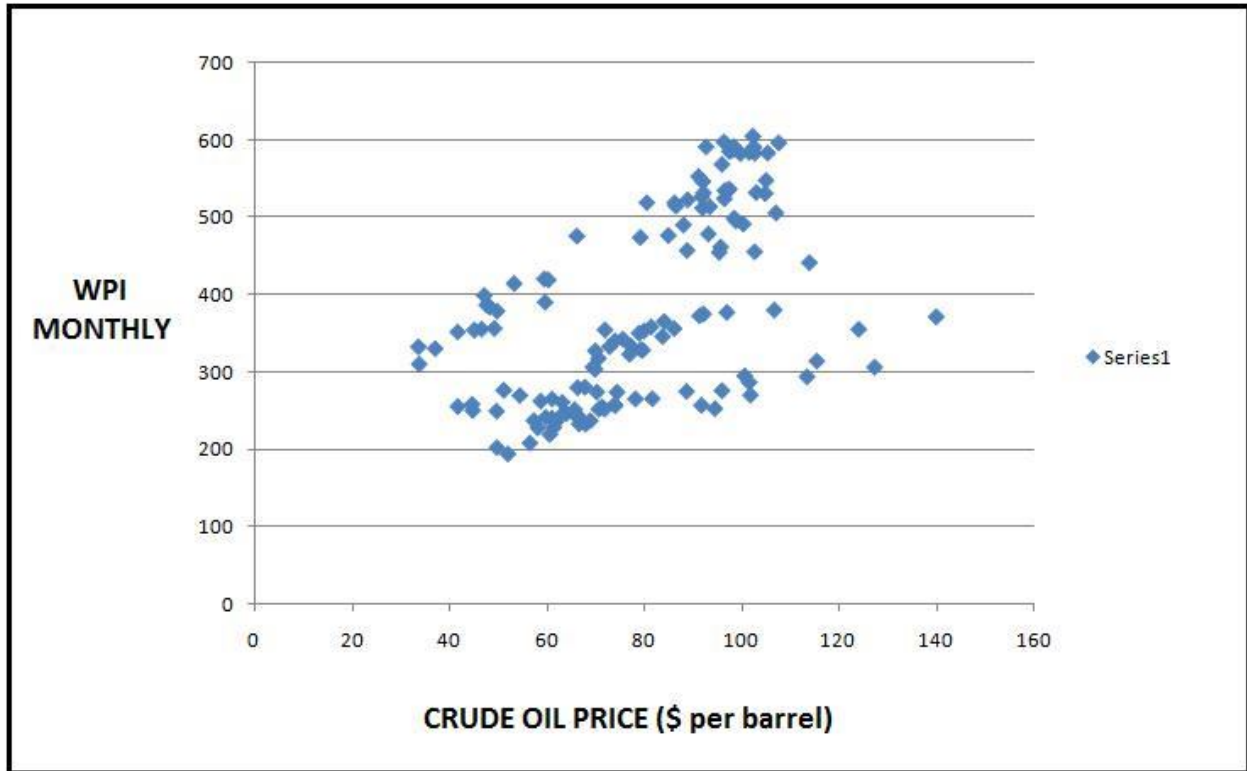
X = denotes the Crude oil price (taken on 1st day of every month)

u_t = denotes the residual or error term of the model

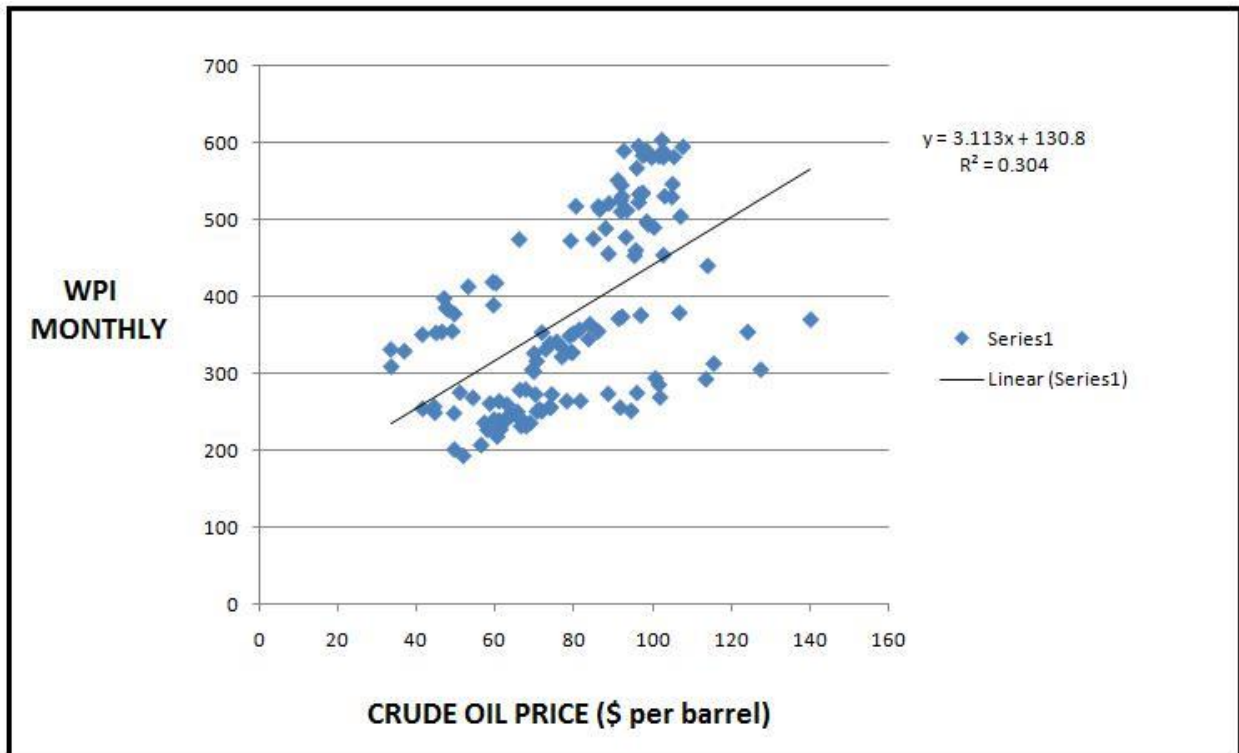
This implies that the time series regression equation which will be arrived will be in the form:

$$\mathbf{WPI = a + b*Crude oil price}$$

SCATTER PLOT OF X AND Y :



FITTING A REGRESSION LINE:



The equation, $WPI = 130.8 + 3.113 * \text{Crude oil price}$, fits the relationship between the change in WPI on the change in the crude oil price. The estimated slope, “b^”, is 3.113; that is,

$$“b^” = \frac{\text{Changes in Y}}{\text{Changes in X}} = \frac{\text{Change in percent of WPI}}{\text{Change in percent of crude oil price}} = 3.113$$

TWO VARIABLE REGRESSION EQUATION

(Making use of Appendix table 2)

$$b^ = \{N(\sum X_t Y_t) - (\sum X_t)(\sum Y_t)\} \div \{N(\sum X_t^2) - (\sum X_t)^2\}$$

$$b^ = \{131*(4094458.472) - (49408.1)*(10362.55)\} / \{131*(879484.1353) - (10362.55)^2\}$$

$$b^ = 3.113$$

$$a^ = \bar{Y} - b^ \bar{X}$$

$$a^ = 377.16 - (3.113 * 79.1)$$

$$a^ = 130.8 \text{ (approx)}$$

Therefore, the two variable regression equation is

$$\mathbf{WPI = 130.8 + 3.113 * \text{Crude oil price}}$$

TEST OF SIGNIFICANCE OF ESTIMATE PARAMETERS

H₀ : There is no significant relationship between WPI and the crude oil price, i.e., b = 0

H₁ : There is a significant relationship between WPI and the Crude oil prices, i.e., b > 0 or b < 0

$$\text{Variance of } b = \frac{\sum (Y_t - \hat{Y}_t)^2}{\{(N-k) \sum (X_t - \bar{X})^2\}} = \frac{\sum e_t^2}{\{(N-k) \sum (X_t - \bar{X})^2\}}$$

Standard error of b = SQRT (Variance of b)

(Making use of Appendix table 3)

$$\text{Variance of } b = \frac{\sum (Y_t - \hat{Y}_t)^2}{\{(N-k) \sum (X_t - \bar{X})^2\}} = \frac{\sum e_t^2}{\{(N-k) \sum (X_t - \bar{X})^2\}}$$

$$\text{Variance of } b = (1323012.95) / (131 - 2) * (59770.8353) = 0.171587$$

$$\text{Standard Error of } b = \text{SQRT}(\text{Variance of } b) = \text{SQRT}(0.171587) = 0.414231$$

Applying the “t” test,

$$t = (b^{\wedge} - b) / \text{S.E}$$

$$t = (3.113 - 0) / 0.414231 = 7.515$$

The degree of freedom is n-k, where n = 131 (number of observations) and k = 2 (number of parameters)

INTERPRETATION: The critical t values for different degrees of freedom can be checked in the t – table. The t test is usually performed at 5 per cent level number 129 under the degrees of freedom. When 129 degree of freedom is linked with 5 per cent level of confidence, under the column 0.05, the critical t value derived is 1.96 for the “two – tailed test”. The value of t calculated in the regression analysis is 7.515. This value of t (i.e., 7.515) far exceeds the critical t value (i.e., 1.96) at the 5 per cent level of significance. Therefore, the null hypothesis that “there is no relationship between Y (WPI) and X (Crude oil price)” is rejected. The rejection of null hypothesis at 5 per cent level of significance means that there is a statistically significant relationship between Y (WPI) and X (Crude oil price). More precisely, the conclusion derived is that we are 95 per cent confident that there is a statistically significant relationship between Y (WPI) and X (Crude oil price).

TEST OF GOODNESS OF FIT: COEFFICIENT OF CORRELATION

$$R^2 = \frac{\text{Explained Variation in Y}}{\text{Total variation in Y}}$$

$$\text{Explained variation in Y} = \sum_{t=1}^{nt-1} (\hat{Y}_t - \bar{Y})^2$$

$$\text{Total variation in Y} = \sum_{t=1}^{nt-1} (Y_t - \bar{Y})^2$$

Thus, the coefficient of determination (R^2) can be redefined in terms of the ratio of explained variation in Y and total variation in Y as

$$R^2 = \frac{\sum_{t=1}^n (Y_t^{\wedge} - Y)^2}{\sum_{t=1}^n (Y_t - Y)^2}$$

(Making use of Appendix table 4)

$$R^2 = 579227 / 1902495 = 0.304$$

$$r = \text{SQRT}(R^2) = \text{SQRT}(0.304) = 0.55136$$

ANALYSIS OF VARIANCE (ANOVA)

$$F = \frac{\{(\text{Explained variation}) / (k - 1)\}}{\{(\text{Unexplained variation}) / (N - k)\}}$$

Where k= number of estimated parameters, N = number of observations.

The F – statistics can also be calculated by the following formula,

$$F = \frac{R^2 / (k-1)}{(1 - R^2) / (N-k)}$$

$$F = \frac{(0.304) / (2-1)}{(1 - 0.304) / (131-2)} = 56.3448$$

The degree of freedom for the Numerator is $n-1 = 2-1 = 1$

The degree of freedom for the Denominator is $n-k = 131-2 = 129$

INTERPRETATION: The critical F values for different degrees of freedom can be checked in the F – table. The F test is usually performed at 5 per cent level number 129 under the degrees of freedom. When 129 degree of freedom is linked with 5 per cent level of confidence, under the column 0.05, the critical F value derived is 8.3399 for the “two – tailed test”. The value of t calculated in the regression analysis is 56.3448. This value of t (i.e., 56.3448) far exceeds the

critical t value (i.e., 8.3399) at the 5 per cent level of significance. Therefore, the null hypothesis that “there is no relationship between Y (WPI) and X (Crude oil price)” is rejected. The rejection of null hypothesis at 5 per cent level of significance means that there is a statistically significant relationship between Y (WPI) and X (Crude oil price). More precisely, the conclusion derived is that we are 95 per cent confident that there is a statistically significant relationship between Y (WPI) and X (Crude oil price).

| Model | R | R square | Adjusted R square | Standard error of the estimate | Number of observations |
|-------|---------|----------|-------------------|--------------------------------|------------------------|
| 1 | 0.55136 | 0.304 | 0.2992 | 0.4142 | 129 |

Linest Function

| | |
|----------|----------|
| 3.113693 | 130.8572 |
| 0.414231 | 33.94069 |
| 0.304591 | 101.2714 |
| 56.50243 | 129 |
| 579483.3 | 1323011 |

The table explains the values as follows:

1. Coefficient of X (b) = 3.113693
2. Standard error of b = 0.414231
3. $R^2 = 0.304591$
4. F-value = 56.50243
5. Sum of squares of Regression = 579423.3
6. Intercept (a) = 130.8592
7. Standard error of Intercept = 33.94069
8. Standard error of Regression = 101.2714
9. Degree of freedom = 129
10. Sum of squares of Residual = 1323011

SUMMARY OF REGRESSION OUTPUT

| <i>Regression Statistics</i> | |
|------------------------------|-------------|
| Multiple R | 0.551897923 |
| R Square | 0.304591317 |
| Adjusted R Square | 0.299200552 |
| Standard Error | 101.2714241 |
| Observations | 131 |

LOG NATURAL TRANSFORMATION DATA OF WPI AND CRUDE OIL PRICE

(Making use of Appendix table 5)

SUMMARY OF REGRESSION OUTPUT

| <i>Regression Statistics</i> | |
|------------------------------|-------------|
| Multiple R | 0.527278271 |
| R Square | 0.278022375 |
| Adjusted R Square | 0.272425649 |
| Standard Error | 0.27270414 |
| Observations | 131 |

E-VIEWS OUTPUT OF REGRESSION

| Dependent Variable: YT Method: Least Squares Date: 04/02/16 Time: 16:19 Sample: 1 131 Included observations: 131 | | | | |
|--|-------------|---------------------------------|-------------|----------|
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| C | 130.8572 | 33.94069 | 3.855468 | 0.0002 |
| XT | 3.113693 | 0.414231 | 7.51681 | 0 |
| R-squared | 0.304591 | Mean dependent var | | 377.1611 |
| Adjusted R-squared | 0.299201 | S.D. dependent var | | 120.9734 |
| S.E. of regression | 101.2714 | Akaike info criterion | | 12.08864 |
| Sum squared resid | 1323011 | Schwarz criterion | | 12.13253 |
| Log likelihood | -789.8056 | Hannan-Quinn criter. | | 12.10647 |
| F-statistic | 56.50243 | Durbin-Watson stat | | 0.044655 |
| Prob(F-statistic) | 0 | | | |

MODEL 2:

KARL PEARSON'S CORRELATION COEFFICIENT

(Making use of Appendix Table 6)

(NOTE: The WPI based inflation rates have been averaged out for every quarter based on the monthly data available on the website)

$$r = \frac{\sum XY - \frac{\sum X \sum Y}{N}}{\sqrt{(\sum X^2 - \frac{(\sum X)^2}{N})(\sum Y^2 - \frac{(\sum Y)^2}{N})}}$$

$$r = 0.43635$$

$$r \text{ squared} = 0.1904$$

TIME SERIES REGRESSION EQUATION

$$Y_t = a + bX + u_t$$

Where,

Y_t = denotes the quarterly India GDP Growth rate

a = denotes constant quantity, i.e., the intercept on the line on Y-

axis b = denotes the coefficient of X

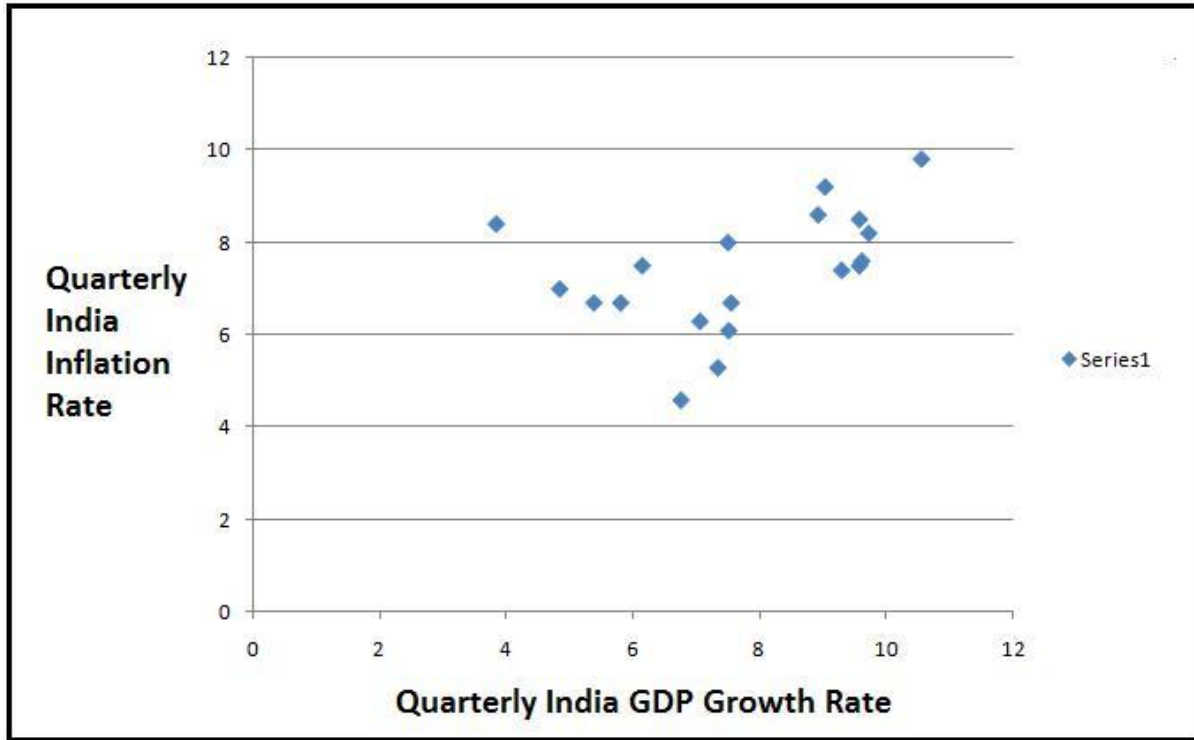
X = denotes the quarterly India inflation rate

u_t = denotes the residual or error term of the model

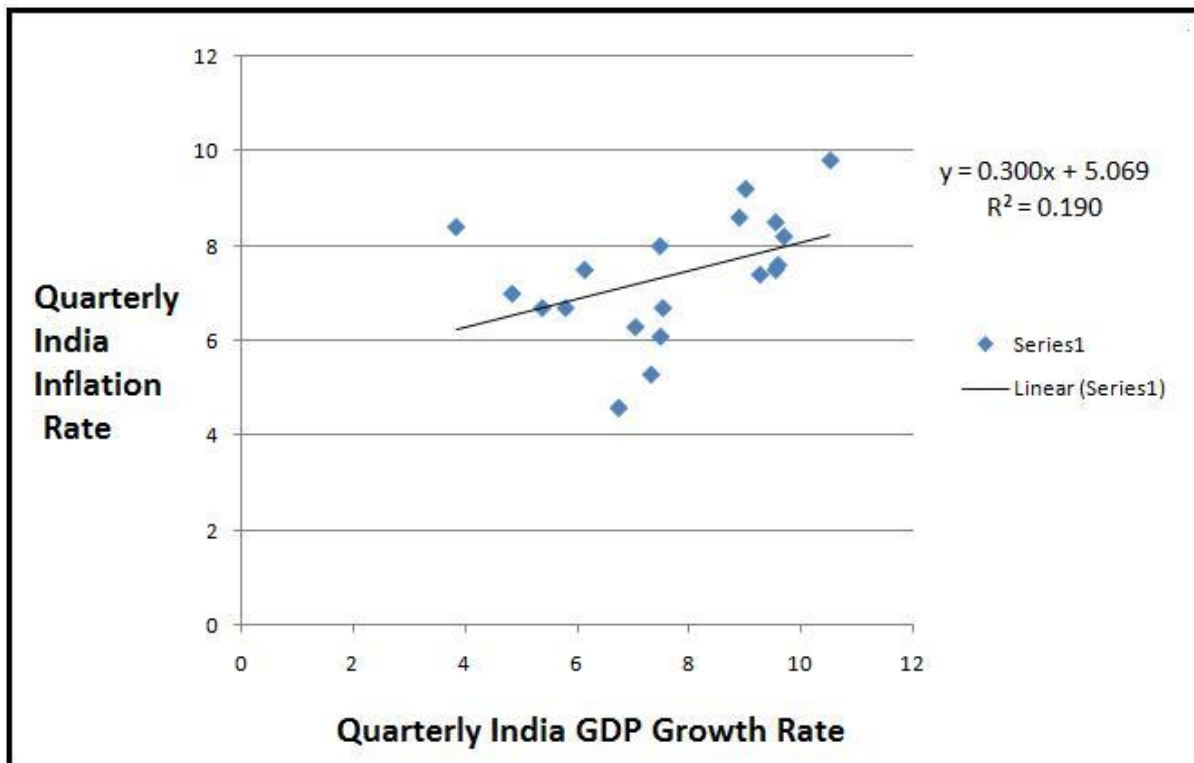
Therefore, the time series regression equation for the given model is as follows:

$$\text{Quarterly GDP growth rate} = a + b * \text{Quarterly inflation rate}$$

SCATTER PLOT OF X AND Y:



FITTING A REGRESSION LINE:



The equation, Quarterly GDP Growth = 5.069 + 0.300 *Quarterly Inflation Rate, fits the relationship between the change in GDP Growth Rate on the change in the Inflation Rate. The estimated slope, „b^“, is 0.300; that is,

$$“b^” = \frac{\text{Changes in Y}}{\text{Changes in X}} = \frac{\text{Change in percent of WPI}}{\text{Change in percent of crude oil price}} = 3.0016$$

TWO VARIABLE REGRESSION ANALYSIS

(Making use of Appendix Table 7)

$$b1^ = (\Sigma xtyt) / \Sigma x^2$$

$$= (19.3316) / (64.4038) = 0.30016$$

$$a^ = E(Y) - b^E(X)$$

$$= 7.37 - (0.30016 * 7.68) = 5.0648 \text{ Therefore,}$$

the two variable equation formed is

$$\text{Quarterly GDP Growth} = 5.0648 + 0.30016 * \text{Quarterly Inflation Rate}$$

CALCULATION OF STANDARD ERROR OF COEFFICIENT

(Making use of Appendix table 8)

$$SSE = \Sigma (Y_t - Y^)^2 = 24.674$$

$$MSE (\text{Estimate of } \sigma^2) = S^2 = \frac{SSE}{N-2} = \frac{24.674}{19-2} = 1.4514$$

To estimate σ , we take the square root of S^2 , the resulting value; S is referred to as the standard error of estimate.

$$\text{Therefore, } S = \text{SQRT}(MSE) = \text{SQRT}(1.4514) = 1.2047$$

t-TEST

H₀: There is no significant relationship between the two variables, i.e., b is equal to 0.

H₁: There is a significant relationship between the two variables, i.e., b is not equal to 0.

$$S.E = \frac{S}{\text{SQRT} \{ \Sigma (X - E(X))^2 \}} = \frac{1.2047}{64.4038} = 0.0187$$

$$t = (b_1^{\wedge} - b_1) / S.E$$

$$t = (0.30016 - 0) / 0.0187$$

$$t = 16.05$$

The degree of freedom is n-k, where n = 19 (number of observations) and k = 2 (number of parameters)

INTERPRETATION: The critical t values for different degrees of freedom can be checked in the t – table. The t test is usually performed at 5 per cent level number 17 under the degrees of freedom. When 17 degree of freedom is linked with 5 per cent level of confidence, under the column 0.05, the critical t value derived is 2.11 for the “two – tailed test”. The value of t calculated in the regression analysis is 16.05. This value of t (i.e., 16.05) far exceeds the critical t value (i.e., 2.11) at the 5 per cent level of significance. Therefore, the null hypothesis that “there is no relationship between Y (Quarterly Inflation Rate) and X (Quarterly GDP Growth Rate)” is rejected. The rejection of null hypothesis at 5 per cent level of significance means that there is a statistically significant relationship between Y (WPI) and X (Crude oil price). More precisely, the conclusion derived is that we are 95 per cent confident that there is a statistically significant relationship between Y (Quarterly Inflation Rate) and X (Quarterly GDP Growth Rate).

CONFIDENCE INTERVAL OF b

The confidence interval of b is

$$b \pm t_{\alpha/2} S.E (b)$$

$$P(0.30016 - 4.45 \leq b \leq 0.30016 + 4.45) = 1 - 0.05$$

$$P(-4.14984 \leq b \leq 4.75016) = 0.95$$

LINEST FUNCTION

| | |
|-------------|-------------|
| 0.300168559 | 5.069653544 |
| 0.15012079 | 1.184979007 |
| 0.190401189 | 1.204745888 |
| 3.998054566 | 17 |
| 5.802826988 | 24.67401512 |

The table explains the values as follows:

1. Coefficient of X (b) = 0.300168559
2. Standard error of b = 0.15012079
3. $R^2 = 0.190401189$
4. F-value = 3.998054566
5. Sum of squares of Regression = 5.802826988
6. Intercept (a) = 5.069653544
7. Standard error of Intercept = 1.18497007
8. Standard error of Regression = 1.204745888
9. Degree of freedom = 17
10. Sum of squares of Residual = 24.67401512

SUMMARY TABLE

| <i>Regression Statistics</i> | |
|------------------------------|-------------|
| Multiple R | 0.436349848 |
| R Square | 0.190401189 |
| Adjusted R Square | 0.14277773 |
| Standard Error | 1.204745888 |
| Observations | 19 |

LOG TRANSFORMATION DATA OF GDP GROWTH RATE AND INFLATION RATE

(Making use of Appendix table 9)

SUMMARY OF REGRESSION OUTPUT

| <i>Regression Statistics</i> | |
|------------------------------|-------------|
| Multiple R | 0.436349848 |
| R Square | 0.190401189 |
| Adjusted R Square | 0.14277773 |
| Standard Error | 1.204745888 |
| Observations | 19 |

E-VIEWS OUTPUT OF REGRESSION

| Dependent Variable: Y | | | | |
|----------------------------|-------------|------------------------------|-------------|----------|
| Method: Least Squares | | | | |
| Date: 04/02/16 Time: 16:12 | | | | |
| Sample: 1 19 | | | | |
| Included observations: 19 | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| C | 5.069654 | 1.184979 | 4.278264 | 0.0005 |
| X | 0.300169 | 0.150121 | 1.999514 | 0.0618 |
| R-squared | 0.190401 | Mean dependent var | | 7.373684 |
| Adjusted R-squared | 0.142778 | S.D. dependent var | | 1.301214 |
| S.E. of regression | 1.204746 | Akaike info criterion | | 3.309715 |
| Sum squared resid | 24.67402 | Schwarz criterion | | 3.40913 |
| Log likelihood | -29.44229 | Hannan-Quinn criter. | | 3.32654 |
| F-statistic | 3.998055 | Durbin-Watson stat | | 1.340523 |
| Prob(F-statistic) | 0.061796 | | | |

RESULT

In the light of the researches already conducted, the following results have been established.

In the first Model, the relationship between the crude oil prices and Wholesale Price Index was extensively researched upon deriving various relationships between both the variables.

1. As per the calculations done, R squared comes at 0.304 which implies that R squared explains 30.4 percent variation in Wholesale Price Index is due to Crude oil price. Such a low value implies that our independent variable (crude oil prices) is not explaining our dependant variable (Wholesale Price Index) quite well. Here, as per the data available, the Wholesale Price Index is the sum total of the WPI of Crude Petroleum and the WPI of Mineral oil which consists of LPG, Petrol, kerosene, Aviation Turbine Fuel, High Speed Diesel, Bitumen, Furnace Oil and Lubricants. Along with this, the goodness of fit test showed that the data was not an excellent fit.
2. Two-tailed t-test conducted on the data taken at five percent level of significance proved that a significant relationship was present between the crude oil prices and the Wholesale Price Index.
3. Comparing the data derived from various sources Analysis of Variance test showed the perfectly fine result since the sum of Sum of squares of regression (SSR) and Sum of square of errors (SSE) came out to be Total sum of squares.
4. The tests conducted on the model also involve the P-value test which implies the probability that the value of test statistics is at least as extreme as its computed value on the basis of sample data under null hypothesis. Here, the data is considered at five percent level of significance and the P value arrived at for this model is 8.34 percent. Since the P-value is greater than five percent, it is sure that the null hypothesis is not rejected.
5. In the Durbin Watson conducted, the dl value derived is 3.340 and the du value derived as 3.475. The value calculated in the E views model is 0.044655. This implies that the null hypothesis is rejected and there is some evidence of positive autocorrelation.
6. The log transformation of the data collected showed the conversion of the simple linear model into a log-log model which showed that one percent increase in the crude oil price will lead to 0.5749 percent increase in the Wholesale Price Index of the commodity.

All the tests conducted on Model 1, correctly establishes the fact that there exists some relationship between the Crude oil prices and the Wholesale Price Index (WPI).

In the second Model, the relationship between the quarterly inflation rate and quarterly GDP growth rate has been researched upon and the relationships between the two variables have been arrived at.

1. As per the calculations done, R squared comes at 0.1904 which implies R squared explains 19.04 percent variation in quarterly GDP growth rate is due to quarterly inflation rate. Such a low value implies that our independent variable (quarterly inflation rate) is not explaining our dependant variable (quarterly GDP growth rate) quite well. Along with this, the goodness of fit test showed that the data was not an excellent fit.
2. Two-tailed t-test conducted on the data taken at five percent level of significance proved that a significant relationship was present between inflation rate and the GDP growth rate.
3. Comparing the data derived from various sources Analysis of Variance test showed the perfectly fine result since the sum of Sum of squares of regression (SSR) and Sum of square of errors (SSE) came out to be Total sum of squares.
4. The P-value arrived at for Model two is 6.1796 percent which is greater than the five percent level of significance considered. Greater P-value indicates that the null hypothesis is not rejected.
5. The tests also included the confidence interval derived for the slope intercept (b), that is, at five percent level of significance the slope intercept lies between -4.14984 and 4.75016.
6. In the Durbin Watson conducted, the dl value derived is 1.074 and the du value derived as 1.536. The value calculated in the E views model is 1.340523. This implies that value calculated lies in the zone of indecision.
7. The log transformation of the data collected showed the conversion of the simple linear model into a log-log model which showed that one percent increase in the quarterly inflation rate will lead to 0.300169 percent increase in the quarterly GDP growth rate.

Therefore, all the tests conducted on the second model conclude that there exists some relationship between the inflation rate and GDP growth rate.

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APPENDIX

Appendix Table 1:

(BASE YEAR: 2004-05)

| Months | Wholesale Price Index (Variable Y) | Crude Oil Prices (\$) (Variable X) | XY | X square | Y square |
|---------------|---|---|-----------|-----------------|-----------------|
| Feb'16 | 310.1 | 33.75 | 10465.875 | 1139.0625 | 96162.01 |
| Jan'16 | 332.4 | 33.62 | 11175.288 | 1130.3044 | 110489.76 |
| Dec'15 | 330.1 | 37.04 | 12226.904 | 1371.9616 | 108966.01 |
| Nov'15 | 351.7 | 41.65 | 14648.305 | 1734.7225 | 123692.89 |
| Oct'15 | 355.3 | 46.59 | 16553.427 | 2170.6281 | 126238.09 |
| Sep'15 | 354 | 45.09 | 15961.86 | 2033.1081 | 125316 |
| Aug'15 | 356.1 | 49.2 | 17520.12 | 2420.64 | 126807.21 |
| July'15 | 398.8 | 47.12 | 18791.456 | 2220.2944 | 159041.44 |
| June'15 | 420.1 | 59.47 | 24983.347 | 3536.6809 | 176484.01 |
| May'15 | 418.9 | 60.3 | 25259.67 | 3636.09 | 175477.21 |
| Apr'15 | 390.1 | 59.63 | 23261.663 | 3555.7369 | 152178.01 |
| Mar'15 | 386.4 | 47.6 | 18392.64 | 2265.76 | 149304.96 |
| Feb'15 | 378.5 | 49.76 | 18834.16 | 2476.0576 | 143262.25 |
| Jan'15 | 383.9 | 48.24 | 18519.336 | 2327.0976 | 147379.21 |
| Dec'14 | 414 | 53.27 | 22053.78 | 2837.6929 | 171396 |
| Nov'14 | 475.3 | 66.15 | 31441.095 | 4375.8225 | 225910.09 |
| Oct'14 | 518.6 | 80.54 | 41768.044 | 6486.6916 | 268945.96 |
| Sep'14 | 552.4 | 91.16 | 50356.784 | 8310.1456 | 305145.76 |
| Aug'14 | 568 | 95.96 | 54505.28 | 9208.3216 | 322624 |
| July'14 | 586.4 | 98.17 | 57566.888 | 9637.3489 | 343864.96 |
| June'14 | 582.6 | 105.37 | 61388.562 | 11102.8369 | 339422.76 |
| May'14 | 582.3 | 102.71 | 59808.033 | 10549.3441 | 339073.29 |
| Apr'14 | 581.9 | 99.74 | 58038.706 | 9948.0676 | 338607.61 |
| Mar'14 | 583.6 | 101.58 | 59282.088 | 10318.4964 | 340588.96 |
| Feb'14 | 590.1 | 102.59 | 60538.359 | 10524.7081 | 348218.01 |
| Jan'14 | 584.5 | 97.49 | 56982.905 | 9504.3001 | 341640.25 |
| Dec'13 | 591 | 98.42 | 58166.22 | 9686.4964 | 349281 |
| Nov'13 | 590.5 | 92.72 | 54751.16 | 8596.9984 | 348690.25 |
| Oct'13 | 596.8 | 96.38 | 57519.584 | 9289.1044 | 356170.24 |
| Sep'13 | 604.3 | 102.33 | 61838.019 | 10471.4289 | 365178.49 |
| Aug'13 | 595.7 | 107.65 | 64127.105 | 11588.5225 | 354858.49 |

| | | | | | |
|---------------|-------|--------|-----------|------------|-----------|
| July'13 | 547.3 | 105.03 | 57482.919 | 11031.3009 | 299537.29 |
| June'13 | 534.1 | 96.56 | 51572.696 | 9323.8336 | 285262.81 |
| May'13 | 511.6 | 91.97 | 47051.852 | 8458.4809 | 261734.56 |
| Apr'13 | 513.3 | 93.46 | 47973.018 | 8734.7716 | 263476.89 |
| Mar'13 | 534.2 | 97.23 | 51940.266 | 9453.6729 | 285369.64 |
| Feb'13 | 545.9 | 92.05 | 50250.095 | 8473.2025 | 298006.81 |
| Jan'13 | 536 | 97.49 | 52254.64 | 9504.3001 | 287296 |
| Dec'12 | 526.1 | 91.82 | 48306.502 | 8430.9124 | 276781.21 |
| Nov'12 | 522.2 | 88.91 | 46428.802 | 7904.9881 | 272692.84 |
| Oct'12 | 518.3 | 86.24 | 44698.192 | 7437.3376 | 268634.89 |
| Sep'12 | 531.1 | 92.19 | 48962.109 | 8498.9961 | 282067.21 |
| Aug'12 | 523.6 | 96.47 | 50511.692 | 9306.4609 | 274156.96 |
| July'12 | 489.7 | 88.06 | 43122.982 | 7754.5636 | 239806.09 |
| June'12 | 476.2 | 84.96 | 40457.952 | 7218.2016 | 226766.44 |
| May'12 | 514.2 | 86.53 | 44493.726 | 7487.4409 | 264401.64 |
| Apr'12 | 530.4 | 104.87 | 55623.048 | 10997.7169 | 281324.16 |
| Mar'12 | 531.6 | 103.02 | 54765.432 | 10613.1204 | 282598.56 |
| Feb'12 | 505.3 | 107.07 | 54102.471 | 11463.9849 | 255328.09 |
| Jan'12 | 498.5 | 98.48 | 49092.28 | 9698.3104 | 248502.25 |
| Dec'11 | 495.1 | 98.83 | 48930.733 | 9767.3689 | 245124.01 |
| Nov'11 | 490.9 | 100.36 | 49266.724 | 10072.1296 | 240982.81 |
| Oct'11 | 478.1 | 93.19 | 44554.139 | 8684.3761 | 228579.61 |
| Sep'11 | 473.6 | 79.2 | 37509.12 | 6272.64 | 224296.96 |
| Aug'11 | 456.8 | 88.81 | 40568.408 | 7887.2161 | 208666.24 |
| July'11 | 461.2 | 95.7 | 44136.84 | 9158.49 | 212705.44 |
| June'11 | 454.3 | 95.42 | 43349.306 | 9104.9764 | 206388.49 |
| May'11 | 455.1 | 102.7 | 46738.77 | 10547.29 | 207116.01 |
| Apr'11 | 441.1 | 113.93 | 50254.523 | 12980.0449 | 194569.21 |
| Mar'11 | 380 | 106.72 | 40553.6 | 11389.1584 | 144400 |
| Feb'11 | 376.9 | 96.97 | 36547.993 | 9403.1809 | 142053.61 |
| Jan'11 | 374.8 | 92.19 | 34552.812 | 8498.9961 | 140475.04 |
| Dec'10 | 372.5 | 91.38 | 34039.05 | 8350.3044 | 138756.25 |
| Nov'10 | 365.2 | 84.11 | 30716.972 | 7074.4921 | 133371.04 |
| Oct'10 | 358.2 | 81.43 | 29168.226 | 6630.8449 | 128307.24 |
| Sep'10 | 353 | 79.97 | 28229.41 | 6395.2009 | 124609 |
| Aug'10 | 354.3 | 71.92 | 25481.256 | 5172.4864 | 125528.49 |
| July'10 | 350 | 78.95 | 27632.5 | 6233.1025 | 122500 |
| June'10 | 342.4 | 75.63 | 25895.712 | 5719.8969 | 117237.76 |
| May'10 | 340.1 | 73.97 | 25157.197 | 5471.5609 | 115668.01 |
| Apr'10 | 356 | 86.15 | 30669.4 | 7421.8225 | 126736 |
| Mar'10 | 345.8 | 83.76 | 28964.208 | 7015.7376 | 119577.64 |

| | | | | | |
|---------------|-------|--------|-----------|------------|-----------|
| Feb'10 | 328.2 | 79.66 | 26144.412 | 6345.7156 | 107715.24 |
| Jan'10 | 332.7 | 72.89 | 24250.503 | 5312.9521 | 110689.29 |
| Dec'09 | 328.7 | 79.36 | 26085.632 | 6298.0096 | 108043.69 |
| Nov'09 | 333.5 | 77.28 | 25772.88 | 5972.1984 | 111222.25 |
| Oct'09 | 322.8 | 77 | 24855.6 | 5929 | 104199.84 |
| Sep'09 | 317.4 | 70.61 | 22411.614 | 4985.7721 | 100742.76 |
| Aug'09 | 327.3 | 69.96 | 22897.908 | 4894.4016 | 107125.29 |
| July'09 | 306.3 | 69.45 | 21272.535 | 4823.3025 | 93819.69 |
| June'09 | 303.6 | 69.89 | 21218.604 | 4884.6121 | 92172.96 |
| May'09 | 279.7 | 66.31 | 18546.907 | 4397.0161 | 78232.09 |
| Apr'09 | 276.4 | 51.12 | 14129.568 | 2613.2544 | 76396.96 |
| Mar'09 | 249.4 | 49.66 | 12385.204 | 2466.1156 | 62200.36 |
| Feb'09 | 250.2 | 44.76 | 11198.952 | 2003.4576 | 62600.04 |
| Jan'09 | 255.3 | 41.68 | 10640.904 | 1737.2224 | 65178.09 |
| Dec'08 | 258.1 | 44.6 | 11511.26 | 1989.16 | 66615.61 |
| Nov'08 | 269.6 | 54.43 | 14674.328 | 2962.6249 | 72684.16 |
| Oct'08 | 280.3 | 67.81 | 19007.143 | 4598.1961 | 78568.09 |
| Sep'08 | 295 | 100.64 | 29688.8 | 10128.4096 | 87025 |
| Aug'08 | 314 | 115.46 | 36254.44 | 13331.0116 | 98596 |
| July'08 | 355 | 124.08 | 44048.4 | 15395.8464 | 126025 |
| June'08 | 371.2 | 140 | 51968 | 19600 | 137789.44 |
| May'08 | 306.2 | 127.35 | 38994.57 | 16218.0225 | 93758.44 |
| Apr'08 | 293.7 | 113.46 | 33323.202 | 12873.1716 | 86259.69 |
| Mar'08 | 286.6 | 101.58 | 29112.828 | 10318.4964 | 82139.56 |
| Feb'08 | 270.1 | 101.84 | 27506.984 | 10371.3856 | 72954.01 |
| Jan'08 | 257 | 91.75 | 23579.75 | 8418.0625 | 66049 |
| Dec'07 | 275.9 | 95.98 | 26480.882 | 9212.1604 | 76120.81 |
| Nov'07 | 274.8 | 88.71 | 24377.508 | 7869.4641 | 75515.04 |
| Oct'07 | 252.6 | 94.53 | 23878.278 | 8935.9209 | 63806.76 |
| Sep'07 | 265.4 | 81.66 | 21672.564 | 6668.3556 | 70437.16 |
| Aug'07 | 256.5 | 74.04 | 18991.26 | 5481.9216 | 65792.25 |
| July'07 | 265.2 | 78.21 | 20741.292 | 6116.8041 | 70331.04 |
| June'07 | 251.9 | 70.68 | 17804.292 | 4995.6624 | 63453.61 |
| May'07 | 246.3 | 64.01 | 15765.663 | 4097.2801 | 60663.69 |
| Apr'07 | 251.4 | 65.71 | 16519.494 | 4317.8041 | 63201.96 |
| Mar'07 | 244.5 | 65.87 | 16105.215 | 4338.8569 | 59780.25 |
| Feb'07 | 235.4 | 61.79 | 14545.366 | 3818.0041 | 55413.16 |
| Jan'07 | 228 | 58.14 | 13255.92 | 3380.2596 | 51984 |
| Dec'06 | 265.1 | 61.05 | 16184.355 | 3727.1025 | 70278.01 |
| Nov'06 | 260.9 | 63.13 | 16470.617 | 3985.3969 | 68068.81 |
| Oct'06 | 262.3 | 58.73 | 15404.879 | 3449.2129 | 68801.29 |

| | | | | | |
|------------------|---------|----------|-------------|-------------|-------------|
| Sep'06 | 243.5 | 62.91 | 15318.585 | 3957.6681 | 59292.25 |
| Aug'06 | 274 | 70.26 | 19251.24 | 4936.4676 | 75076 |
| July'06 | 273.9 | 74.4 | 20378.16 | 5535.36 | 75021.21 |
| June'06 | 258 | 73.93 | 19073.94 | 5465.6449 | 66564 |
| May'06 | 254.8 | 71.29 | 18164.692 | 5082.2641 | 64923.04 |
| Apr'06 | 252 | 71.88 | 18113.76 | 5166.7344 | 63504 |
| Mar'06 | 232.9 | 66.63 | 15518.127 | 4439.5569 | 54242.41 |
| Feb'06 | 228.6 | 61.41 | 14038.326 | 3771.1881 | 52257.96 |
| Jan'06 | 232.7 | 67.92 | 15804.984 | 4613.1264 | 54149.29 |
| Dec'05 | 240.2 | 61.04 | 14661.808 | 3725.8816 | 57696.04 |
| Nov'05 | 237.1 | 57.32 | 13590.572 | 3285.5824 | 56216.41 |
| Oct'05 | 241.4 | 59.76 | 14426.064 | 3571.2576 | 58273.96 |
| Sep'05 | 244 | 66.24 | 16162.56 | 4387.7376 | 59536 |
| Aug'05 | 237.1 | 68.94 | 16345.674 | 4752.7236 | 56216.41 |
| July'05 | 219.3 | 60.57 | 13283.001 | 3668.7249 | 48092.49 |
| June'05 | 208.2 | 56.5 | 11763.3 | 3192.25 | 43347.24 |
| May'05 | 194.2 | 51.97 | 10092.574 | 2700.8809 | 37713.64 |
| Apr'05 | 202.3 | 49.72 | 10058.356 | 2472.0784 | 40925.29 |
| | | | | | |
| N = 131 | | | | | |
| | | | | | |
| SUMMATION | 49408.1 | 10362.55 | 4094458.472 | 879484.1353 | 20537306.41 |
| | | | | | |
| AVERAGE | 377.16 | 79.1 | 31255.41 | 6713.62 | 156773.33 |

[Source : Wholesale Price Index: www.eaindustry.nic.in, Office of economic Advisor, Government of India, Ministry of Commerce and Industry, Department of Industrial policy and Promotion (DIPP)]

Appendix Table 2:

| Months | Wholesale Price Index (monthly) | Crude Oil Prices (\$) | XtYt | X square |
|---------------|--|------------------------------|-------------|-----------------|
| | Yt | Xt | | |
| Feb'16 | 310.1 | 33.75 | 10465.875 | 1139.0625 |
| Jan'16 | 332.4 | 33.62 | 11175.288 | 1130.3044 |
| Dec'15 | 330.1 | 37.04 | 12226.904 | 1371.9616 |
| Nov'15 | 351.7 | 41.65 | 14648.305 | 1734.7225 |
| Oct'15 | 355.3 | 46.59 | 16553.427 | 2170.6281 |
| Sep'15 | 354 | 45.09 | 15961.86 | 2033.1081 |
| Aug'15 | 356.1 | 49.2 | 17520.12 | 2420.64 |
| July'15 | 398.8 | 47.12 | 18791.456 | 2220.2944 |
| June'15 | 420.1 | 59.47 | 24983.347 | 3536.6809 |
| May'15 | 418.9 | 60.3 | 25259.67 | 3636.09 |
| Apr'15 | 390.1 | 59.63 | 23261.663 | 3555.7369 |
| Mar'15 | 386.4 | 47.6 | 18392.64 | 2265.76 |
| Feb'15 | 378.5 | 49.76 | 18834.16 | 2476.0576 |
| Jan'15 | 383.9 | 48.24 | 18519.336 | 2327.0976 |
| Dec'14 | 414 | 53.27 | 22053.78 | 2837.6929 |
| Nov'14 | 475.3 | 66.15 | 31441.095 | 4375.8225 |
| Oct'14 | 518.6 | 80.54 | 41768.044 | 6486.6916 |
| Sep'14 | 552.4 | 91.16 | 50356.784 | 8310.1456 |
| Aug'14 | 568 | 95.96 | 54505.28 | 9208.3216 |
| July'14 | 586.4 | 98.17 | 57566.888 | 9637.3489 |
| June'14 | 582.6 | 105.37 | 61388.562 | 11102.8369 |
| May'14 | 582.3 | 102.71 | 59808.033 | 10549.3441 |
| Apr'14 | 581.9 | 99.74 | 58038.706 | 9948.0676 |
| Mar'14 | 583.6 | 101.58 | 59282.088 | 10318.4964 |
| Feb'14 | 590.1 | 102.59 | 60538.359 | 10524.7081 |
| Jan'14 | 584.5 | 97.49 | 56982.905 | 9504.3001 |
| Dec'13 | 591 | 98.42 | 58166.22 | 9686.4964 |
| Nov'13 | 590.5 | 92.72 | 54751.16 | 8596.9984 |
| Oct'13 | 596.8 | 96.38 | 57519.584 | 9289.1044 |
| Sep'13 | 604.3 | 102.33 | 61838.019 | 10471.4289 |
| Aug'13 | 595.7 | 107.65 | 64127.105 | 11588.5225 |
| July'13 | 547.3 | 105.03 | 57482.919 | 11031.3009 |
| June'13 | 534.1 | 96.56 | 51572.696 | 9323.8336 |
| May'13 | 511.6 | 91.97 | 47051.852 | 8458.4809 |
| Apr'13 | 513.3 | 93.46 | 47973.018 | 8734.7716 |
| Mar'13 | 534.2 | 97.23 | 51940.266 | 9453.6729 |
| Feb'13 | 545.9 | 92.05 | 50250.095 | 8473.2025 |
| Jan'13 | 536 | 97.49 | 52254.64 | 9504.3001 |

| | | | | |
|---------------|-------|--------|-----------|------------|
| Dec'12 | 526.1 | 91.82 | 48306.502 | 8430.9124 |
| Nov'12 | 522.2 | 88.91 | 46428.802 | 7904.9881 |
| Oct'12 | 518.3 | 86.24 | 44698.192 | 7437.3376 |
| Sep'12 | 531.1 | 92.19 | 48962.109 | 8498.9961 |
| Aug'12 | 523.6 | 96.47 | 50511.692 | 9306.4609 |
| July'12 | 489.7 | 88.06 | 43122.982 | 7754.5636 |
| June'12 | 476.2 | 84.96 | 40457.952 | 7218.2016 |
| May'12 | 514.2 | 86.53 | 44493.726 | 7487.4409 |
| Apr'12 | 530.4 | 104.87 | 55623.048 | 10997.7169 |
| Mar'12 | 531.6 | 103.02 | 54765.432 | 10613.1204 |
| Feb'12 | 505.3 | 107.07 | 54102.471 | 11463.9849 |
| Jan'12 | 498.5 | 98.48 | 49092.28 | 9698.3104 |
| Dec'11 | 495.1 | 98.83 | 48930.733 | 9767.3689 |
| Nov'11 | 490.9 | 100.36 | 49266.724 | 10072.1296 |
| Oct'11 | 478.1 | 93.19 | 44554.139 | 8684.3761 |
| Sep'11 | 473.6 | 79.2 | 37509.12 | 6272.64 |
| Aug'11 | 456.8 | 88.81 | 40568.408 | 7887.2161 |
| July'11 | 461.2 | 95.7 | 44136.84 | 9158.49 |
| June'11 | 454.3 | 95.42 | 43349.306 | 9104.9764 |
| May'11 | 455.1 | 102.7 | 46738.77 | 10547.29 |
| Apr'11 | 441.1 | 113.93 | 50254.523 | 12980.0449 |
| Mar'11 | 380 | 106.72 | 40553.6 | 11389.1584 |
| Feb'11 | 376.9 | 96.97 | 36547.993 | 9403.1809 |
| Jan'11 | 374.8 | 92.19 | 34552.812 | 8498.9961 |
| Dec'10 | 372.5 | 91.38 | 34039.05 | 8350.3044 |
| Nov'10 | 365.2 | 84.11 | 30716.972 | 7074.4921 |
| Oct'10 | 358.2 | 81.43 | 29168.226 | 6630.8449 |
| Sep'10 | 353 | 79.97 | 28229.41 | 6395.2009 |
| Aug'10 | 354.3 | 71.92 | 25481.256 | 5172.4864 |
| July'10 | 350 | 78.95 | 27632.5 | 6233.1025 |
| June'10 | 342.4 | 75.63 | 25895.712 | 5719.8969 |
| May'10 | 340.1 | 73.97 | 25157.197 | 5471.5609 |
| Apr'10 | 356 | 86.15 | 30669.4 | 7421.8225 |
| Mar'10 | 345.8 | 83.76 | 28964.208 | 7015.7376 |
| Feb'10 | 328.2 | 79.66 | 26144.412 | 6345.7156 |
| Jan'10 | 332.7 | 72.89 | 24250.503 | 5312.9521 |
| Dec'09 | 328.7 | 79.36 | 26085.632 | 6298.0096 |
| Nov'09 | 333.5 | 77.28 | 25772.88 | 5972.1984 |
| Oct'09 | 322.8 | 77 | 24855.6 | 5929 |
| Sep'09 | 317.4 | 70.61 | 22411.614 | 4985.7721 |
| Aug'09 | 327.3 | 69.96 | 22897.908 | 4894.4016 |

| | | | | |
|---------------|-------|--------|-----------|------------|
| July'09 | 306.3 | 69.45 | 21272.535 | 4823.3025 |
| June'09 | 303.6 | 69.89 | 21218.604 | 4884.6121 |
| May'09 | 279.7 | 66.31 | 18546.907 | 4397.0161 |
| Apr'09 | 276.4 | 51.12 | 14129.568 | 2613.2544 |
| Mar'09 | 249.4 | 49.66 | 12385.204 | 2466.1156 |
| Feb'09 | 250.2 | 44.76 | 11198.952 | 2003.4576 |
| Jan'09 | 255.3 | 41.68 | 10640.904 | 1737.2224 |
| Dec'08 | 258.1 | 44.6 | 11511.26 | 1989.16 |
| Nov'08 | 269.6 | 54.43 | 14674.328 | 2962.6249 |
| Oct'08 | 280.3 | 67.81 | 19007.143 | 4598.1961 |
| Sep'08 | 295 | 100.64 | 29688.8 | 10128.4096 |
| Aug'08 | 314 | 115.46 | 36254.44 | 13331.0116 |
| July'08 | 355 | 124.08 | 44048.4 | 15395.8464 |
| June'08 | 371.2 | 140 | 51968 | 19600 |
| May'08 | 306.2 | 127.35 | 38994.57 | 16218.0225 |
| Apr'08 | 293.7 | 113.46 | 33323.202 | 12873.1716 |
| Mar'08 | 286.6 | 101.58 | 29112.828 | 10318.4964 |
| Feb'08 | 270.1 | 101.84 | 27506.984 | 10371.3856 |
| Jan'08 | 257 | 91.75 | 23579.75 | 8418.0625 |
| Dec'07 | 275.9 | 95.98 | 26480.882 | 9212.1604 |
| Nov'07 | 274.8 | 88.71 | 24377.508 | 7869.4641 |
| Oct'07 | 252.6 | 94.53 | 23878.278 | 8935.9209 |
| Sep'07 | 265.4 | 81.66 | 21672.564 | 6668.3556 |
| Aug'07 | 256.5 | 74.04 | 18991.26 | 5481.9216 |
| July'07 | 265.2 | 78.21 | 20741.292 | 6116.8041 |
| June'07 | 251.9 | 70.68 | 17804.292 | 4995.6624 |
| May'07 | 246.3 | 64.01 | 15765.663 | 4097.2801 |
| Apr'07 | 251.4 | 65.71 | 16519.494 | 4317.8041 |
| Mar'07 | 244.5 | 65.87 | 16105.215 | 4338.8569 |
| Feb'07 | 235.4 | 61.79 | 14545.366 | 3818.0041 |
| Jan'07 | 228 | 58.14 | 13255.92 | 3380.2596 |
| Dec'06 | 265.1 | 61.05 | 16184.355 | 3727.1025 |
| Nov'06 | 260.9 | 63.13 | 16470.617 | 3985.3969 |
| Oct'06 | 262.3 | 58.73 | 15404.879 | 3449.2129 |
| Sep'06 | 243.5 | 62.91 | 15318.585 | 3957.6681 |
| Aug'06 | 274 | 70.26 | 19251.24 | 4936.4676 |
| July'06 | 273.9 | 74.4 | 20378.16 | 5535.36 |
| June'06 | 258 | 73.93 | 19073.94 | 5465.6449 |
| May'06 | 254.8 | 71.29 | 18164.692 | 5082.2641 |
| Apr'06 | 252 | 71.88 | 18113.76 | 5166.7344 |
| Mar'06 | 232.9 | 66.63 | 15518.127 | 4439.5569 |

| | | | | |
|------------------|---------|----------|-------------|-------------|
| Feb'06 | 228.6 | 61.41 | 14038.326 | 3771.1881 |
| Jan'06 | 232.7 | 67.92 | 15804.984 | 4613.1264 |
| Dec'05 | 240.2 | 61.04 | 14661.808 | 3725.8816 |
| Nov'05 | 237.1 | 57.32 | 13590.572 | 3285.5824 |
| Oct'05 | 241.4 | 59.76 | 14426.064 | 3571.2576 |
| Sep'05 | 244 | 66.24 | 16162.56 | 4387.7376 |
| Aug'05 | 237.1 | 68.94 | 16345.674 | 4752.7236 |
| July'05 | 219.3 | 60.57 | 13283.001 | 3668.7249 |
| June'05 | 208.2 | 56.5 | 11763.3 | 3192.25 |
| May'05 | 194.2 | 51.97 | 10092.574 | 2700.8809 |
| Apr'05 | 202.3 | 49.72 | 10058.356 | 2472.0784 |
| | | | | |
| Summation | 49408.1 | 10362.55 | 4094458.472 | 879484.1353 |
| | | | | |
| Average | 377.16 | 79.1 | 31255.41 | 6713.62 |

Appendix Table 3:

| Months | Wholesale Price Index (monthly) | Crude Oil Prices (\$) | Yt^ | et = Yt - Yt^ | (Yt - Yt^) squared | (Xt - X̄) | xt = (Xt - X̄) squared |
|---------------|---------------------------------|-----------------------|-----------|---------------|-----------------------|-----------|---------------------------|
| | Yt | Xt | | | | | |
| Feb'16 | 310.1 | 33.75 | 235.86375 | 74.23625 | 5511.02081 | -45.35 | 2056.6225 |
| Jan'16 | 332.4 | 33.62 | 235.45906 | 96.94094 | 9397.54585 | -45.48 | 2068.4304 |
| Dec'15 | 330.1 | 37.04 | 246.10552 | 83.99448 | 7055.07267 | -42.06 | 1769.0436 |
| Nov'15 | 351.7 | 41.65 | 260.45645 | 91.24355 | 8325.38542 | -37.45 | 1402.5025 |
| Oct'15 | 355.3 | 46.59 | 275.83467 | 79.46533 | 6314.73867 | -32.51 | 1056.9001 |
| Sep'15 | 354 | 45.09 | 271.16517 | 82.83483 | 6861.60906 | -34.01 | 1156.6801 |
| Aug'15 | 356.1 | 49.2 | 283.9596 | 72.1404 | 5204.23731 | -29.9 | 894.01 |
| July'15 | 398.8 | 47.12 | 277.48456 | 121.31544 | 14717.436 | -31.98 | 1022.7204 |
| June'15 | 420.1 | 59.47 | 315.93011 | 104.16989 | 10851.366 | -19.63 | 385.3369 |
| May'15 | 418.9 | 60.3 | 318.5139 | 100.3861 | 10077.3691 | -18.8 | 353.44 |
| Apr'15 | 390.1 | 59.63 | 316.42819 | 73.67181 | 5427.53559 | -19.47 | 379.0809 |
| Mar'15 | 386.4 | 47.6 | 278.9788 | 107.4212 | 11539.3142 | -31.5 | 992.25 |
| Feb'15 | 378.5 | 49.76 | 285.70288 | 92.79712 | 8611.30548 | -29.34 | 860.8356 |
| Jan'15 | 383.9 | 48.24 | 280.97112 | 102.92888 | 10594.3543 | -30.86 | 952.3396 |
| Dec'14 | 414 | 53.27 | 296.62951 | 117.37049 | 13775.8319 | -25.83 | 667.1889 |
| Nov'14 | 475.3 | 66.15 | 336.72495 | 138.57505 | 19203.0445 | -12.95 | 167.7025 |
| Oct'14 | 518.6 | 80.54 | 381.52102 | 137.07898 | 18790.6468 | 1.44 | 2.0736 |
| Sep'14 | 552.4 | 91.16 | 414.58108 | 137.81892 | 18994.0547 | 12.06 | 145.4436 |
| Aug'14 | 568 | 95.96 | 429.52348 | 138.47652 | 19175.7466 | 16.86 | 284.2596 |
| July'14 | 586.4 | 98.17 | 436.40321 | 149.99679 | 22499.037 | 19.07 | 363.6649 |
| June'14 | 582.6 | 105.37 | 458.81681 | 123.78319 | 15322.2781 | 26.27 | 690.1129 |
| May'14 | 582.3 | 102.71 | 450.53623 | 131.76377 | 17361.6911 | 23.61 | 557.4321 |
| Apr'14 | 581.9 | 99.74 | 441.29062 | 140.60938 | 19770.9977 | 20.64 | 426.0096 |
| Mar'14 | 583.6 | 101.58 | 447.01854 | 136.58146 | 18654.4952 | 22.48 | 505.3504 |
| Feb'14 | 590.1 | 102.59 | 450.16267 | 139.93733 | 19582.4563 | 23.49 | 551.7801 |
| Jan'14 | 584.5 | 97.49 | 434.28637 | 150.21363 | 22564.1346 | 18.39 | 338.1921 |
| Dec'13 | 591 | 98.42 | 437.18146 | 153.81854 | 23660.1432 | 19.32 | 373.2624 |
| Nov'13 | 590.5 | 92.72 | 419.43736 | 171.06264 | 29262.4268 | 13.62 | 185.5044 |
| Oct'13 | 596.8 | 96.38 | 430.83094 | 165.96906 | 27545.7289 | 17.28 | 298.5984 |
| Sep'13 | 604.3 | 102.33 | 449.35329 | 154.94671 | 24008.4829 | 23.23 | 539.6329 |
| Aug'13 | 595.7 | 107.65 | 465.91445 | 129.78555 | 16844.289 | 28.55 | 815.1025 |
| July'13 | 547.3 | 105.03 | 457.75839 | 89.54161 | 8017.69992 | 25.93 | 672.3649 |
| June'13 | 534.1 | 96.56 | 431.39128 | 102.70872 | 10549.0812 | 17.46 | 304.8516 |
| May'13 | 511.6 | 91.97 | 417.10261 | 94.49739 | 8929.75672 | 12.87 | 165.6369 |
| Apr'13 | 513.3 | 93.46 | 421.74098 | 91.55902 | 8383.05414 | 14.36 | 206.2096 |
| Mar'13 | 534.2 | 97.23 | 433.47699 | 100.72301 | 10145.1247 | 18.13 | 328.6969 |
| Feb'13 | 545.9 | 92.05 | 417.35165 | 128.54835 | 16524.6783 | 12.95 | 167.7025 |

| | | | | | | | |
|---------------|-------|--------|-----------|-----------|------------|-------|-----------|
| Jan'13 | 536 | 97.49 | 434.28637 | 101.71363 | 10345.6625 | 18.39 | 338.1921 |
| Dec'12 | 526.1 | 91.82 | 416.63566 | 109.46434 | 11982.4417 | 12.72 | 161.7984 |
| Nov'12 | 522.2 | 88.91 | 407.57683 | 114.62317 | 13138.4711 | 9.81 | 96.2361 |
| Oct'12 | 518.3 | 86.24 | 399.26512 | 119.03488 | 14169.3027 | 7.14 | 50.9796 |
| Sep'12 | 531.1 | 92.19 | 417.78747 | 113.31253 | 12839.7295 | 13.09 | 171.3481 |
| Aug'12 | 523.6 | 96.47 | 431.11111 | 92.48889 | 8554.19477 | 17.37 | 301.7169 |
| July'12 | 489.7 | 88.06 | 404.93078 | 84.76922 | 7185.82066 | 8.96 | 80.2816 |
| June'12 | 476.2 | 84.96 | 395.28048 | 80.91952 | 6547.96872 | 5.86 | 34.3396 |
| May'12 | 514.2 | 86.53 | 400.16789 | 114.03211 | 13003.3221 | 7.43 | 55.2049 |
| Apr'12 | 530.4 | 104.87 | 457.26031 | 73.13969 | 5349.41425 | 25.77 | 664.0929 |
| Mar'12 | 531.6 | 103.02 | 451.50126 | 80.09874 | 6415.80815 | 23.92 | 572.1664 |
| Feb'12 | 505.3 | 107.07 | 464.10891 | 41.19109 | 1696.7059 | 27.97 | 782.3209 |
| Jan'12 | 498.5 | 98.48 | 437.36824 | 61.13176 | 3737.09208 | 19.38 | 375.5844 |
| Dec'11 | 495.1 | 98.83 | 438.45779 | 56.64221 | 3208.33995 | 19.73 | 389.2729 |
| Nov'11 | 490.9 | 100.36 | 443.22068 | 47.67932 | 2273.31756 | 21.26 | 451.9876 |
| Oct'11 | 478.1 | 93.19 | 420.90047 | 57.19953 | 3271.78623 | 14.09 | 198.5281 |
| Sep'11 | 473.6 | 79.2 | 377.3496 | 96.2504 | 9264.1395 | 0.1 | 0.01 |
| Aug'11 | 456.8 | 88.81 | 407.26553 | 49.53447 | 2453.66372 | 9.71 | 94.2841 |
| July'11 | 461.2 | 95.7 | 428.7141 | 32.4859 | 1055.3337 | 16.6 | 275.56 |
| June'11 | 454.3 | 95.42 | 427.84246 | 26.45754 | 700.001423 | 16.32 | 266.3424 |
| May'11 | 455.1 | 102.7 | 450.5051 | 4.5949 | 21.113106 | 23.6 | 556.96 |
| Apr'11 | 441.1 | 113.93 | 485.46409 | -44.36409 | 1968.17248 | 34.83 | 1213.1289 |
| Mar'11 | 380 | 106.72 | 463.01936 | -83.01936 | 6892.21413 | 27.62 | 762.8644 |
| Feb'11 | 376.9 | 96.97 | 432.66761 | -55.76761 | 3110.02633 | 17.87 | 319.3369 |
| Jan'11 | 374.8 | 92.19 | 417.78747 | -42.98747 | 1847.92258 | 13.09 | 171.3481 |
| Dec'10 | 372.5 | 91.38 | 415.26594 | -42.76594 | 1828.92562 | 12.28 | 150.7984 |
| Nov'10 | 365.2 | 84.11 | 392.63443 | -27.43443 | 752.647949 | 5.01 | 25.1001 |
| Oct'10 | 358.2 | 81.43 | 384.29159 | -26.09159 | 680.771069 | 2.33 | 5.4289 |
| Sep'10 | 353 | 79.97 | 379.74661 | -26.74661 | 715.381146 | 0.87 | 0.7569 |
| Aug'10 | 354.3 | 71.92 | 354.68696 | -0.38696 | 0.14973804 | -7.18 | 51.5524 |
| July'10 | 350 | 78.95 | 376.57135 | -26.57135 | 706.036641 | -0.15 | 0.0225 |
| June'10 | 342.4 | 75.63 | 366.23619 | -23.83619 | 568.163954 | -3.47 | 12.0409 |
| May'10 | 340.1 | 73.97 | 361.06861 | -20.96861 | 439.682605 | -5.13 | 26.3169 |
| Apr'10 | 356 | 86.15 | 398.98495 | -42.98495 | 1847.70593 | 7.05 | 49.7025 |
| Mar'10 | 345.8 | 83.76 | 391.54488 | -45.74488 | 2092.59405 | 4.66 | 21.7156 |
| Feb'10 | 328.2 | 79.66 | 378.78158 | -50.58158 | 2558.49624 | 0.56 | 0.3136 |
| Jan'10 | 332.7 | 72.89 | 357.70657 | -25.00657 | 625.328543 | -6.21 | 38.5641 |
| Dec'09 | 328.7 | 79.36 | 377.84768 | -49.14768 | 2415.49445 | 0.26 | 0.0676 |
| Nov'09 | 333.5 | 77.28 | 371.37264 | -37.87264 | 1434.33686 | -1.82 | 3.3124 |
| Oct'09 | 322.8 | 77 | 370.501 | -47.701 | 2275.3854 | -2.1 | 4.41 |
| Sep'09 | 317.4 | 70.61 | 350.60893 | -33.20893 | 1102.83303 | -8.49 | 72.0801 |

| | | | | | | | |
|---------------|-------|--------|-----------|-----------|------------|--------|-----------|
| Aug'09 | 327.3 | 69.96 | 348.58548 | -21.28548 | 453.071659 | -9.14 | 83.5396 |
| July'09 | 306.3 | 69.45 | 346.99785 | -40.69785 | 1656.31499 | -9.65 | 93.1225 |
| June'09 | 303.6 | 69.89 | 348.36757 | -44.76757 | 2004.13532 | -9.21 | 84.8241 |
| May'09 | 279.7 | 66.31 | 337.22303 | -57.52303 | 3308.89898 | -12.79 | 163.5841 |
| Apr'09 | 276.4 | 51.12 | 289.93656 | -13.53656 | 183.238457 | -27.98 | 782.8804 |
| Mar'09 | 249.4 | 49.66 | 285.39158 | -35.99158 | 1295.39383 | -29.44 | 866.7136 |
| Feb'09 | 250.2 | 44.76 | 270.13788 | -19.93788 | 397.519059 | -34.34 | 1179.2356 |
| Jan'09 | 255.3 | 41.68 | 260.54984 | -5.24984 | 27.56082 | -37.42 | 1400.2564 |
| Dec'08 | 258.1 | 44.6 | 269.6398 | -11.5398 | 133.166984 | -34.5 | 1190.25 |
| Nov'08 | 269.6 | 54.43 | 300.24059 | -30.64059 | 938.845756 | -24.67 | 608.6089 |
| Oct'08 | 280.3 | 67.81 | 341.89253 | -61.59253 | 3793.63975 | -11.29 | 127.4641 |
| Sep'08 | 295 | 100.64 | 444.09232 | 149.09232 | 22228.5199 | 21.54 | 463.9716 |
| Aug'08 | 314 | 115.46 | 490.22698 | 176.22698 | 31055.9485 | 36.36 | 1322.0496 |
| July'08 | 355 | 124.08 | 517.06104 | 162.06104 | 26263.7807 | 44.98 | 2023.2004 |
| June'08 | 371.2 | 140 | 566.62 | -195.42 | 38188.9764 | 60.9 | 3708.81 |
| May'08 | 306.2 | 127.35 | 527.24055 | 221.04055 | 48858.9247 | 48.25 | 2328.0625 |
| Apr'08 | 293.7 | 113.46 | 484.00098 | 190.30098 | 36214.463 | 34.36 | 1180.6096 |
| Mar'08 | 286.6 | 101.58 | 447.01854 | 160.41854 | 25734.108 | 22.48 | 505.3504 |
| Feb'08 | 270.1 | 101.84 | 447.82792 | 177.72792 | 31587.2135 | 22.74 | 517.1076 |
| Jan'08 | 257 | 91.75 | 416.41775 | 159.41775 | 25414.019 | 12.65 | 160.0225 |
| Dec'07 | 275.9 | 95.98 | 429.58574 | 153.68574 | 23619.3067 | 16.88 | 284.9344 |
| Nov'07 | 274.8 | 88.71 | 406.95423 | 132.15423 | 17464.7405 | 9.61 | 92.3521 |
| Oct'07 | 252.6 | 94.53 | 425.07189 | 172.47189 | 29746.5528 | 15.43 | 238.0849 |
| Sep'07 | 265.4 | 81.66 | 385.00758 | 119.60758 | 14305.9732 | 2.56 | 6.5536 |
| Aug'07 | 256.5 | 74.04 | 361.28652 | 104.78652 | 10980.2148 | -5.06 | 25.6036 |
| July'07 | 265.2 | 78.21 | 374.26773 | 109.06773 | 11895.7697 | -0.89 | 0.7921 |
| June'07 | 251.9 | 70.68 | 350.82684 | -98.92684 | 9786.51967 | -8.42 | 70.8964 |
| May'07 | 246.3 | 64.01 | 330.06313 | -83.76313 | 7016.26195 | -15.09 | 227.7081 |
| Apr'07 | 251.4 | 65.71 | 335.35523 | -83.95523 | 7048.48064 | -13.39 | 179.2921 |
| Mar'07 | 244.5 | 65.87 | 335.85331 | -91.35331 | 8345.42725 | -13.23 | 175.0329 |

| | | | | | | | |
|------------------|---------|----------|-----------|-----------|------------|--------|------------|
| Feb'07 | 235.4 | 61.79 | 323.15227 | -87.75227 | 7700.46089 | -17.31 | 299.6361 |
| Jan'07 | 228 | 58.14 | 311.78982 | -83.78982 | 7020.73394 | -20.96 | 439.3216 |
| Dec'06 | 265.1 | 61.05 | 320.84865 | -55.74865 | 3107.91198 | -18.05 | 325.8025 |
| Nov'06 | 260.9 | 63.13 | 327.32369 | -66.42369 | 4412.10659 | -15.97 | 255.0409 |
| Oct'06 | 262.3 | 58.73 | 313.62649 | -51.32649 | 2634.40858 | -20.37 | 414.9369 |
| Sep'06 | 243.5 | 62.91 | 326.63883 | -83.13883 | 6912.06505 | -16.19 | 262.1161 |
| Aug'06 | 274 | 70.26 | 349.51938 | -75.51938 | 5703.17676 | -8.84 | 78.1456 |
| July'06 | 273.9 | 74.4 | 362.4072 | -88.5072 | 7833.52445 | -4.7 | 22.09 |
| | | | | - | | | |
| June'06 | 258 | 73.93 | 360.94409 | 102.94409 | 10597.4857 | -5.17 | 26.7289 |
| May'06 | 254.8 | 71.29 | 352.72577 | -97.92577 | 9589.45643 | -7.81 | 60.9961 |
| | | | | - | | | |
| Apr'06 | 252 | 71.88 | 354.56244 | 102.56244 | 10519.0541 | -7.22 | 52.1284 |
| | | | | - | | | |
| Mar'06 | 232.9 | 66.63 | 338.21919 | 105.31919 | 11092.1318 | -12.47 | 155.5009 |
| Feb'06 | 228.6 | 61.41 | 321.96933 | -93.36933 | 8717.83178 | -17.69 | 312.9361 |
| | | | | - | | | |
| Jan'06 | 232.7 | 67.92 | 342.23496 | 109.53496 | 11997.9075 | -11.18 | 124.9924 |
| Dec'05 | 240.2 | 61.04 | 320.81752 | -80.61752 | 6499.18453 | -18.06 | 326.1636 |
| Nov'05 | 237.1 | 57.32 | 309.23716 | -72.13716 | 5203.76985 | -21.78 | 474.3684 |
| Oct'05 | 241.4 | 59.76 | 316.83288 | -75.43288 | 5690.11939 | -19.34 | 374.0356 |
| Sep'05 | 244 | 66.24 | 337.00512 | -93.00512 | 8649.95235 | -12.86 | 165.3796 |
| | | | | - | | | |
| Aug'05 | 237.1 | 68.94 | 345.41022 | 108.31022 | 11731.1038 | -10.16 | 103.2256 |
| | | | | - | | | |
| July'05 | 219.3 | 60.57 | 319.35441 | 100.05441 | 10010.885 | -18.53 | 343.3609 |
| June'05 | 208.2 | 56.5 | 306.6845 | -98.4845 | 9699.19674 | -22.6 | 510.76 |
| May'05 | 194.2 | 51.97 | 292.58261 | -98.38261 | 9679.13795 | -27.13 | 736.0369 |
| Apr'05 | 202.3 | 49.72 | 285.57836 | -83.27836 | 6935.28524 | -29.38 | 863.1844 |
| | | | | | | | |
| Summation | 49408.1 | 10362.55 | | 14.68184 | 1323012.95 | | 59770.8353 |
| | | | | | | | |
| Average | 377.16 | 79.1 | | | | | |

Appendix Table 4:

| Months | Wholesale Price Index (monthly) | Crude Oil Prices (\$) | (Yt - Ȳ) | (Yt - Ȳ) squared | Yt^ | (Yt^ - Ȳ) | (Yt^ - Ȳ) squared | et = Yt - Yt^ | (Yt - Yt^) squared |
|---------------|---------------------------------|-----------------------|-----------|-------------------|---------|------------|--------------------|---------------|--------------------|
| | Yt | Xt | | | | | | | |
| Feb'16 | 310.1 | 33.75 | -67.06 | 4497.04 | 235.864 | -141.3 | 19964.6 | 74.2363 | 5511.02 |
| Jan'16 | 332.4 | 33.62 | -44.76 | 2003.46 | 235.459 | -141.7 | 20079.2 | 96.9409 | 9397.55 |
| Dec'15 | 330.1 | 37.04 | -47.06 | 2214.64 | 246.106 | -131.05 | 17175.3 | 83.9945 | 7055.07 |
| Nov'15 | 351.7 | 41.65 | -25.46 | 648.212 | 260.456 | -116.7 | 13619.7 | 91.2436 | 8325.39 |
| Oct'15 | 355.3 | 46.59 | -21.86 | 477.86 | 275.835 | -101.33 | 10266.8 | 79.4653 | 6314.74 |
| Sep'15 | 354 | 45.09 | -23.16 | 536.386 | 271.165 | -105.99 | 11234.9 | 82.8348 | 6861.61 |
| Aug'15 | 356.1 | 49.2 | -21.06 | 443.524 | 283.96 | -93.2 | 8686.31 | 72.1404 | 5204.24 |
| July'15 | 398.8 | 47.12 | 21.64 | 468.29 | 277.485 | -99.675 | 9935.19 | 121.315 | 14717.4 |
| June'15 | 420.1 | 59.47 | 42.94 | 1843.84 | 315.93 | -61.23 | 3749.1 | 104.17 | 10851.4 |
| May'15 | 418.9 | 60.3 | 41.74 | 1742.23 | 318.514 | -58.646 | 3439.37 | 100.386 | 10077.4 |
| Apr'15 | 390.1 | 59.63 | 12.94 | 167.444 | 316.428 | -60.732 | 3688.35 | 73.6718 | 5427.54 |
| Mar'15 | 386.4 | 47.6 | 9.24 | 85.3776 | 278.979 | -98.181 | 9639.55 | 107.421 | 11539.3 |
| Feb'15 | 378.5 | 49.76 | 1.34 | 1.7956 | 285.703 | -91.457 | 8364.4 | 92.7971 | 8611.31 |
| Jan'15 | 383.9 | 48.24 | 6.74 | 45.4276 | 280.971 | -96.189 | 9252.3 | 102.929 | 10594.4 |
| Dec'14 | 414 | 53.27 | 36.84 | 1357.19 | 296.63 | -80.53 | 6485.16 | 117.37 | 13775.8 |
| Nov'14 | 475.3 | 66.15 | 98.14 | 9631.46 | 336.725 | -40.435 | 1634.99 | 138.575 | 19203 |
| Oct'14 | 518.6 | 80.54 | 141.44 | 20005.3 | 381.521 | 4.36102 | 19.0185 | 137.079 | 18790.6 |
| Sep'14 | 552.4 | 91.16 | 175.24 | 30709.1 | 414.581 | 37.4211 | 1400.34 | 137.819 | 18994.1 |
| Aug'14 | 568 | 95.96 | 190.84 | 36419.9 | 429.523 | 52.3635 | 2741.93 | 138.477 | 19175.7 |
| July'14 | 586.4 | 98.17 | 209.24 | 43781.4 | 436.403 | 59.2432 | 3509.76 | 149.997 | 22499 |
| June'14 | 582.6 | 105.37 | 205.44 | 42205.6 | 458.817 | 81.6568 | 6667.83 | 123.783 | 15322.3 |
| May'14 | 582.3 | 102.71 | 205.14 | 42082.4 | 450.536 | 73.3762 | 5384.07 | 131.764 | 17361.7 |
| Apr'14 | 581.9 | 99.74 | 204.74 | 41918.5 | 441.291 | 64.1306 | 4112.74 | 140.609 | 19771 |
| Mar'14 | 583.6 | 101.58 | 206.44 | 42617.5 | 447.019 | 69.8585 | 4880.22 | 136.581 | 18654.5 |
| Feb'14 | 590.1 | 102.59 | 212.94 | 45343.4 | 450.163 | 73.0027 | 5329.39 | 139.937 | 19582.5 |
| Jan'14 | 584.5 | 97.49 | 207.34 | 42989.9 | 434.286 | 57.1264 | 3263.42 | 150.214 | 22564.1 |
| Dec'13 | 591 | 98.42 | 213.84 | 45727.5 | 437.181 | 60.0215 | 3602.58 | 153.819 | 23660.1 |
| Nov'13 | 590.5 | 92.72 | 213.34 | 45514 | 419.437 | 42.2774 | 1787.38 | 171.063 | 29262.4 |
| Oct'13 | 596.8 | 96.38 | 219.64 | 48241.7 | 430.831 | 53.6709 | 2880.57 | 165.969 | 27545.7 |
| Sep'13 | 604.3 | 102.33 | 227.14 | 51592.6 | 449.353 | 72.1933 | 5211.87 | 154.947 | 24008.5 |
| Aug'13 | 595.7 | 107.65 | 218.54 | 47759.7 | 465.914 | 88.7545 | 7877.35 | 129.786 | 16844.3 |
| July'13 | 547.3 | 105.03 | 170.14 | 28947.6 | 457.758 | 80.5984 | 6496.1 | 89.5416 | 8017.7 |
| June'13 | 534.1 | 96.56 | 156.94 | 24630.2 | 431.391 | 54.2313 | 2941.03 | 102.709 | 10549.1 |
| May'13 | 511.6 | 91.97 | 134.44 | 18074.1 | 417.103 | 39.9426 | 1595.41 | 94.4974 | 8929.76 |
| Apr'13 | 513.3 | 93.46 | 136.14 | 18534.1 | 421.741 | 44.581 | 1987.46 | 91.559 | 8383.05 |

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|---------------|-------|--------|--------|---------|---------|---------|---------|---------|---------|
| Mar'13 | 534.2 | 97.23 | 157.04 | 24661.6 | 433.477 | 56.317 | 3171.6 | 100.723 | 10145.1 |
| Feb'13 | 545.9 | 92.05 | 168.74 | 28473.2 | 417.352 | 40.1917 | 1615.37 | 128.548 | 16524.7 |
| Jan'13 | 536 | 97.49 | 158.84 | 25230.1 | 434.286 | 57.1264 | 3263.42 | 101.714 | 10345.7 |
| Dec'12 | 526.1 | 91.82 | 148.94 | 22183.1 | 416.636 | 39.4757 | 1558.33 | 109.464 | 11982.4 |
| Nov'12 | 522.2 | 88.91 | 145.04 | 21036.6 | 407.577 | 30.4168 | 925.184 | 114.623 | 13138.5 |
| Oct'12 | 518.3 | 86.24 | 141.14 | 19920.5 | 399.265 | 22.1051 | 488.636 | 119.035 | 14169.3 |
| Sep'12 | 531.1 | 92.19 | 153.94 | 23697.5 | 417.787 | 40.6275 | 1650.59 | 113.313 | 12839.7 |
| Aug'12 | 523.6 | 96.47 | 146.44 | 21444.7 | 431.111 | 53.9511 | 2910.72 | 92.4889 | 8554.19 |
| July'12 | 489.7 | 88.06 | 112.54 | 12665.3 | 404.931 | 27.7708 | 771.216 | 84.7692 | 7185.82 |
| June'12 | 476.2 | 84.96 | 99.04 | 9808.92 | 395.28 | 18.1205 | 328.352 | 80.9195 | 6547.97 |
| May'12 | 514.2 | 86.53 | 137.04 | 18780 | 400.168 | 23.0079 | 529.363 | 114.032 | 13003.3 |
| Apr'12 | 530.4 | 104.87 | 153.24 | 23482.5 | 457.26 | 80.1003 | 6416.06 | 73.1397 | 5349.41 |
| Mar'12 | 531.6 | 103.02 | 154.44 | 23851.7 | 451.501 | 74.3413 | 5526.62 | 80.0987 | 6415.81 |
| Feb'12 | 505.3 | 107.07 | 128.14 | 16419.9 | 464.109 | 86.9489 | 7560.11 | 41.1911 | 1696.71 |
| Jan'12 | 498.5 | 98.48 | 121.34 | 14723.4 | 437.368 | 60.2082 | 3625.03 | 61.1318 | 3737.09 |
| Dec'11 | 495.1 | 98.83 | 117.94 | 13909.8 | 438.458 | 61.2978 | 3757.42 | 56.6422 | 3208.34 |
| Nov'11 | 490.9 | 100.36 | 113.74 | 12936.8 | 443.221 | 66.0607 | 4364.01 | 47.6793 | 2273.32 |
| Oct'11 | 478.1 | 93.19 | 100.94 | 10188.9 | 420.9 | 43.7405 | 1913.23 | 57.1995 | 3271.79 |
| Sep'11 | 473.6 | 79.2 | 96.44 | 9300.67 | 377.35 | 0.1896 | 0.03595 | 96.2504 | 9264.14 |
| Aug'11 | 456.8 | 88.81 | 79.64 | 6342.53 | 407.266 | 30.1055 | 906.343 | 49.5345 | 2453.66 |
| July'11 | 461.2 | 95.7 | 84.04 | 7062.72 | 428.714 | 51.5541 | 2657.83 | 32.4859 | 1055.33 |
| June'11 | 454.3 | 95.42 | 77.14 | 5950.58 | 427.842 | 50.6825 | 2568.71 | 26.4575 | 700.001 |
| May'11 | 455.1 | 102.7 | 77.94 | 6074.64 | 450.505 | 73.3451 | 5379.5 | 4.5949 | 21.1131 |
| Apr'11 | 441.1 | 113.93 | 63.94 | 4088.32 | 485.464 | 108.304 | 11729.8 | -44.364 | 1968.17 |
| Mar'11 | 380 | 106.72 | 2.84 | 8.0656 | 463.019 | 85.8594 | 7371.83 | -83.019 | 6892.21 |
| Feb'11 | 376.9 | 96.97 | -0.26 | 0.0676 | 432.668 | 55.5076 | 3081.09 | -55.768 | 3110.03 |
| Jan'11 | 374.8 | 92.19 | -2.36 | 5.5696 | 417.787 | 40.6275 | 1650.59 | -42.987 | 1847.92 |
| Dec'10 | 372.5 | 91.38 | -4.66 | 21.7156 | 415.266 | 38.1059 | 1452.06 | -42.766 | 1828.93 |
| Nov'10 | 365.2 | 84.11 | -11.96 | 143.042 | 392.634 | 15.4744 | 239.458 | -27.434 | 752.648 |
| Oct'10 | 358.2 | 81.43 | -18.96 | 359.482 | 384.292 | 7.13159 | 50.8596 | -26.092 | 680.771 |
| Sep'10 | 353 | 79.97 | -24.16 | 583.706 | 379.747 | 2.58661 | 6.69055 | -26.747 | 715.381 |
| Aug'10 | 354.3 | 71.92 | -22.86 | 522.58 | 354.687 | -22.473 | 505.038 | -0.387 | 0.14974 |
| July'10 | 350 | 78.95 | -27.16 | 737.666 | 376.571 | -0.5886 | 0.34651 | -26.571 | 706.037 |
| June'10 | 342.4 | 75.63 | -34.76 | 1208.26 | 366.236 | -10.924 | 119.33 | -23.836 | 568.164 |
| May'10 | 340.1 | 73.97 | -37.06 | 1373.44 | 361.069 | -16.091 | 258.933 | -20.969 | 439.683 |
| Apr'10 | 356 | 86.15 | -21.16 | 447.746 | 398.985 | 21.825 | 476.328 | -42.985 | 1847.71 |
| Mar'10 | 345.8 | 83.76 | -31.36 | 983.45 | 391.545 | 14.3849 | 206.925 | -45.745 | 2092.59 |
| Feb'10 | 328.2 | 79.66 | -48.96 | 2397.08 | 378.782 | 1.62158 | 2.62952 | -50.582 | 2558.5 |
| Jan'10 | 332.7 | 72.89 | -44.46 | 1976.69 | 357.707 | -19.453 | 378.436 | -25.007 | 625.329 |

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|---------------|-------|--------|--------|---------|---------|---------|---------|---------|---------|
| Dec'09 | 328.7 | 79.36 | -48.46 | 2348.37 | 377.848 | 0.68768 | 0.4729 | -49.148 | 2415.49 |
| Nov'09 | 333.5 | 77.28 | -43.66 | 1906.2 | 371.373 | -5.7874 | 33.4935 | -37.873 | 1434.34 |
| Oct'09 | 322.8 | 77 | -54.36 | 2955.01 | 370.501 | -6.659 | 44.3423 | -47.701 | 2275.39 |
| Sep'09 | 317.4 | 70.61 | -59.76 | 3571.26 | 350.609 | -26.551 | 704.959 | -33.209 | 1102.83 |
| Aug'09 | 327.3 | 69.96 | -49.86 | 2486.02 | 348.585 | -28.575 | 816.503 | -21.285 | 453.072 |
| July'09 | 306.3 | 69.45 | -70.86 | 5021.14 | 346.998 | -30.162 | 909.755 | -40.698 | 1656.31 |
| June'09 | 303.6 | 69.89 | -73.56 | 5411.07 | 348.368 | -28.792 | 829.004 | -44.768 | 2004.14 |
| May'09 | 279.7 | 66.31 | -97.46 | 9498.45 | 337.223 | -39.937 | 1594.96 | -57.523 | 3308.9 |
| Apr'09 | 276.4 | 51.12 | 100.76 | 10152.6 | 289.937 | -87.223 | 7607.93 | -13.537 | 183.238 |
| Mar'09 | 249.4 | 49.66 | 127.76 | 16322.6 | 285.392 | -91.768 | 8421.44 | -35.992 | 1295.39 |
| Feb'09 | 250.2 | 44.76 | 126.96 | 16118.8 | 270.138 | -107.02 | 11453.7 | -19.938 | 397.519 |
| Jan'09 | 255.3 | 41.68 | 121.86 | 14849.9 | 260.55 | -116.61 | 13597.9 | -5.2498 | 27.5608 |
| Dec'08 | 258.1 | 44.6 | 119.06 | 14175.3 | 269.64 | -107.52 | 11560.6 | -11.54 | 133.167 |
| Nov'08 | 269.6 | 54.43 | 107.56 | 11569.2 | 300.241 | -76.919 | 5916.6 | -30.641 | 938.846 |
| Oct'08 | 280.3 | 67.81 | -96.86 | 9381.86 | 341.893 | -35.267 | 1243.79 | -61.593 | 3793.64 |
| Sep'08 | 295 | 100.64 | -82.16 | 6750.27 | 444.092 | 66.9323 | 4479.94 | -149.09 | 22228.5 |
| Aug'08 | 314 | 115.46 | -63.16 | 3989.19 | 490.227 | 113.067 | 12784.1 | -176.23 | 31055.9 |
| July'08 | 355 | 124.08 | -22.16 | 491.066 | 517.061 | 139.901 | 19572.3 | -162.06 | 26263.8 |
| June'08 | 371.2 | 140 | -5.96 | 35.5216 | 566.62 | 189.46 | 35895.1 | -195.42 | 38189 |
| May'08 | 306.2 | 127.35 | -70.96 | 5035.32 | 527.241 | 150.081 | 22524.2 | -221.04 | 48858.9 |
| Apr'08 | 293.7 | 113.46 | -83.46 | 6965.57 | 484.001 | 106.841 | 11415 | -190.3 | 36214.5 |
| Mar'08 | 286.6 | 101.58 | -90.56 | 8201.11 | 447.019 | 69.8585 | 4880.22 | -160.42 | 25734.1 |
| Feb'08 | 270.1 | 101.84 | 107.06 | 11461.8 | 447.828 | 70.6679 | 4993.95 | -177.73 | 31587.2 |
| Jan'08 | 257 | 91.75 | 120.16 | 14438.4 | 416.418 | 39.2578 | 1541.17 | -159.42 | 25414 |
| Dec'07 | 275.9 | 95.98 | 101.26 | 10253.6 | 429.586 | 52.4257 | 2748.46 | -153.69 | 23619.3 |
| Nov'07 | 274.8 | 88.71 | 102.36 | 10477.6 | 406.954 | 29.7942 | 887.696 | -132.15 | 17464.7 |
| Oct'07 | 252.6 | 94.53 | 124.56 | 15515.2 | 425.072 | 47.9119 | 2295.55 | -172.47 | 29746.6 |
| Sep'07 | 265.4 | 81.66 | 111.76 | 12490.3 | 385.008 | 7.84758 | 61.5845 | -119.61 | 14306 |
| Aug'07 | 256.5 | 74.04 | 120.66 | 14558.8 | 361.287 | -15.873 | 251.967 | -104.79 | 10980.2 |

| | | | | | | | | | | |
|---------------|-------|-------|--------|---|---------|---------|---------|---------|---------|---------|
| July'07 | 265.2 | 78.21 | 111.96 | - | 12535 | 374.268 | -2.8923 | 8.36523 | -109.07 | 11895.8 |
| June'07 | 251.9 | 70.68 | 125.26 | - | 15690.1 | 350.827 | -26.333 | 693.435 | -98.927 | 9786.52 |
| May'07 | 246.3 | 64.01 | 130.86 | - | 17124.3 | 330.063 | -47.097 | 2218.12 | -83.763 | 7016.26 |
| Apr'07 | 251.4 | 65.71 | 125.76 | - | 15815.6 | 335.355 | -41.805 | 1747.64 | -83.955 | 7048.48 |
| Mar'07 | 244.5 | 65.87 | 132.66 | - | 17598.7 | 335.853 | -41.307 | 1706.24 | -91.353 | 8345.43 |
| Feb'07 | 235.4 | 61.79 | 141.76 | - | 20095.9 | 323.152 | -54.008 | 2916.83 | -87.752 | 7700.46 |
| Jan'07 | 228 | 58.14 | 149.16 | - | 22248.7 | 311.79 | -65.37 | 4273.26 | -83.79 | 7020.73 |
| Dec'06 | 265.1 | 61.05 | 112.06 | - | 12557.4 | 320.849 | -56.311 | 3170.97 | -55.749 | 3107.91 |
| Nov'06 | 260.9 | 63.13 | 116.26 | - | 13516.4 | 327.324 | -49.836 | 2483.66 | -66.424 | 4412.11 |
| Oct'06 | 262.3 | 58.73 | 114.86 | - | 13192.8 | 313.626 | -63.534 | 4036.51 | -51.326 | 2634.41 |
| Sep'06 | 243.5 | 62.91 | 133.66 | - | 17865 | 326.639 | -50.521 | 2552.39 | -83.139 | 6912.07 |
| Aug'06 | 274 | 70.26 | 103.16 | - | 10642 | 349.519 | -27.641 | 764.004 | -75.519 | 5703.18 |
| July'06 | 273.9 | 74.4 | 103.26 | - | 10662.6 | 362.407 | -14.753 | 217.645 | -88.507 | 7833.52 |
| June'06 | 258 | 73.93 | 119.16 | - | 14199.1 | 360.944 | -16.216 | 262.956 | -102.94 | 10597.5 |
| May'06 | 254.8 | 71.29 | 122.36 | - | 14972 | 352.726 | -24.434 | 597.032 | -97.926 | 9589.46 |
| Apr'06 | 252 | 71.88 | 125.16 | - | 15665 | 354.562 | -22.598 | 510.65 | -102.56 | 10519.1 |
| Mar'06 | 232.9 | 66.63 | 144.26 | - | 20810.9 | 338.219 | -38.941 | 1516.39 | -105.32 | 11092.1 |
| Feb'06 | 228.6 | 61.41 | 148.56 | - | 22070.1 | 321.969 | -55.191 | 3046.01 | -93.369 | 8717.83 |
| Jan'06 | 232.7 | 67.92 | 144.46 | - | 20868.7 | 342.235 | -34.925 | 1219.76 | -109.53 | 11997.9 |
| Dec'05 | 240.2 | 61.04 | 136.96 | - | 18758 | 320.818 | -56.342 | 3174.48 | -80.618 | 6499.18 |
| Nov'05 | 237.1 | 57.32 | 140.06 | - | 19616.8 | 309.237 | -67.923 | 4613.51 | -72.137 | 5203.77 |
| Oct'05 | 241.4 | 59.76 | 135.76 | - | 18430.8 | 316.833 | -60.327 | 3639.36 | -75.433 | 5690.12 |
| Sep'05 | 244 | 66.24 | 133.16 | - | 17731.6 | 337.005 | -40.155 | 1612.41 | -93.005 | 8649.95 |

| | | | | | | | | | | |
|----------------|---------|---------|--------|---|---------|---------|---------|---------|---------|---------|
| Aug'05 | 237.1 | 68.94 | 140.06 | - | 19616.8 | 345.41 | -31.75 | 1008.05 | -108.31 | 11731.1 |
| July'05 | 219.3 | 60.57 | 157.86 | - | 24919.8 | 319.354 | -57.806 | 3341.49 | -100.05 | 10010.9 |
| June'05 | 208.2 | 56.5 | 168.96 | - | 28547.5 | 306.685 | -70.476 | 4966.8 | -98.485 | 9699.2 |
| May'05 | 194.2 | 51.97 | 182.96 | - | 33474.4 | 292.583 | -84.577 | 7153.33 | -98.383 | 9679.14 |
| Apr'05 | 202.3 | 49.72 | 174.86 | - | 30576 | 285.578 | -91.582 | 8387.2 | -285.58 | 81555 |
| | | | | | | | | | | |
| Sum | 49408.1 | 10362.6 | | | 1902495 | | -14.542 | 579227 | | 1397633 |
| | | | | | | | | | | |
| Average | 377.16 | 79.1 | | | | | | | | |

Appendix Table 5:

| Wholesale Price Index (Variable Y) | Crude Oil Prices (\$)(Variable X) | ln(WPI) | ln(crude oil price) |
|---|--|----------------|----------------------------|
| 310.1 | 33.75 | 5.736894826 | 3.518980417 |
| 332.4 | 33.62 | 5.806339063 | 3.515121128 |
| 330.1 | 37.04 | 5.799395639 | 3.61199841 |
| 351.7 | 41.65 | 5.862778539 | 3.729301369 |
| 355.3 | 46.59 | 5.872962503 | 3.841385926 |
| 354 | 45.09 | 5.869296913 | 3.808660492 |
| 356.1 | 49.2 | 5.87521159 | 3.895893623 |
| 398.8 | 47.12 | 5.988460038 | 3.852697539 |
| 420.1 | 59.47 | 6.040492778 | 4.085471984 |
| 418.9 | 60.3 | 6.037632228 | 4.099332104 |
| 390.1 | 59.63 | 5.966403117 | 4.088158803 |
| 386.4 | 47.6 | 5.956873102 | 3.862832761 |
| 378.5 | 49.76 | 5.936216073 | 3.907211448 |
| 383.9 | 48.24 | 5.950382102 | 3.876188552 |
| 414 | 53.27 | 6.025865974 | 3.975373321 |
| 475.3 | 66.15 | 6.163946184 | 4.191924891 |
| 518.6 | 80.54 | 6.251132873 | 4.388753955 |
| 552.4 | 91.16 | 6.314272422 | 4.512616204 |
| 568 | 95.96 | 6.342121419 | 4.563931438 |
| 586.4 | 98.17 | 6.374002151 | 4.58670067 |
| 582.6 | 105.37 | 6.367500845 | 4.657477966 |
| 582.3 | 102.71 | 6.366985779 | 4.631909483 |
| 581.9 | 99.74 | 6.366298612 | 4.6025668 |
| 583.6 | 101.58 | 6.369215817 | 4.620846665 |
| 590.1 | 102.59 | 6.380292014 | 4.630740462 |
| 584.5 | 97.49 | 6.370756781 | 4.579749809 |
| 591 | 98.42 | 6.381816017 | 4.589244035 |
| 590.5 | 92.72 | 6.380969636 | 4.529584199 |
| 596.8 | 96.38 | 6.391582049 | 4.568298711 |
| 604.3 | 102.33 | 6.404070763 | 4.628202885 |
| 595.7 | 107.65 | 6.389737185 | 4.678885224 |
| 547.3 | 105.03 | 6.304997098 | 4.654246024 |
| 534.1 | 96.56 | 6.280583087 | 4.570164577 |
| 511.6 | 91.97 | 6.23754307 | 4.521462437 |
| 513.3 | 93.46 | 6.24086047 | 4.537533537 |
| 534.2 | 97.23 | 6.280770301 | 4.577079306 |

| | | | |
|-------|--------|-------------|-------------|
| 545.9 | 92.05 | 6.302435809 | 4.522331908 |
| 536 | 97.49 | 6.284134161 | 4.579749809 |
| 526.1 | 91.82 | 6.265491309 | 4.519830139 |
| 522.2 | 88.91 | 6.258050656 | 4.487624622 |
| 518.3 | 86.24 | 6.250554225 | 4.457134107 |
| 531.1 | 92.19 | 6.274950327 | 4.523851665 |
| 523.6 | 96.47 | 6.260728034 | 4.569232079 |
| 489.7 | 88.06 | 6.193792959 | 4.4780184 |
| 476.2 | 84.96 | 6.165837934 | 4.442180557 |
| 514.2 | 86.53 | 6.242612295 | 4.460491175 |
| 530.4 | 104.87 | 6.273631439 | 4.652721488 |
| 531.6 | 103.02 | 6.275891327 | 4.634923144 |
| 505.3 | 107.07 | 6.225152312 | 4.673482826 |
| 498.5 | 98.48 | 6.211603589 | 4.589853482 |
| 495.1 | 98.83 | 6.204759762 | 4.593401202 |
| 490.9 | 100.36 | 6.196240441 | 4.608763721 |
| 478.1 | 93.19 | 6.169819916 | 4.53464042 |
| 473.6 | 79.2 | 6.160363084 | 4.371976299 |
| 456.8 | 88.81 | 6.124245658 | 4.486499256 |
| 461.2 | 95.7 | 6.133831788 | 4.561218298 |
| 454.3 | 95.42 | 6.118757773 | 4.5582882 |
| 455.1 | 102.7 | 6.120517175 | 4.631812117 |
| 441.1 | 113.93 | 6.089271607 | 4.735584225 |
| 380 | 106.72 | 5.940171253 | 4.670208582 |
| 376.9 | 96.97 | 5.9319799 | 4.574401652 |
| 374.8 | 92.19 | 5.92639255 | 4.523851665 |
| 372.5 | 91.38 | 5.920237038 | 4.515026636 |
| 365.2 | 84.11 | 5.900445149 | 4.432125466 |
| 358.2 | 81.43 | 5.88109149 | 4.399743755 |
| 353 | 79.97 | 5.866468057 | 4.381651564 |
| 354.3 | 71.92 | 5.870144012 | 4.27555439 |
| 350 | 78.95 | 5.857933154 | 4.368814741 |
| 342.4 | 75.63 | 5.835979644 | 4.32585303 |
| 340.1 | 73.97 | 5.829239692 | 4.303659606 |
| 356 | 86.15 | 5.874930731 | 4.456089963 |
| 345.8 | 83.76 | 5.845860573 | 4.427955567 |
| 328.2 | 79.66 | 5.793623179 | 4.377767578 |
| 332.7 | 72.89 | 5.807241183 | 4.288951455 |
| 328.7 | 79.36 | 5.795145481 | 4.373994463 |
| 333.5 | 77.28 | 5.809642865 | 4.34743519 |

| | | | |
|-------|--------|-------------|-------------|
| 322.8 | 77 | 5.777032936 | 4.343805422 |
| 317.4 | 70.61 | 5.760162808 | 4.257171778 |
| 327.3 | 69.96 | 5.790877182 | 4.24792365 |
| 306.3 | 69.45 | 5.724565014 | 4.240607069 |
| 303.6 | 69.89 | 5.715711046 | 4.246922577 |
| 279.7 | 66.31 | 5.6337176 | 4.194340715 |
| 276.4 | 51.12 | 5.621849092 | 3.93417581 |
| 249.4 | 49.66 | 5.519058033 | 3.90519978 |
| 250.2 | 44.76 | 5.522260598 | 3.801314883 |
| 255.3 | 41.68 | 5.542439324 | 3.730021397 |
| 258.1 | 44.6 | 5.553347107 | 3.797733859 |
| 269.6 | 54.43 | 5.596939379 | 3.996915472 |
| 280.3 | 67.81 | 5.635860458 | 4.216709677 |
| 295 | 100.64 | 5.686975356 | 4.611549793 |
| 314 | 115.46 | 5.749392986 | 4.74892415 |
| 355 | 124.08 | 5.872117789 | 4.820926519 |
| 371.2 | 140 | 5.916741001 | 4.941642423 |
| 306.2 | 127.35 | 5.724238483 | 4.846939201 |
| 293.7 | 113.46 | 5.682558838 | 4.731450352 |
| 286.6 | 101.58 | 5.658087515 | 4.620846665 |
| 270.1 | 101.84 | 5.598792261 | 4.623402954 |
| 257 | 91.75 | 5.549076085 | 4.519067487 |
| 275.9 | 95.98 | 5.620038481 | 4.564139836 |
| 274.8 | 88.71 | 5.61604356 | 4.485372623 |
| 252.6 | 94.53 | 5.53180721 | 4.548917244 |
| 265.4 | 81.66 | 5.581238122 | 4.402564286 |
| 256.5 | 74.04 | 5.547128665 | 4.304605488 |
| 265.2 | 78.21 | 5.580484258 | 4.359397517 |
| 251.9 | 70.68 | 5.529032183 | 4.258162647 |
| 246.3 | 64.01 | 5.506550305 | 4.159039321 |
| 251.4 | 65.71 | 5.527045296 | 4.185251121 |
| 244.5 | 65.87 | 5.499215309 | 4.187683103 |
| 235.4 | 61.79 | 5.461286195 | 4.123741539 |
| 228 | 58.14 | 5.429345629 | 4.062853895 |
| 265.1 | 61.05 | 5.580107113 | 4.111693201 |
| 260.9 | 63.13 | 5.564137192 | 4.145196092 |
| 262.3 | 58.73 | 5.569488887 | 4.07295067 |
| 243.5 | 62.91 | 5.495116943 | 4.141705134 |
| 274 | 70.26 | 5.613128106 | 4.252202647 |
| 273.9 | 74.4 | 5.612763076 | 4.309455942 |

| | | | |
|-------|-------|-------------|-------------|
| 258 | 73.93 | 5.552959585 | 4.3031187 |
| 254.8 | 71.29 | 5.540478924 | 4.266756065 |
| 252 | 71.88 | 5.529429088 | 4.274998062 |
| 232.9 | 66.63 | 5.450609177 | 4.199154927 |
| 228.6 | 61.41 | 5.431973751 | 4.117572688 |
| 232.7 | 67.92 | 5.44975007 | 4.218330542 |
| 240.2 | 61.04 | 5.48147191 | 4.111529387 |
| 237.1 | 57.32 | 5.468481993 | 4.048649603 |
| 241.4 | 59.76 | 5.486455309 | 4.090336541 |
| 244 | 66.24 | 5.497168225 | 4.19328451 |
| 237.1 | 68.94 | 5.468481993 | 4.233236561 |
| 219.3 | 60.57 | 5.390440655 | 4.103799721 |
| 208.2 | 56.5 | 5.338499156 | 4.034240638 |
| 194.2 | 51.97 | 5.268888556 | 3.950666629 |
| 202.3 | 49.72 | 5.309751744 | 3.906407267 |

Appendix Table 6:

| | | Quarterly India GDP growth Y | Quarterly India Inflation Rate X | XY | X Square | Y Square |
|---------|----|---|---|-----------|-----------------|-----------------|
| 2010 | Q1 | 7.5 | 9.56 | 71.7 | 91.3936 | 56.25 |
| | Q2 | 9.8 | 10.54 | 103.292 | 111.0916 | 96.04 |
| | Q3 | 7.4 | 9.28 | 68.672 | 86.1184 | 54.76 |
| | Q4 | 8.6 | 8.91 | 76.626 | 79.3881 | 73.96 |
| 2011 | Q1 | 8.5 | 9.56 | 81.26 | 91.3936 | 72.25 |
| | Q2 | 7.6 | 9.6 | 72.96 | 92.16 | 57.76 |
| | Q3 | 8.2 | 9.71 | 79.622 | 94.2841 | 67.24 |
| | Q4 | 9.2 | 9.02 | 82.984 | 81.3604 | 84.64 |
| 2012 | Q1 | 8 | 7.49 | 59.92 | 56.1001 | 64 |
| | Q2 | 6.7 | 7.54 | 50.518 | 56.8516 | 44.89 |
| | Q3 | 6.1 | 7.5 | 45.75 | 56.25 | 37.21 |
| | Q4 | 5.3 | 7.33 | 38.849 | 53.7289 | 28.09 |
| 2013 | Q1 | 4.6 | 6.75 | 31.05 | 45.5625 | 21.16 |
| | Q2 | 7 | 4.84 | 33.88 | 23.4256 | 49 |
| | Q3 | 7.5 | 6.14 | 46.05 | 37.6996 | 56.25 |
| | Q4 | 6.3 | 7.05 | 44.415 | 49.7025 | 39.69 |
| 2014 | Q1 | 6.7 | 5.38 | 36.046 | 28.9444 | 44.89 |
| | Q2 | 6.7 | 5.8 | 38.86 | 33.64 | 44.89 |
| | Q3 | 8.4 | 3.84 | 32.256 | 14.7456 | 70.56 |
| Sum | | 140.1 | 145.84 | 1094.71 | 1183.84 | 1063.53 |
| Average | | 7.37368 | 7.675789 | 57.616 | 62.3074 | 55.975 |

[Source: WPI based Inflation Rates: www.theteamwork.com/articles/2016-2101-indian-government-current-monthly-annual-inflation-rate.html

GDP Growth Rate: www.portal.indiainfoline.com/datamonitor/Others/Ministry-Of-Finance-Government-of-India/Quarterly-Growth-Rate-in-GDP.aspx

www.ieconomics.com/india-gdp-annual-growth-rate]

Appendix Table 7:

| | | Quarterly India GDP growth Y | Quarterly India Inflation Rate X | XY | X Square | xt = (Xt - X̄) | xt = (Xt - X̄) squared | yt = (Yt - Ȳ) | xt*yt |
|---------|----|--|--|---------|-------------|----------------------|------------------------------|---------------------|---------|
| 2010 | Q1 | 7.5 | 9.56 | 71.7 | 91.3936 | 1.88 | 3.5344 | 0.13 | 0.2444 |
| | Q2 | 9.8 | 10.54 | 103.292 | 111.0916 | 2.86 | 8.1796 | 2.43 | 6.9498 |
| | Q3 | 7.4 | 9.28 | 68.672 | 86.1184 | 1.6 | 2.56 | 0.03 | 0.048 |
| | Q4 | 8.6 | 8.91 | 76.626 | 79.3881 | 1.23 | 1.5129 | 1.23 | 1.5129 |
| 2011 | Q1 | 8.5 | 9.56 | 81.26 | 91.3936 | 1.88 | 3.5344 | 1.13 | 2.1244 |
| | Q2 | 7.6 | 9.6 | 72.96 | 92.16 | 1.92 | 3.6864 | 0.23 | 0.4416 |
| | Q3 | 8.2 | 9.71 | 79.622 | 94.2841 | 2.03 | 4.1209 | 0.83 | 1.6849 |
| | Q4 | 9.2 | 9.02 | 82.984 | 81.3604 | 1.34 | 1.7956 | 1.83 | 2.4522 |
| 2012 | Q1 | 8 | 7.49 | 59.92 | 56.1001 | -0.19 | 0.0361 | 0.63 | -0.1197 |
| | Q2 | 6.7 | 7.54 | 50.518 | 56.8516 | -0.14 | 0.0196 | -0.67 | 0.0938 |
| | Q3 | 6.1 | 7.5 | 45.75 | 56.25 | -0.18 | 0.0324 | -1.27 | 0.2286 |
| | Q4 | 5.3 | 7.33 | 38.849 | 53.7289 | -0.35 | 0.1225 | -2.07 | 0.7245 |
| 2013 | Q1 | 4.6 | 6.75 | 31.05 | 45.5625 | -0.93 | 0.8649 | -2.77 | 2.5761 |
| | Q2 | 7 | 4.84 | 33.88 | 23.4256 | -2.84 | 8.0656 | -0.37 | 1.0508 |
| | Q3 | 7.5 | 6.14 | 46.05 | 37.6996 | -1.54 | 2.3716 | 0.13 | -0.2002 |
| | Q4 | 6.3 | 7.05 | 44.415 | 49.7025 | -0.63 | 0.3969 | -1.07 | 0.6741 |
| 2014 | Q1 | 6.7 | 5.38 | 36.046 | 28.9444 | -2.3 | 5.29 | -0.67 | 1.541 |
| | Q2 | 6.7 | 5.8 | 38.86 | 33.64 | -1.88 | 3.5344 | -0.67 | 1.2596 |
| | Q3 | 8.4 | 3.84 | 32.256 | 14.7456 | -3.84 | 14.7456 | 1.03 | -3.9552 |
| Sum | | 140.1 | 145.84 | 1094.71 | 1183.84 | | 64.4038 | | 19.3316 |
| Average | | 7.37 | 7.68 | 57.62 | 62.31 | | | | |

Appendix Table 8:

| | | Quarterly India GDP growth Y | Quarterly India Inflation Rate X | Yt [^] | (Y - Yt [^]) | (\bar{Y} - Yt [^]) square | xt = (Xt - X ⁻) | xt = (Xt - X ⁻) squared |
|---------|-------|--|--|-----------------|---------------------------|--|-----------------------------------|---|
| 2010 | Q1 | 7.5 | 9.56 | 7.937 | -0.437 | 0.190969 | 1.88 | 3.5344 |
| | Q2 | 9.8 | 10.54 | 8.231 | 1.569 | 2.461761 | 2.86 | 8.1796 |
| | Q3 | 7.4 | 9.28 | 7.853 | -0.453 | 0.205209 | 1.6 | 2.56 |
| | Q4 | 8.6 | 8.91 | 7.742 | 0.858 | 0.736164 | 1.23 | 1.5129 |
| 2011 | Q1 | 8.5 | 9.56 | 7.937 | 0.563 | 0.316969 | 1.88 | 3.5344 |
| | Q2 | 7.6 | 9.6 | 7.949 | -0.349 | 0.121801 | 1.92 | 3.6864 |
| | Q3 | 8.2 | 9.71 | 7.982 | 0.218 | 0.047524 | 2.03 | 4.1209 |
| | Q4 | 9.2 | 9.02 | 7.775 | 1.425 | 2.030625 | 1.34 | 1.7956 |
| 2012 | Q1 | 8 | 7.49 | 7.316 | 0.684 | 0.467856 | -0.19 | 0.0361 |
| | Q2 | 6.7 | 7.54 | 7.331 | -0.631 | 0.398161 | -0.14 | 0.0196 |
| | Q3 | 6.1 | 7.5 | 7.319 | -1.219 | 1.485961 | -0.18 | 0.0324 |
| | Q4 | 5.3 | 7.33 | 7.268 | -1.968 | 3.873024 | -0.35 | 0.1225 |
| 2013 | Q1 | 4.6 | 6.75 | 7.094 | -2.494 | 6.220036 | -0.93 | 0.8649 |
| | Q2 | 7 | 4.84 | 6.521 | 0.479 | 0.229441 | -2.84 | 8.0656 |
| | Q3 | 7.5 | 6.14 | 6.911 | 0.589 | 0.346921 | -1.54 | 2.3716 |
| | Q4 | 6.3 | 7.05 | 7.184 | -0.884 | 0.781456 | -0.63 | 0.3969 |
| 2014 | Q1 | 6.7 | 5.38 | 6.683 | 0.017 | 0.000289 | -2.3 | 5.29 |
| | Q2 | 6.7 | 5.8 | 6.809 | -0.109 | 0.011881 | -1.88 | 3.5344 |
| | Q3 | 8.4 | 3.84 | 6.221 | 2.179 | 4.748041 | -3.84 | 14.7456 |
| Sum | 140.1 | 145.84 | | | 24.674 | | 64.4038 | |
| Average | 7.37 | 7.68 | | | | | | |

Appendix Table 9:

| | | Quarterly India GDP growth Y | Quarterly India Inflation Rate X | ln (GDP growth rate) | ln (inflation rate) |
|------|----|---------------------------------------|--|-------------------------|------------------------|
| 2010 | Q1 | 7.5 | 9.56 | 2.014903 | 2.2575877 |
| | Q2 | 9.8 | 10.54 | 2.2823824 | 2.3551775 |
| | Q3 | 7.4 | 9.28 | 2.00148 | 2.2278615 |
| | Q4 | 8.6 | 8.91 | 2.1517622 | 2.1871742 |
| 2011 | Q1 | 8.5 | 9.56 | 2.1400662 | 2.2575877 |
| | Q2 | 7.6 | 9.6 | 2.0281482 | 2.2617631 |
| | Q3 | 8.2 | 9.71 | 2.1041342 | 2.2731563 |
| | Q4 | 9.2 | 9.02 | 2.2192035 | 2.1994443 |
| 2012 | Q1 | 8 | 7.49 | 2.0794415 | 2.0135688 |
| | Q2 | 6.7 | 7.54 | 1.9021075 | 2.0202222 |
| | Q3 | 6.1 | 7.5 | 1.8082888 | 2.014903 |
| | Q4 | 5.3 | 7.33 | 1.6677068 | 1.9919755 |
| 2013 | Q1 | 4.6 | 6.75 | 1.5260563 | 1.9095425 |
| | Q2 | 7 | 4.84 | 1.9459101 | 1.5769147 |
| | Q3 | 7.5 | 6.14 | 2.014903 | 1.8148247 |
| | Q4 | 6.3 | 7.05 | 1.8405496 | 1.9530276 |
| 2014 | Q1 | 6.7 | 5.38 | 1.9021075 | 1.6826884 |
| | Q2 | 6.7 | 5.8 | 1.9021075 | 1.7578579 |
| | Q3 | 8.4 | 3.84 | 2.1282317 | 1.3454724 |