

Dynamic Fuel Pricing in India: An Event Study Methodology

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ABSTRACT

The decision of daily changes in prices of petroleum products by the Government of India was implemented from June 16, 2017. The public-sector oil marketing companies started the system of daily price revision as against the previous system for auto fuel, where any revision was taken fortnightly. The central argument of this paper is to know the pre and post effect of petrol price changes in India. The study is done by taking the petrol prices of five major cities of India viz. Delhi, Mumbai, Chennai, Kolkata and Bangalore. The petrol prices are analyzed for the year 2017. The prices were changed in 122 days out of 365 days. The event study methodology is used to find out the Average Abnormal Price (AAP) by Mean Adjusted Method in petrol prices in five cities. The results as per the mean adjusted revealed that there was a significant impact of the dynamic fuel pricing from August 22, 2017 to October 3, 2017. The other days did not show any significant impact of the decision.

Keywords: Oil Marketing Companies, Dynamic fuel pricing, Administered Price Mechanism, Event study methodology, Average Abnormal Pricing, Return Generating Model.

INTRODUCTION:

The Government of India initiated a new pricing model for fuel across the country since June 2017. At present, the prices of fuel are changed on a daily basis which is coined as dynamic fuel pricing. This new pricing policy initially started on May 1, 2017 in five cities across the country viz. Pondicherry and Vishakhapatnam among southern states, Udaipur in the West, Jamshedpur in the East and Chandigarh in the North. After the success of the pilot project in these cities, it was implemented in approximately 58,000 petrol pumps across the nation from June 16, 2017. This every day change of fuel prices are based on international market prices of crude oil and foreign exchange rates¹. Previously, the Oil Marketing Companies (OMCs) namely, Indian Oil Corporation Limited (IOCL), Hindustan Petroleum Corporation Limited (HPCL) and Bharat Petroleum Corporation Limited (BPCL), used to revise their fuel prices on the 1st and 16th of every month. The rates were based on the average international price of the previous fortnight and the exchange rate².

Globally, countries like the United States of America (USA), Australia, Japan and Germany are following the dynamic fuel pricing policy since last two decades. Hence, this change in policy in India from a government regulated system to a dynamic one is to bring parity with international petroleum product prices i.e. diesel and petrol. Another objective of this change is to curb the price speculation in the petroleum product market in India. It is believed by the OMCs that when changes were done on 1st and 16th of every month, speculation use to happen

¹<https://spontaneousorder.in/a-guide-to-petrol-pricing-in-india-components-mechanisms-and-daily-price-change-a84fb67f23dd> on April 15, 2018.

² <http://www.thehindu.com/todays-paper/petrol-diesel-prices-to-be-fixed-daily/article17967958.ece>

in the market about, whether the prices would go up or come down and customers would behave accordingly. On the other hand, now when the price changes every day, speculation does not have a major significance³. Given this backdrop, the central argument of this paper is to study the pre and post effect of dynamic fuel pricing in India. The paper has two specific objectives. First, to identify the pre and post impact of dynamic fuel pricing in Indian petroleum industry; and, secondly, to examine if there are any issues related to abnormal prices caused due to the policy change and the reason behind it. In other words, this study aims to determine whether there is any significant fluctuation in the petroleum price prior and post policy change. This study considered only the prices related to petrol. For the same, the retail petrol price data is analyzed and Average Abnormal Pricing (AAP) is found out by a Return Generating Model (RGM) i.e. mean adjusted pricing model for the year 2017.

DETERMINATION OF PETROL PRICES IN INDIA:

From an industry perspective the petroleum industry consist of three major segments – upstream, midstream and downstream. This retail sell of petroleum is a part of downstream industry where the crude oil is purchased by OMCs like IOCL, BPCL and HPCL in India from the midstream players like GAIL (India), Reliance and Essar. These companies pay freight and transportation charge in addition to crude oil prices per barrel. Then the oil is converted into petrol by refineries. In exchange of this refining service, the OMCs pay the refinery transfer price to the refineries. Till this point, the oil remains to be owned by the OMCs. OMCs pay excise duty to dealers at a margin, before selling it. Further this refined oil, which is now in the form of petrol, is sold to dealers by the OMCs. It is sold on cost plus profit basis. From this point the petrol is owned by the dealers. State VAT and dealer's margin with pollution cess⁴ and surcharge are finally added to the cost price. More than 57 per cent of the retail petrol price per liter goes towards taxes, duties, cess and dealer margins. This price is final retail price of petrol, and this price is available on petrol pumps.

From 2002, the government was following the Administered Price Mechanism (APM), wherein the government pre-determined the prices at cost plus formula. So, the OMCs were eligible to a fixed return on investment based on their cost of production. APM was dismantled in 2002, and various practices for partial deregulation were implemented between 2002 and 2010. In 2010, petrol prices were totally liberalized and freed to be determined based on market forces. A shift was made to the automatic price mechanism which would reflect on international market prices and foreign exchange rates. The supreme authority to set the final retail prices lay with OMCs.

From June 16, 2017, government came up with the daily price change mechanism in India. The petrol pumps now follow a system of marginally differentiated pricing. According to this policy, different prices are set at different outlets of the same OMC, based on location. Suppose a petrol pump which is nearer to the supply station would have lower price as compared to the one which is farther. This change helps align fuel prices to international crude oil prices and enhance transparency in the pricing mechanism by reducing political proposals in price setting. The prices are revised at 6 AM every morning at each petrol pumps.

For petrol pumps, which are automated, the prices are changed centrally, with no additional manpower requirements. Out of the total 58,000 petrol pumps, only about 20 per cent form such automated petrol pumps. For the remaining non-automated petrol pumps, prices will have to be revised manually every day. The non-automated petrol pumps can access the information via customized SMS, emails, mobile applications and web portal for dealers. Also, for the consumers the revised prices are immediately exhibited at all petrol pumps⁵.

LITERATURE REVIEW:

While there are several studies conducted on the crude oil prices and government policies, however not many literature is available related to the dynamic fuel pricing in India. Since this day of pricing is a recent phenomenon with Indian petroleum market therefore it is quite obvious that not much work is done in this area. Therefore, research of this paper will definitely be an important contribution in this area.

A range of structural indicators suggest that Irish retail fuel markets at national level are competitive, with the markets characterized by relatively tight margins. Still, the perception persists that the retail transport fuel market in Ireland may not be entirely competitive with consumers not benefitting from falls in crude oil prices with the same rapidity as they are burdened with rises in crude oil prices. It is been found that, the retail prices react more quickly when price pressures are negative compared to positive, from investigation done on the movements of refined prices, wholesale prices and retail pump prices in Ireland during 2008 (Bermingham and

³ <http://indianexpress.com/article/india/new-fuel-price-diesel-petrol-4721879/>

⁴ A cess a tax on tax, levied by the Indian government for a specific purpose. For example, a cess for financing primary education – the education cess (which is imposed on all central government taxes) is to be spent only for financing primary education and not for any other purposes.

⁵ <https://spontaneousorder.in/a-guide-to-petrol-pricing-in-india-components-mechanisms-and-daily-price-change-a84fb67f23dd>

Brien, 2011). A study on the effects of the price level and industrial output revealed that, the impact on the U.S. and Canadian economies is substantial, with smaller and significant effects in Japan, Germany, and the U.K. For industrial production, it was found that the price of oil exerts a sizeable influence in the U.S. and the U.K., but the responses in other countries are, by comparison, quite small (Burbidge and Harrison, 1984). In a study it was found that between 1999 and 2008, world oil prices more than quadrupled in real terms. Due to this, the oil importing countries have to spend a considerable portion of the GDP on the oil imports. Considering medians, low-income countries had the highest vulnerability in 2008 and the highest increase in vulnerability between 1999 and 2008 (Kojima, 2012).

In India, the petrol prices rise mostly because of the cost of the crude oil and refined products in international markets and absence compensation to the oil companies. The company should have freedom to set fuel prices in the competitive market and government should help consumers by providing subsidies which does not have any negative effect on oil companies while setting oil prices in the market place (Dani, 2014). Crude oil and other petroleum products play a very important role in an economy and India imports around 100 million tons of crude oil and other petroleum products. It has been usually observed that in India, the pricing scheme is designed in such a way that it offers a system to moderate the rising international oil prices and in that way it studies impact of growth, inflation etc. the rising oil prices may differ from country to country depending upon their individual demand and supply structure (Aparna, 2013). Till 1939 there were no control on the prices of the petroleum products and from 1939 to 1948 the oil companies themselves use to account the products without any interference of the government. In 1948 the attempt was made to control the prices through value stock procedure it was a formula based on import parity to control the various cost such as ocean freight, insurance, ocean loss, remuneration, import duty and other levies charges this continued till early 70s. Post 1973 the government formed the oil price committee under the chairmanship of Krishnaswamy in 1974. The oil price committee (OPC) removed the import parity and introduced administered pricing mechanism (APM) for the petroleum product (Bandyopadhyay, 2009).

RESEARCH METHODOLOGY:

This study is conducted through empirical analysis based on secondary sources of data. The data is collected from the IOCL website. For the analysis Mean Adjusted Pricing Method (MAPM) is used to find the average abnormal petrol price fluctuations. The study is conducted on the five metropolitan cities of India viz. Delhi, Chennai, Bangalore, Kolkata and Mumbai. The fuel prices are analyzed from January 1, 2017 to December 8, 2017, in which the pre event is considered from January 1, 2017 to June 1, 2017 and post event is considered from June 16, 2017 to December 8, 2017.

Research Hypothesis:

To achieve the objectives of the study, the following hypothesis is developed:

H₀: There is no significant Average Abnormal Price caused due to dynamic fuel pricing in India on petrol prices.

H₁: There is significant Average Abnormal Price caused due to dynamic fuel pricing in India on petrol prices.

Proposed Model:

To study the abnormality in the fuel pricing, Mean Adjusted pricing Model (MAPM) is used to find AAP and the hypothesis is tested using t-statistic.

Event study methodology is used to study whether there are any abnormal returns caused due to dynamic fuel pricing on petrol pricing of five cities. The main objective is to detect the abnormal price fluctuation due to the implementation of the policy. The model is explained below.

Mean Adjusted Pricing Model:

The mean adjusted return model, takes into account the mean of the petrol prices of city i as expected price. It is calculated as:

$$AP_{it} = P_{it} - \bar{P}_t$$

where, AP_{it} is Abnormal Price of city i and day t;

P_{it} is price of petrol of city i and day t;

\bar{P}_t is simple mean of petrol price of city i daily price.

Average Abnormal Price:

Abnormal Price is found to segregate the effect of event from its average price of a particular time interval. AAR is calculated as below

$$AAP_t = \sum_{i=1}^N \frac{AP_{it}}{N}$$

AAP_t is Average abnormal Price at day t
 N is number of cities, here 5.

Test Statistics:

The T statistics is calculated to test the significant impact of dynamic fuel pricing on petrol prices, the level of significance of AAP from January 1, 2017 to December 8, 2017. T-statistics is calculated with 4 degrees of freedom and at 5, 2.5, 1 and 0.5 per cent level of significance.

Alpha with respective t-values

α	t-value
5%	2.132
2.50%	2.776
1%	3.747
0.50%	4.604

$$t = \frac{AAP_t}{S.E.}$$

where, S.E. is Standard Error calculated as

$$S.E. = \sqrt{\sum \frac{(AP_{it} - AAP_t)^2}{N - 1}}$$

RESULTS AND DISCUSSION:

Pre Dynamic Fuel Pricing:

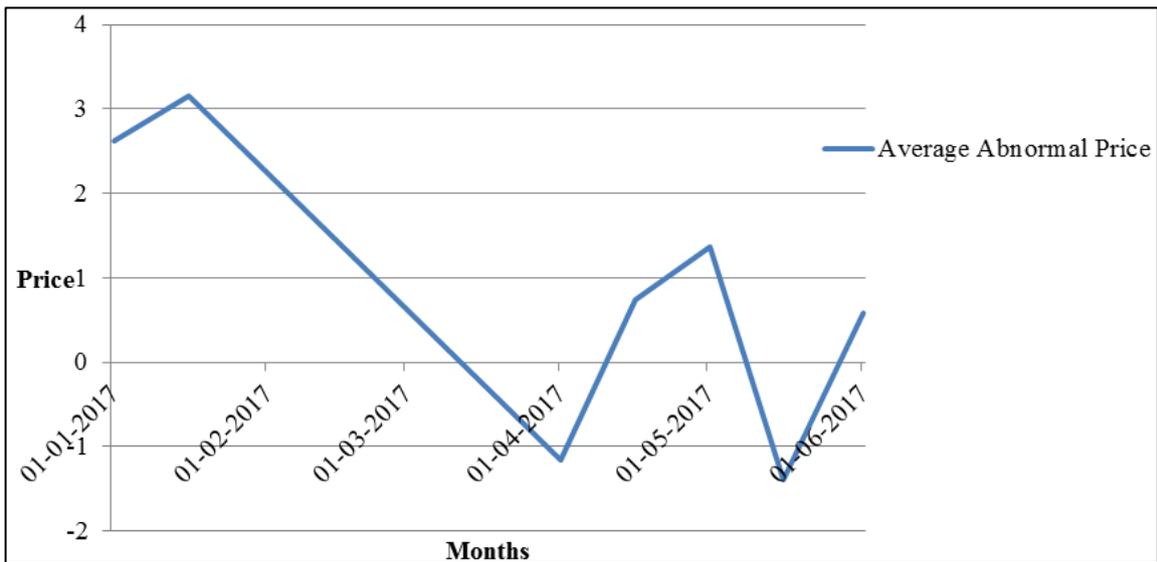
Table 1: AAP of Mean Adjusted Model

Date	Average Abnormal Price	T-statistics
01-01-2017	2.617424897	1.108168329
16-01-2017	3.159424897	1.331218221
01-04-2017	-1.164575103	-0.084057392
16-04-2017	0.735424897	0.426512654
01-05-2017	1.361424897	1.234941253
16-05-2017	-1.400575103	-1.416154844
01-06-2017	0.581424897	0.454103938

Source: Calculated by author

The T-test is done with 5 per cent level of significance and 4 degrees of freedom. The t-value at 95 per cent confidence interval is 2.132. Hence any t-value which is greater than 2.132 will depict that the null hypothesis is rejected and there is a significant price fluctuation due to the policy. From Table 1 and Figure 1, it is revealed that there is no abnormal price fluctuation prior to the policy of dynamic fuel pricing.

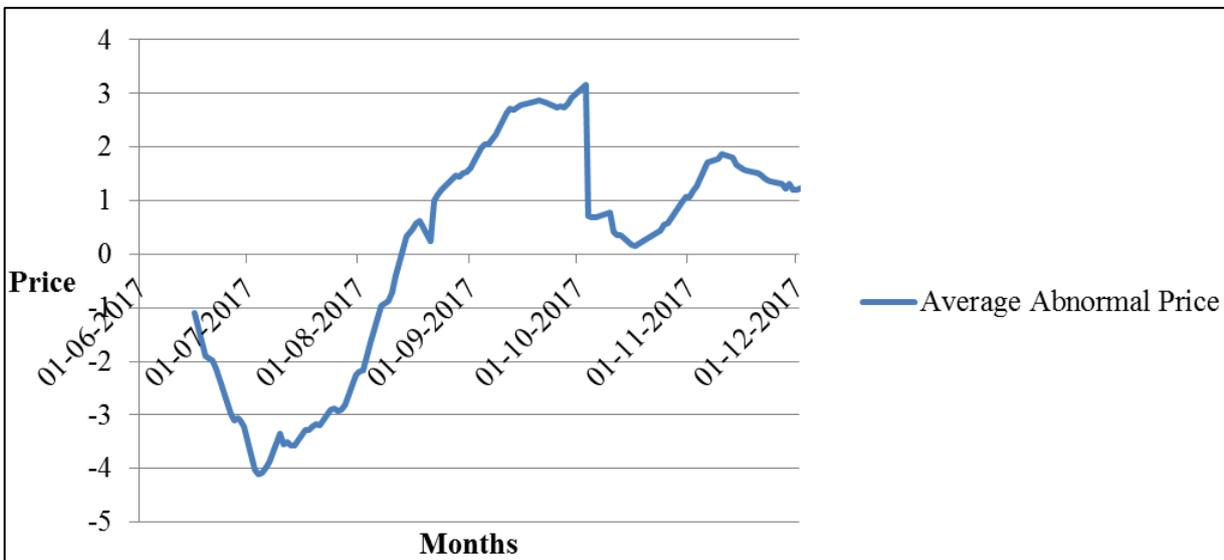
Figure 1: Volatility of AAP of Mean Adjusted Model



Source: Calculated by author

Post dynamic fuel pricing:

Figure 2: Volatility of AAP of Mean Adjusted Model



Source: Calculated by author

Annexure 1 and Figure 2 depicts that the data from June 16, 2017 to December 8, 2017 explains the AAP fluctuations found from August 22, 2017 till October 3, 2017. Significant price fluctuations were found during this interval at 5%, 2.5%, 1% and 0.5% level of significance. The t-test values reflect that, there is a significant impact of fuel pricing on petrol prices. It cannot be just the policy of dynamic fuel pricing that has influence the volatility of petrol during this particular period. There may be some factors which can impact the price fluctuations in the petrol prices, all the external factors like political, economic, technological, environmental and legal.

However in this case it was found that fuel prices have reached its three years peak during this phase, due to ecological imbalance. The primary reason behind this is the impact of Hurricane IRMA and Harvey. IRMA developed on August 30, 2017 in Cape Verde, in West Africa and resumed on September 13, 2017, in Missouri, in the US. Whereas, Harvey formed on August 17, 2017 in Houston metropolitan area, in the US and disappeared on September 2, 2017, in Louisiana, in the US. The hurricanes, IRMA and Harvey have caused a 13% decline in global refining capacity. Also, this has resulted international crude prices to increase, petrol price had increased 18% and diesel prices have increased 20% in global markets. Data shows that between July 1, 2017 and

September 12, 2017, prices of petrol and diesel in Delhi rose from INR 63.09⁶ per litre to INR 70.38 per litre. The price of diesel has risen from INR 53.33 per litre on July 1, 2017 to INR 58.72 per litre September 18, 2017. Thus it results to an increase of 11.55 per cent in the price of petrol and 10.1 per cent for diesel. Due to this imbalance in the global market, in India the price of petrol increased by INR 5 and of diesel by INR 3.

CONCLUSION:

Although several experts in the petroleum field were skeptical about the influence of dynamic fuel pricing in the Indian market, however, the study shows that there is no abnormality in petrol prices after June 16, 2017, due to the implementation of dynamic fuel pricing. Although, there is an abnormality observed in the study between August 8, 2017 and October 3, 2017, but this abnormality is mainly due to external influence factors. The hurricane caused 18 per cent to 20 per cent of increase in world market and that led to increase in the domestic market. Hence it can be concluded that there is not much significant change in the behaviour of the Indian market in context of dynamic fuel pricing policy.

The limitation of this study is that it has considered only 6 months period for research post the implementation of the dynamic pricing policy. Also, the study has considered the five metropolitan cities only, which may not show the whole picture of the pricing policy. When the prices rose during August, September and October, there was a chaos amongst the consumers. The consumers thought that the petrol price rose due the implementation of the dynamic fuel pricing, which is not true. The real reason was the ecological imbalance that caused due to the hurricane IRMA and Harvey which is discussed in the study.

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ANNEXURE 1:

Table 2: AAP of Mean Adjusted Model

Date	AAP	T-statistics	Date	AAP	T-statistics	Date	AAP	T-statistics
16-06-2017	-1.089	-0.854	10-08-2017	-0.721	-1.585	10-10-2017	0.783	0.334
19-06-2017	-1.895	-1.380	11-08-2017	-0.411	-0.904	11-10-2017	0.409	0.144
20-06-2017	-1.950	-1.720	14-08-2017	0.325	0.748	12-10-2017	0.345	0.119
21-06-2017	-1.991	-1.455	16-08-2017	0.465	1.047	13-10-2017	0.359	0.124
22-06-2017	-2.141	-1.577	17-08-2017	0.567	1.277	16-10-2017	0.181	0.059
23-06-2017	-2.353	-1.750	18-08-2017	0.621	1.412	17-10-2017	0.151	0.048
26-06-2017	-2.973	-2.264	21-08-2017	0.242	0.278	18-10-2017	0.189	0.061
27-06-2017	-3.103	-2.371	22-08-2017	0.999	2.277*	24-10-2017	0.433	0.155
28-06-2017	-3.059	-2.336	23-08-2017	1.111	2.609*	25-10-2017	0.551	0.205
29-06-2017	-3.097	-2.376	24-08-2017	1.209	2.752*	26-10-2017	0.583	0.219
30-06-2017	-3.207	-2.462	28-08-2017	1.477	3.501*	30-10-2017	0.969	0.429
03-07-2017	-4.025	-3.538	29-08-2017	1.453	3.336*	31-10-2017	1.067	0.495
04-07-2017	-4.115	-3.611	30-08-2017	1.507	3.572*	01-11-2017	1.073	0.500
05-07-2017	-4.075	-3.580	31-08-2017	1.535	3.653*	02-11-2017	1.185	0.583

⁶ Exchange rate 1 USD = 67.79 INR as on May 17, 2018.

Date	AAP	T-statistics	Date	AAP	T-statistics	Date	AAP	T-statistics
06-07-2017	-4.005	-3.521	01-09-2017	1.599	3.703*	03-11-2017	1.275	0.656
07-07-2017	-3.875	-3.410	04-09-2017	1.977	4.587**	06-11-2017	1.707	1.119
10-07-2017	-3.349	-2.937	05-09-2017	2.049	4.754**	07-11-2017	1.739	1.162
11-07-2017	-3.541	-7.328	06-09-2017	2.049	4.754**	09-11-2017	1.789	1.233
12-07-2017	-3.499	-7.262	07-09-2017	2.143	4.995**	10-11-2017	1.871	1.358
13-07-2017	-3.563	-7.316	08-09-2017	2.233	5.224**	13-11-2017	1.799	1.248
14-07-2017	-3.579	-7.377	11-09-2017	2.627	6.180**	14-11-2017	1.667	1.067
17-07-2017	-3.279	-7.187	12-09-2017	2.723	6.374***	15-11-2017	1.617	1.004
18-07-2017	-3.273	-6.975	13-09-2017	2.697	6.344***	16-11-2017	1.587	0.968
19-07-2017	-3.221	-7.087	14-09-2017	2.739	6.440***	17-11-2017	1.549	0.925
20-07-2017	-3.181	-7.047	15-09-2017	2.779	6.534***	20-11-2017	1.513	0.889
21-07-2017	-3.203	-6.870	19-09-2017	2.841	6.737***	21-11-2017	1.467	0.836
24-07-2017	-2.909	-6.657	20-09-2017	2.871	6.787***	22-11-2017	1.417	0.786
25-07-2017	-2.871	-6.591	21-09-2017	2.841	6.737***	23-11-2017	1.369	0.740
26-07-2017	-2.917	-6.449	22-09-2017	2.819	6.617***	24-11-2017	1.347	0.720
27-07-2017	-2.903	-6.446	25-09-2017	2.731	6.217***	27-11-2017	1.321	0.705
28-07-2017	-2.805	-6.284	26-09-2017	2.759	6.342***	28-11-2017	1.225	0.622
31-07-2017	-2.253	-5.305	27-09-2017	2.731	6.217***	29-11-2017	1.305	0.691
01-08-2017	-2.185	-4.579	28-09-2017	2.809	6.582***	30-11-2017	1.209	0.610
02-08-2017	-2.167	-4.401	29-09-2017	2.913	6.782***	01-12-2017	1.193	0.598
04-08-2017	-1.653	-3.484	03-10-2017	3.171	5.738*	05-12-2017	1.311	0.701
07-08-2017	-0.965	-2.151	04-10-2017	0.711	0.294	06-12-2017	1.225	0.627
08-08-2017	-0.927	-2.023	05-10-2017	0.681	0.278	07-12-2017	1.217	0.621
09-08-2017	-0.865	-1.883	06-10-2017	0.691	0.283	08-12-2017	1.185	0.596

Source: Calculated by author.

Note: * Significant at 90%, **Significant at 95%, ***Significant at 97.5%.
