

OIL PRICES AND INFLATION: THE CASE OF INDIA

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Abstract:

Oil has today become a very important part of any economy. And it is generally said that even a slight increase or decrease in the oil prices affect the country's inflation to a large extent. To investigate this we examined two periods in the context of Indian economy, one from April 2005 to December 2007 and the other from January 2008 to November 2013. By applying the Johansen co-integration test and the Granger Causality test the relationship was examined. From April 2005 to December 2007 there was no significant impact of oil prices on inflation found but the econometric examination showed the effect of oil prices on inflation between January 2008 to November 2013. Contrary to the general perception, it was concluded that there would always be a correlation between oil prices and inflation is not necessary.

Keywords: Oil Prices, Inflation, India, Granger Causality, Johansen Co-Integration, Indian Economy.

INTRODUCTION:

In the recent decades, oil has become a major component in running both developed and developing economies of the world. And, Indian economy is not an exception. Whenever we talk about oil prices, the question which often arises is that what is the relationship between oil prices and inflation? And in the answer, it is being said, that they both move hand in hand. If oil prices move up or down, inflation follows in the same direction. And the reason, given for this is that oil is a major input in the economy – it is used in the critical activities such as fuelling transportation and heating homes and if input cost rise, so should the cost of end products and vice versa. The

reason makes proper sense but the answer seems wrong.

This answer would be right if oil prices would be the only factor affecting inflation. Imagine, a period, in which there is an increase in oil prices and, in that same period, agriculture production also increased drastically due to good weather. Now, will this increased agriculture production not dilute down the effect of an increase in oil prices on inflation?

In this paper, I will try to find out the answer to this question by taking two periods of Indian economy. One period would be, in which there was a significant impact of oil price and the other would be, in which the impact of oil prices was not that significant.

There can be two possibilities, one, oil prices do not affect inflation and the other, oil prices do affect inflation. In the first part of this paper, I will talk about both of these possibilities, in theory, in the second part, I will use econometric techniques to analyse both of these possibilities. Lastly, in the conclusion part, I will put forward the key findings.

Oil prices, Inflation and their relationship:

India uses WPI i.e. wholesale price index to measure its inflation rate. And fuel prices i.e. mineral oil has a share of 9.36439% in WPI. So one type of effect of fuel prices on inflation is straightforward.

Now let's talk about the ripple effect. We know that petrol and diesel are such a critical inputs into a range of sectors and industries, that any increase in fuel prices will have a ripple effect causing other sectors in turn to hike their prices. Take agriculture, for instance, petroleum products are used in running irrigation pump sets, running other agricultural machines, transportation, and even in the fertilizers, so any increase in diesel prices results in higher costs for farmers, and over a period of time, higher food prices for consumers.

Celestine (2013, p.1) has stated that in 2011, Reserve Bank of India, assessed that a 10% increase in domestic fuel prices, could raise overall wholesale prices by about 1% in the short run and in the long run by about 2 percentage points. Earlier also India have faced sharp increases in oil prices that sparked massive inflation in the years 1973-74, 1979-80 and 1990-91.

The period from January 2008 to November 2013, I took for analysing the relationship between oil prices and inflation also showed a significant impact of oil prices on inflation. In the year 2008-09 inflation remained high on account of high international fuel prices. In 2009-10, there was a global slowdown and unfavourable monsoon, still, the average inflation was only 3.6 percent because of negative inflation in fuel. In 2010-11 the effect remained quite low, in 2011-12, in initial months a revision in the administered prices of fuel increased WPI. In 2012, the contribution of fuel group remained high despite suppressed inflation from the administered prices of some petrol products. And in 2013 also fuel remained a key driver of price rise throughout the year.

Now let's talk about the other possibility i.e. oil prices having no effect on inflation. during the 1990's gulf war oil crisis, in the US, oil prices doubled in six months from around 20\$ to 40\$, but CPI remained relatively stable, growing from 134.6 in January 1991 to 137.9 in December

1991. This detachment in the relationship was even more apparent during the oil prices run-up from 1995 to 2005, in which the annual average nominal of oil rose from 16.56\$ to 50.04\$ and CPI only rose from 164.30 to 196.80.

India also saw a similar kind of detachment in this relationship in a recent period, from April 2005 to December 2007. And this period, I have taken for analysing the relationship between oil prices and inflation. From April 2005 to December 2005 oil prices went up from 107.2 to 121.3 but the inflation rose only from 102.7 to 104.6. and years 2006 and 2007 also didn't show a strong relationship between the oil prices and inflation.

Now the question arises that what can be the reason of this detachment in the relationship. In my view, the reason would be, the significant impact of other factors on inflation which dilutes the impact of oil prices.

ECONOMETRIC ESTIMATION:

1st possibility: Oil prices and inflation does not have any relationship.

☑ Time Period: Monthly time series of the time period 2005:4 to 2007:12.

☑ Data: For inflation, monthly WPI index of all commodities and for domestic oil prices, monthly WPI index of mineral oil.

☑ Source of data: Office of Economic Advisor of India, the ministry of commerce and industry, the government of India.

☑ Base Year: 2004-05.

☑ Tool: Eviews software for performing the tests.

Step 1: In several studies where time series were used, it was observed that these series included a unit root and were not stationary. Conscious of the fact that results obtained from analyses performed with an unstable time series could be spurious, unit root test was done on both the time series and the result of the test are given below in table 1 and table 2.

Table 1:

Augmented Dickey-fuller test

At level

Variable	Intercept	T-Statistic	Trend And Intercept	T-Statistic	None	T-Statistic
Oil prices	-3.66	-3.13	-4.28	-2.51	-2.64	0.67
Inflation rate	-3.65	-0.65	-4.30	-3.22	-2.63	3.57

Table 2:

Augmented dickey fuller test

1st difference

Variable	Intercept	T-Statistic	Trend And Intercept	T-Statistic	None	T-Statistic
Oil prices	-3.66	-4.10	-4.28	-4.52	-2.64	-3.80
Inflation rate	-3.66	-4.79	-4.28	-4.77	-2.64	-3.27

The resultant values shown in the tables are at 1%. According to Schwarz information criteria (SIC) the maximum lag length was taken as 8. The ADF test results revealed that the level values of variables included a unit root as shown in table 1 and first difference of variables had stationary characteristics as shown in table 2.

Step 2: To find out the relationship between oil prices and inflation, Pairwise Granger Causality tests were performed, by taking logs 2,4,6,8 and 10 on the stationary first differenced time series data of oil and inflation. Its results are shown below in Table 3.

Table 3:

Pairwise Granger Causality Tests

Null hypothesis	Probability at lag 2	Probability at lag 4	Probability at lag 6	Probability at lag 8	Probability at lag 10
OIL does not Granger Cause INFLATION	0.9630	0.9917	0.9328	0.2665	0.6534
INFLATION does not Granger Cause DOIL	0.9150	0.4272	0.5469	0.8058	0.6384

In all the cases, both null hypotheses at 10% proves to be right by highly significant numbers. Now when both the hypothesis is proved right, we can say that the outcome of Granger causality test is that there is no relationship between oil prices and inflation, whatsoever. Step 3: Lag length selection criteria of VAR model is being performed to find out the optimal number of lag and its results are shown below in Table 4.

Table 4:

Lag	LogL	LR	SC
0	-123.9614	NA	10.59496
1	-57.74764	115.8742*	5.606817*
2	-53.02692	7.474477	5.743099
3	-50.29550	3.869507	6.045157
4	-47.22867	3.833539	6.319263
5	-42.67634	4.931699	6.469577
6	-37.13552	5.079079	6.537519
7	-32.41584	3.539762	6.673887
8	-27.58184	2.819836	6.800729
9	-23.01919	1.901101	6.950185

***INDICATES LAG ORDER SELECTED BY THE CRITERION.**

LR: LR test statistics (each test at 5%)

SC: Schwarz Information Criterion

According to both LR and SC criterion the optimal lag was found to be 1.

Step4: Johansen- Julius maximum likelihood co-integration analysis test is being performed, by taking lag 1, according to LR criterion, to know the relationship between the 2-time series. Its results are shown below in Table 5.

Table 5

Hypothesized	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.251134	12.87999	18.39771	0.2486
At most 1 *	0.118640	3.914947	3.841466	0.0479

The results of the co-integration test clearly show that at 0.05 level there is no co-integration between the 2 series and we cannot reject the first null hypothesis.

Outcome: Both granger causality test and co-integration test found that there is no relationship between the two time series i.e. between oil prices and inflation in the period, April 2005 to December 2007.

2nd possibility: oil prices affect inflation.

Time period: From January 2008 till November 2013.

There is only a change in time period, all other things are same as they were in the first possibility.

Step1: First, I checked the stationary status of the data and found the same conclusion as it was in the first case. Both the time series were non-stationary at the level and stationary at first difference.

Step2: Then I performed the Lag length selection criteria of VAR model to find the optimal amount of lag and optimal lag was found to be 9 according to LR criteria.

Step3: Johansen- Jueselius maximum likelihood co-integration analysis test is being performed, by taking lag 9, according to LR criterion, to know the relationship between the 2-time series. Its results are shown below in Table 6.

Table 6:

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.427253	36.80088	15.49471	0.0000
At most 1	0.044941	2.804902	3.841466	0.0940

The results of the co integration test clearly shows that at 0.05 level there is co-integration between the 2 series and we cannot reject the second null hypothesis.

Step 4: Performed the granger causality test on vector error correction model to know the relationship between 2 time series and to know which times series affects whom. The results are shown below in table 7.

Table 7:

Dependent variable: D(INFLATION)

Excluded	Chi -sq	df	Prob.
D(OIL)	15.30876	2	0.0005
All	15.30876	2	0.0005

Dependent variable : D(DOIL)

Excluded	Chi -sq	df	Prob.
D(INFLATION)	4.920623	2	0.0854
All	4.920623	2	0.0854

Oil prices do not Granger cause inflation, this null hypothesis is rejected at 0.05 level.

Inflation does not Granger cause oil prices, this null hypothesis is accepted at 0.05 level.

With the rejection of the first hypothesis, it becomes clear that oil does affect inflation.

Outcome: Co-integration test clearly found that there is a relationship between oil prices and inflation, in the period January 2008 to November 2013. And one step ahead to this, Granger causality test showed the movement of that relationship. It showed that this movement is from oil prices to inflation i.e. oil prices causes inflation.

Conclusion:

We discussed in the first part of the paper that from April 2005 to December 2007, there was not a significant impact of oil prices on inflation and from January 2008 to November 2013, there was a significant impact of oil prices on inflation. And econometric tests have statistically proven those findings.

The econometrical tests have shown that from 2005-2007 there was no relationship between oil prices and inflation. But in theory saying that would be wrong. There always exists a certain relationship between them, it is just that when other factors affect inflation significantly then the effect of oil prices on inflation got diluted and econometrical tests show the results similar to which they have shown during the period of April 2005- December 2007.

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