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How long will the impact of oil price shock last?

Evaluating historical data of international crude price and its impact on India's growth and inflation reveal some interesting results. Over the past 54 years, we found that on 18 out of 54 occasions, crude prices rose more than 20% in a year. Also, we have seen that the crude price shock is concentrated in certain years and the high of crude price generally lasts for 6-7 months. Here in our analysis, the period FY07-16 showed significant volatility in oil prices. Statistically speaking, the coefficient of determination (called R square) of oil prices impacting GDP and WPI-Fuel also turns out to be higher during this period. The ARDL (autoregressive distributed lag) model does not establish any long run relationship between oil prices, GDP, CPI and WPI. VAR (vector autoregressive) model shows optimal lag length of 5 quarters.

Section 1. Nature of oil price shock-Historical perspective:

We have analyzed the data for the past 54 years to identify occasions when there has been significant jump in crude prices. Out of 54 years data points that we looked at, on 18 occasions (including current year), oil prices rose more than 20%. In the current crisis, it has risen significantly by 39.7% (change since 27 Feb 2026, start of the war, till 6 May 2026). Also, the range of variation (difference between high and low), is significant in the current fiscal, as was seen during FY22 and FY11.

Table 1: Listing out Years where oil price shock has been observed and what caused the same

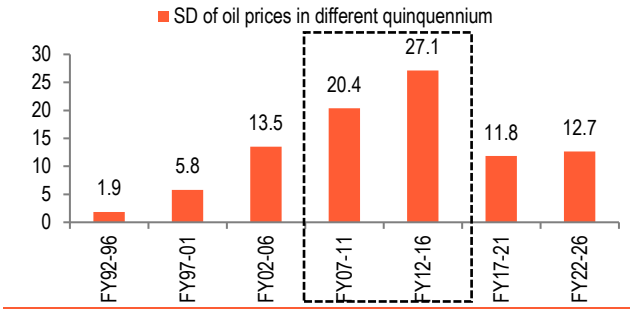
Year	Average Brent price, US$/bbl	Low	High	No of months of high	Change in crude price, YoY	Major Economic Events
FY73	4	N.A.	N.A.	NA	26.7	Organization of Arab Petroleum Exporting Countries proclaimed an oil embargo
FY74	13	10	13	NA	206.9	NA
FY79	22	16	29	NA	48	Iran-Iraq War
FY80	34	31	36	NA	57	Iran oil embargo
FY87	18	16	19	NA	30.2	OPEC price accord begins to deteriorate
FY89	18	16	20	NA	20.9	Spill and to potential shortages on the west coast
FY91	23	16	35	5	27.5	SPR released oil post-Gulf war
FY97	21	18	24	4	22.6	NA
FY00	22	15	27	8	73.1	Energy crisis
FY01	28	23	32	7	30.5	Recession and 9/11
FY05	42	36	53	9	47.4	Hurricane Katrina
FY06	59	50	64	10	39.4	North Korea's missile launch and Israel-Lebanon war
FY08	82	68	103	10+6*	26.2	Financial crisis
FY11	87	75	115	6	23.9	Political turmoil in Egypt, Libya, Yemen, and Bahrain
FY12	114	108	125	12#	30.9	US European sanctions on imports of Iranian oil
FY19	71	58	81	9	22	US sanctions on Venezuela and Iran and OPEC led supply cut
FY22	80	65	113	3	74.6	Russia-Ukraine war
Current crisis**	100	78	118	29 days of above US$ 100/bbl#	39.7	US-Iran conflict

Source: Newspaper reports, Bloomberg, Bank of Baroda Research, Note: ** Data is taken since the start of the war i.e. 28 Feb 2026, # US$ 100/bbl count date till 6 May 2026,*6 months of carry forward to the next year as oil prices remained elevated during those months, #5 months of high, however prices in general was elevated for the full 12-months, Highlighted ones are the years of notable development in financial and political landscape.

Table 1.0 shows that oil prices have the tendency to be impacted by geopolitical tensions. However, the high of crude prices has lasted for an average of 6-7months.

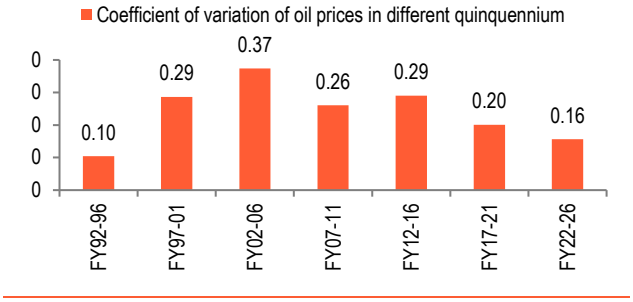
To see during which period the volatility in oil prices is maximum, we have used the Standard Deviation (SD) and Coefficient of variation (CV). For the same exercise, daily data of international oil prices have been used. The SD data in Fig 1 shows significant volatility in years FY07-11 and FY12-16, the years aftermath financial crisis and years corresponding to sanctions on oil, respectively. The coefficient of variation (CV) of oil prices has remained within specific range as mean of oil prices have increased in the volatile phases. Thus, it can be said that oil price shock is concentrated only in particular years.

Figure 1: Volatility of oil prices through SD



Source: Bank of Baroda Research

Figure 2: Coefficient of variation



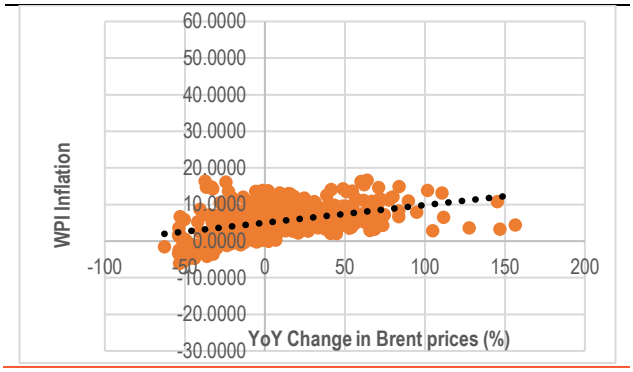
Source: Bank of Baroda Research

Section 2. Impact of crude oil prices on GDP and inflation

In this section we investigate the impact of volatility in oil prices on two major macro variables such as growth and inflation and the intensity of the shock.

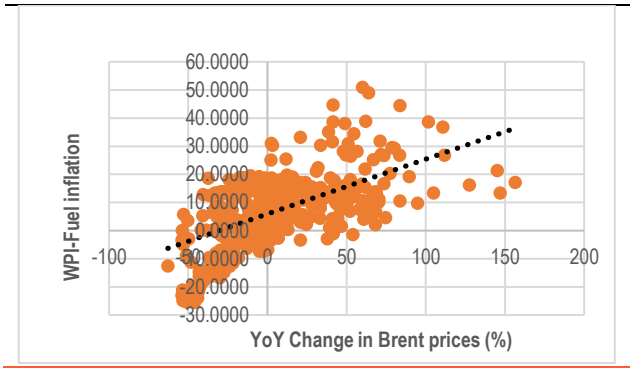
Fig. 3 and 4 shows a positive correlation coefficient between change in oil prices and producer prices (WPI). For the same, we have used monthly inflation and oil prices data from Jan-1991 to Mar'26. The trendline for Fig. 4 is steeper compared to Fig 3. The scatter plot between change in oil prices and CPI establishes no relationship. This is because CPI has a lower weightage of fuel components compared to WPI. Also, the impact of second round effect is more administered especially for components like petrol and diesel as the shock is mostly absorbed by the government.

Figure 3: Scatter plot between WPI and change in Brent prices



Source: Bloomberg, Bank of Baroda Research, Brent and oil is used interchangeably here

Figure 4: Scatter plot between WPI-Fuel and change in Brent prices



Source: Bloomberg, Bank of Baroda Research, Brent and oil is used interchangeably here

Table 2.0 shows that the correlation coefficient between real GDP and brent prices is weak at -0.19, in the long range. For inflation, only for WPI-Fuel, there seems to be a weak positive correlation in the long range.

The results change significantly when we consider the volatile phase that we have established from **Fig 1** i.e. **FY07-16**. Here WPI-Fuel has a strong positive correlation with oil prices, at 0.69.

Table 2: Correlation dynamics with international crude prices

Correlation coefficient with Brent	Long Range	FY07-16
CPI	-0.06	0.27
WPI	-0.02	0.61
WPI-Fuel	0.05	0.69
WPI-Fuel	0.05	0.69

Source: Bank of Baroda Research

Section 3.

3.1. What regression results convey?

Simple linear regression (SLRM) exercise has been conducted, where oil is the independent variable and GDP and inflation are dependent variables. The log scale of oil prices and GDP has been taken. Here two interesting things come out almost on similar line to what was established in the correlation coefficient results. For the long range, we have considered 115 time series observations from Jun-97 to Dec-25. We can see from Table 3. for the long-range series, apart from GDP, the t-statistic is statistically not significant. However, for the period of FY07-16, the summary output is different. Here the t-stat is statistically significant for all GDP, CPI, WPI and WPI-Fuel. However, R2 is higher for GDP and WPI fuel. (To be noted: For inflation, the monthly frequency of the data has been used when regressing with oil prices, to increase the number of observations)

The same exercise is repeated for Jun-06-Dec-25 to incorporate the period of Russia-Ukraine war. However, the results almost replicate the long-range series output with no statistically significant relationship apart from growth (Appendix 1).

Thus, from this section, we see that R2 of oil on WPI increases during Jun-06-Mar-16 period. R2 of oil on GDP is also higher at 0.69 (Table 4).

Table 3: Summary output for the long run series

Jun-97 to Dec-25	R2	t stat
LGDP	0.70	16.19
CPI	0.03	-1.77
WPI	0.05	-2.33
WPI-Fuel	0.01	-1.17

Source: Bank of Baroda Research, L: Log transformation

Table 4: Summary output for specific time periods

Jun-06-Mar-16	R2	t stat
LGDP	0.69	12.98
CPI	0.09	3.39
WPI	0.39	8.69
WPI-Fuel	0.49	10.54

Source: Bank of Baroda Research, Note: L: log transformation

3.2. What other tests convey?

To further establish whether short run or long run relationship exists between the variables, we have used the Auto regressive distributed lag model (ARDL model). The frequency is quarterly data from Jun-97-Dec-25. Before running the model, we have checked that all variables are a combination of I(0)/stationary and I(1)/first difference is stationary (I stand for integrated of order). The results have been shown in the Appendix (Appendix 2). The result of the long run form and Bounds test in Table 5.0 shows that for each of

the variables the F-statistic is less than I (0) i.e. the lower bound. Thus, we accept the null hypothesis that there is no long run relationship and cointegration does not exist.

Table 5: Summary output for long run form and Bounds test

Variables	F-Bounds Test	Null Hypothesis: No levels relationship	ECM
LGDP	F<I(0)	Accept	EC = LGDP - (-2.4250*LOIL + 32.2557)
CPI	F<I(0)	Accept	EC = CPI - (-1.0911*LOIL + 9.8109)
WPI	F<I(0)	Accept	EC = WPI - (-1.7514*LOIL + 10.6391)
WPI-Fuel	F<I(0)	Accept	EC = WPI_FUEL - (-0.2268*LOIL + 6.7251)

Source: Bank of Baroda Research, L: Log transformation

3.3. Econometrically, sometimes it is difficult to ascertain the nature and the extent of the transmission of different shocks. Hence it is better captured using simultaneous equation models. Thus, for further clarification, we have used the Vector autoregressive (VAR) model, so that there should not be a priori distinction between endogenous and exogeneous variables. In simple words, a VAR is a n-variable, n-equation model, in which each variable is a linear function of its own past values and past values of all other variables being considered and a serially uncorrelated error term. Here we have used the quarterly data from Jun-97-Dec-25. The primary step in the VAR model is to select the appropriate lag. If lag length is too small, the model will be mis-specified and if it is too large, then degrees of freedom will be wasted. The autocorrelation LM test confirms lag length of 5 (Appendix 3). This also goes with the Akaike Information Criterion (AIC).

Next, we have established the stability conditions of VAR model which implies stationarity. The inverse roots of the characteristic AR polynomial have modulus less than 1 and lie within the unit circle (Appendix 4), thus estimates of VAR is stable. The autocorrelations of all the variables are within 2 standard error Bounds (Appendix 5), establishing that the VAR model is appropriate.

We limit our exercise to this point as our main objective in the note is to choose the lag length criteria.

Section 4: Conclusion:

1. Historical data suggests that in 18 out of 54 episodes, oil prices have risen by more than 20%. Under the current episode, it has increased by 39.7% (change from 27 Feb 2026 till 6 May 2026)
2. Most of the high of oil price shock historically has lasted for 6-7 months on average.
3. Oil price shock is also concentrated in particular years and is not broad based.
4. In our analysis, FY07-16 turns out to be a crucial period in terms of volatility in oil prices.
5. R2 for GDP and WPI-Fuel is also higher, especially during this period compared to long-range series.
6. The ARDL model also showed that there is no long run relationship between change in oil prices and GDP, CPI, WPI and WPI-Fuel.
7. In VAR model, there is lag effect of 5 quarters of volatility in oil prices on macro variables.

References

1. Bhattacharya, Kaushik and Bhattacharya, Indranil (2001) 'Impact of Increase in Oil Prices on Inflation and Output in India', Economic and Political Weekly, Vol.36, No.51, pp 4735-4741.
2. Mr. Kali Charan Modak, Ms. Pallabi Mukherjee, “A Study on Impact of Crude Oil Price Fluctuation on Indian Economy”.

3. Ibrahim Tuhran and et.al (2012) “oil prices and emerging market exchange rates”, Central Bank of republic of Turkey, Middle East Technical University-MPRA Paper No: 36477, Feb 2012.

Appendix

Appendix 1: Summary output of Simple Linear Regression Model (SLRM)

Jun-06-Dec'25	R2	t stat
LGDP	0.69	12.98
CPI	0.25	-4.98
WPI	0.06	-2.13
WPI-Fuel	0.00	0.38

Source: Bank of Baroda Research, L: Log transformation

Appendix 2: Order of integration before running ARDL

Variables	Integrated of order
Loil	I(1)
GDP	I(1)
CPI	I(1)
WPI	I(0)
WPI fuel	I(0)

Source: Bank of Baroda Research, Note: L: log transformation

Appendix 3: Summary output of VAR Residual Serial Correlation LM Tests

Lag	LRE* stat	Prob.	Prob.	Null hypothesis: No serial correlation at lag h
1	72.4	0.00	0.00	Reject
2	52.9	0.00	0.00	Reject
3	46.0	0.01	0.01	Reject
4	51.8	0.00	0.00	Reject
5	35.4	0.08	0.08	Accept

Source: Bank of Baroda Research

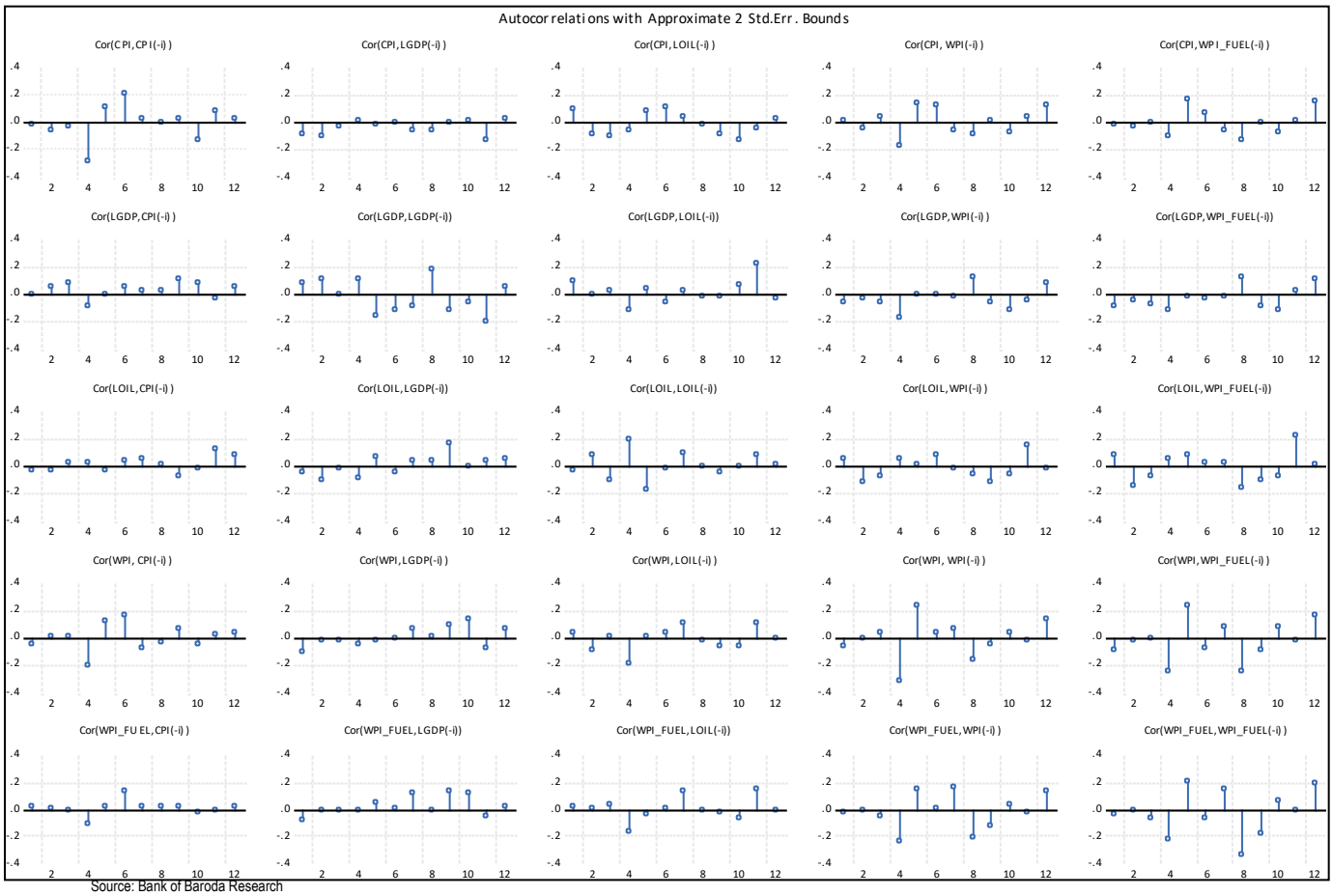
Appendix 4: Summary output of Roots of Characteristic Polynomial

Roots of Characteristic Polynomial Endogenous variables: CPI, LGDP, LOIL, WPI, WPI_FUEL Exogenous variables: C	
Root	**Modulus**
0.99302	0.99302
0.924922	0.924922
0.823449 - 0.348527i	0.89417
0.823449 + 0.348527i	0.89417
0.826728 - 0.217392i	0.854833
0.826728 + 0.217392i	0.854833
0.667072 - 0.487020i	0.825938
0.667072 + 0.487020i	0.825938
0.123498 + 0.721836i	0.732325
0.123498 - 0.721836i	0.732325
0.370525 - 0.559911i	0.671409
0.370525 + 0.559911i	0.671409
-0.652131	0.652131
-0.352688 - 0.534972i	0.640768
-0.352688 + 0.534972i	0.640768
-0.107185 - 0.620255i	0.629448
-0.107185 + 0.620255i	0.629448

-0.514239 + 0.306523i	0.598664
-0.514239 - 0.306523i	0.598664
-0.238367	0.238367
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

Source: Bank of Baroda Research

Appendix 5: Summary output showing autocorrelations of all the variables are within 2 standard error Bounds



Source: Bank of Baroda Research

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