

Dynamics of Crude Oil Price

Crude oil is the most influential commodity affecting all countries and all sectors. Every economist, policy maker, business and even household regularly follows movement of crude prices and its likely impact on the inflation. Yet it is most difficult to predict crude prices. Econometricians, armed with advanced time series models, have been trying, over many decades, to predict movement of crude oil prices. They have failed. What has worked so far is that empiricists were able to identify factors that explain movement of crude oil prices. But predictive models did not work.

India's heavy reliance on crude imports is a known fact- 82% of our crude oil needs are met through imports. Hence, any upward movement in international crude oil prices adversely affects our current account deficit (CAD). Though major oil importing companies in India do not entirely depend on Brent Crude or U.S. oil and they buy a crude basket, the basket prices are pegged to global benchmarks. Hence, a rise in Brent crude oil price would increase India's oil import bill. It is a fact that crude oil (shown as crude petroleum) has only 1.95% weight in India's wholesale price index (WPI). But its pervasive impact on the food prices (weight 15.26%) and manufactured products (weight 64.23%) makes this commodity as the single most influencer in the general price rise in our country. So, no one can ignore the potential damage that spiralling crude price can have on any economy. Should we really worry about crude oil? I show that the politics and economic imperatives of OPEC member (and non-member) nations would ensure that oil prices do not rise significantly in near future.

OPEC Members' Disagreement

The Organisation of the Petroleum Exporting Countries (OPEC) now has 15 members and together they account for close to 45% of global oil production. Therefore, any decision by the OPEC members to reduce or enhance oil production would significantly affect global oil supply and hence its price. OPEC members have in the past been normally adhering to the production agreements reached among the members. Economists believe that decisions of OPEC to curb oil production may influence oil prices in the short run. In the long-run, oil exporting countries may not honour any multilateral agreement on production as that would adversely affect revenue of each oil exporting country. The recent discovery of shale gas in the U.S. and growing initiative among oil importing countries to search for alternative fuel have already created some discord among OPEC members. The average oil production by OPEC members and the Brent crude price are inversely correlated (Table 1). The oil price (Brent) has declined by 40% in the past seven years, whereas the OPEC oil production has increased by only 10% during the same period. Thus, the clout of OPEC members on global oil price is declining. There could be several reasons for such weakening of influence: (a) behaviour of non-member countries in offsetting any attempt for cartelisation by OPEC members; (b) big bullies in the OPEC not honouring decisions of OPEC; (c) the U.S. turning into oil-surplus territory; and (d) emergence of alternative sources of energy. It is interesting to note that the oil price declined by 70% in three years

(2015 vs. 2012) and recovered to 2014 levels in 2016. The upward rally in crude price in 2017 is welcomed by oil exporting countries. OPEC members have agreed to a scheduled cut in oil supplies in January 2017.

Table 1: Crude Oil Price and OPEC Oil Production

Year	Crude price (\$/bbl)	% change	OPEC production	% change
2012	111.94		30482	
2013	110.82	-1.00%	29919	-1.85%
2014	55.76	-49.68%	30302	1.28%
2015	35.75	-35.89%	32945	8.72%
2016	55.41	54.99%	33140	0.59%
2017	66.82	20.59%	32470	-2.02%
2018	66.62	-0.30%	33330	2.65%

Source: Bloomberg. Brent Crude prices and output data are at the end of respective years, except 2018 where the price and output figures are on November 15, 2018. Production figures are in 000 barrel per day.

However, big oil producing countries (Saudi Arabia and Russia) have not followed the OPEC consensus and in a way decided to abandon the agreement. The supply cut, which was put in force in January 2017, is going to expire in December 2018 (the next meeting of OPEC is scheduled on December 6th). With the U.S. pumping record volume of oil and prices tumbling further, the OPEC members would be under pressure to think about their next move. Many non-OPEC oil-producing countries had also agreed to join with OPEC to further limit oil production. However, here also not all the non-OPEC oil producing countries agreed to join the OPEC -mandated production cut. For example, the U.S., Canada, Norway did not join the production cut lobby.

Table 2: Oil Production: OPC Nations and Others

OPEC Nations	Production cutback	Non-OPEC Nations	Production cutback
Algeria	97%	Azerbaijan	79%
Angola	218%	Bahrain	146%
Ecuador	85%	Brunei	638%
Eq. Guinea	81%	Eq. Guinea	95%
Gabon	76%	Kazakhstan	-352%
Iraq	39%	Malayasia	-13%
Kuwait	89%	Mexico	196%
Qatar	143%	Oman	92%
Saudi Arabia	98%	Russia	63%
UAE	67%	South Sudan	-220%
Venezuela	424%	Sudan	188%
TOTAL	121%	TOTAL	76%

Source: Bloomberg. Production cutback indicates percentage of the target cut over the period January 2017-15 November 2018.

It can be seen (Table 2) that big oil producers in Saudi Arabia and Russia did not follow the supply cut diktat. The oil-producing giants have kept their tap open to

counter any pre-emptive move to put upward pressure on the global oil price. This disagreement among oil producing nations has calmed global oil price. This would definitely benefit oil importing countries and their economy.

Oil Price and Stock Market

The relationship between oil prices and stock markets is not straightforward. While some studies find little correlation between oil price movements and stock returns, others find that oil price volatility transmits to stock market volatility. Another study¹ finds that stock market returns do not respond to supply-side shocks, whereas positive responses are observed in cases of aggregate demand shocks. In other words, stock markets do not necessarily react to OPEC's strategy to boost oil prices by cutting supply. Any increase in oil prices, due to increase in demand, sends signal of general economic growth and hence is treated as something positive by stock markets. It is also believed that any impact of oil price shock on the stock market has to be examined at the aggregate level and not at firm level. Using stock market indices of oil exporting and oil importing countries, another study² finds little evidence of stock market being affected by oil price shock.

We look at the relationship between movements in the (Brent) crude oil price and stock indices of three oil exporting countries (Russia, Canada, and Norway) and three oil importing countries/continent (Europe, China and India). We find, using daily prices over seven year period (2012-2018), that aggregate correlation between stock market returns and crude price movements has been positive and low for both oil exporting and importing countries (Table 3)

Table 3: Aggregate Correlation³ over the period (January 2012-15 November 2018)

INDEX	Correlation with	<i>EUCRBRDT Index</i>
IMOEX Index	MOEX Russia Index (Russia)	0.21
SPTSX Index	S&P/TSX Composite Stock Index (Canada)	0.44
OSEAX Index	Oslo Stock Exchange All Share Index (Norway)	0.35
SX5E Index	Euro Stocxx 50 Price EUR (Eurozone)	0.23
SHCOMP Index	Shanghai Stock Exchange Composite Index (China)	0.07
NIFTY Index	NSE Nifty 50 Index (India)	0.10
EUCRBRDT Index	European Crude Dated Brent Spot	1.00
MXWO Index	MSCI World Index	0.36

Data Source: Bloomberg

It may be noted that during this period, the crude oil price fell by more than 40%. It must be good (bad) news for the oil importing (exporting) countries. Yet, the

¹ Kilian, L., & Park, C. (2009). The impact of oil price shocks on the US stock market. *International Economic Review*, 50(4), 1267-1287

² Apergis, N., & Miller, S. M. (2009). Do structural oil-market shocks affect stock prices? *Energy Economics*, 31(4), 569-575.

³ Author acknowledges help of Mr. Anirban Banerjee, a PhD student at IIM Calcutta for estimating the correlation coefficients.

correlation is very low for oil importing countries and somewhat higher for oil exporting nations. The correlation between movements in crude price and global stock market is also pretty low. Why is it so? One reason could be that oil prices are not longer relevant for stock markets as firms (in both type of countries) have adopted robust risk management techniques to mitigate impact of any fluctuations of oil prices on their profitability.

One may argue that there may be inter-temporal relationship between crude oil prices and stock market and hence the dependence is not captured when one looks at the relationship over a longer period of time. Another argument could be that the relationship would depend on the crude price regime (very high price vs. very low price). In order to address these concerns, we also look at annual correlations between stock market returns and crude price movements during periods of high crude price (2012 and 2013) and low crude price (2015). Results (Table 4) are not different.

Table 4: Annual Correlations with Brent Crude Price movements

INDEX	2012	2013	2015	2018
IMOEX Index	0.38	0.12	0.26	0.20
SPTSX Index	0.47	0.30	0.47	0.39
OSEAX Index	0.39	0.13	0.40	0.38
SX5E Index	0.39	0.17	0.21	0.23
SHCOMP Index	0.12	0.06	0.13	0.23
NIFTY Index	0.21	0.02	0.13	0.01
EUCRBRDT Index	1.00	1.00	1.00	1.00
MXWO Index	0.51	0.30	0.42	0.36
Crude Price (\$/bbl)	111.94	110.82	35.75	66.62

Data Source: Bloomberg

Correlation between global stock index and crude price has been somewhat high across various oil price regimes. Similar is the case with oil exporting countries. However, stock markets in China and India- two major oil importing countries- did not appear to bother about crude prices in both the regime. This is quite surprising.

Oil Price and Firm Performance

Though we do not find any significant relationship between aggregate stock market and crude oil price movements, firms do face market risks due to changes in oil prices. This is particularly true for firms, which sell crude oil (upstream business of oil firms) or use crude as raw materials (downstream business). The upstream business showed stellar performance in the years (2012 and 2013) of high oil price (Table 5). The upstream profit margin turned negative for most of the companies in 2015 and thereafter. These results are on excepted lines- a sharp fall in crude price diminishes the top line of upstream business. The upstream oil major in India is an exception.

The downstream oil business, on the other hand, is a high-volume and low-margin business. Interestingly, the profit margin of downstream business, though low, has been positive irrespective of the level of crude oil prices. Investments in upstream projects increase when oil prices are high. One may notice that there had been a

sharp decline in investments in upstream business since 2014. In fact, investment in downstream business increased post 2014, when oil prices softened.

Table 5: Performance of Oil Giants

	2012	2013	2014	2015	2016	2017
EXXONMOBIL						
Revenue (US\$ Million)						
Down Stream	341638	312117	289405	184615	155386	184576
Up Stream	38712	39061	37162	24053	19830	23857
Profit Margin (%)						
Down Stream	3.9	1.1	1.1	3.6	2.7	3.0
UP Stream	77.2	68.7	74.1	29.5	1.0	56.0
Change in Capex (%)						
Down Stream		-71.4	-4.8	237.6	-23.9	12.2
Up Stream		-11.0	7.9	-60.2	-96.7	5563.6
BP						
Revenue (US\$ Million)						
Down Stream	345026	350150	323659	200501	166392	218053
Up Stream	29653	28047	28781	21286	15607	21261
Profit Margin (%)						
Down Stream	0.7	0.8	-0.7	2.6	4.0	NA
UP Stream	86.9	104.0	30.7	-4.5	6.0	NA
Change in Capex (%)						
Down Stream		-14.2	-31.1	-32.1	1.5	12.1
Up Stream		3.2	3.4	-13.6	-6.1	-14.2
ROYAL DATA SHELL						
Revenue (US\$ Million)						
Down Stream	423638	403725	375752	236384	201823	264731
Up Stream	43431	47357	45240	6739	6412	7723
Profit Margin (%)						
Down Stream	1.3	1.0	0.9	4.3	3.3	3.1
UP Stream	51.2	26.7	35.0	-131.1	-57.3	20.1
Change in Capex (%)						
Down Stream		19.6	11.5	-15.6	6.4	9.7
Up Stream		24.0	-9.6	-47.6	-22.5	-10.4
ONGC						
Revenue (US\$ Million)						
Down Stream	11984	12657	12463	10224	7811	40938
Up Stream	19059	17102	16274	16038	13377	13099
Profit Margin (%)						
Down Stream	2.3	-0.2	0.9	-4.0	1.3	5.0
UP Stream	43.3	37.8	38.0	30.7	22.4	28.5

Change in Capex (%)						
Down Stream		-45.3	-38.4	343.7	NA	NA
Up Stream		-28.0	32.4	-36.8	NA	NA

Data: Bloomberg. Computations: Author

Volatility in crude oil prices has intrigued many experts. However, it was difficult to predict oil prices. Studies have shown that movement in oil prices that was led by demand shock had impact on financial markets. However, attempts by OPEC members to curb oil supplies had no impact on its price nor did it have any adverse effect on stock markets. The correlation between stock market returns and oil price movements has been lower particularly for oil importing countries. This is found to be true in both high and low oil price regime. Finally, downstream oil business was less affected by high oil prices as their product prices always passed on the crude price increase to end users. However, the upstream business of global oil majors was seriously affected during low oil prices. Therefore, both OPEC and upstream oil companies hope that the OPEC meeting in Vienna on 6 December 2018 would push for further cut in oil supplies. Not good news for global economy if that happens.