



Regression Analysis Of ONGC's Crude Oil Sales With World's Benchmark Crude Oil Prices

Author 1. S. VIJAYAKUMAR, Ph.D (Part-Time) Research Scholar, Department of Management Studies, Periyar University Center for Post Graduate and Research Studies, Dharmapuri-635205, Tamilnadu, India.

Author 2. Dr.P.KARTHIKEYAN, Professor and Head, Department of Management Studies, Periyar University Centre for Post Graduate and Research Studies, Dharmapuri-635205, Tamilnadu, India.

Abstract

Organization of Petroleum Exporting Countries (OPEC) and its allies agreed to historic production cuts to stabilize prices, for several decades, the OPEC has been the major player, and its move has been watched closely by various nations, leading upstream companies.

ONGC (Oil and Natural Gas Corporation) is a domestic Indian oil company involves in upstream industry doing E&P activities such as producing crude oil, natural gas and other value-added petroleum products. The company's revenue depends upon the changes in international crude oil prices therefore, it watches closely the crude oil market.

ONGC's Crude oil sales dependent upon world benchmark Crude Oil Prices viz. Dated Brent price, WTI (West Texas Intermediate) Cushing Mo01 price, Bonny Light FOB Nigeria London price in terms of USD per barrel. This study shows the relationship of changes in world benchmark prices have an impact on ONGC's domestic crude oil sales in terms of crores of rupees.

Key Words

Crude Oil (petroleum), Dated Brent price, US \$ per barrel, WTI (West Texas Intermediate) Cushing Mo01 price, Bonny Light FOB Nigeria London, Oil Market and Benchmark.

Introduction

Many countries rely on petroleum products especially for transportation, heating, cooking, or generating electricity and other purposes. Petroleum products made from crude oil and other hydrocarbon liquids account for about a third of total world energy consumption.

The crude oil price of Dated Brent in International market is reduced from US \$ 124.93 per barrel (Mar 2012) to US \$60.22 (as on 12th Feb 2021). ONGC's physical performance in terms metric million tons of crude oil sold in the market. Majority revenues of the company come through Sale of crude oil apart from sale of natural Gas and value-added products arising out of production and processing. There has been decreasing trend from the FY'17 to FY'20 due to decreasing production of crude oil because of decline in reserves. The crude oil reserves are declining due to age old fields operated by ONGC. The growth over the past 5/6 years is more than 5%. However, over a period of 10 years it has decreased @6.97% which shows negative signal in respect of crude oil sales.

Objectives of the study

The study involves identifying the factors influencing crude oil sales especially the relationship of ONGC's (Oil and Natural Gas Corporation) Crude oil sales as dependent variable with independent variables such as world benchmark Crude Oil Prices viz. Dated Brent price, WTI (West Texas Intermediate) Cushing Mo01 price, Bonny Light FOB Nigeria London price in terms of USD per barrel. It studies about the changes in world benchmark prices have an impact on domestic crude oil sales done by leading national oil company.

Research Methodology

Ten years data of each variable have been analyzed for the period from the financial year 2010-11 to 2019-20. Multiple linear regression analysis of SPSS model applied to find out the relationship between dependent variable of ONGC crude oil sales (₹ in Crores) with independent variables of world crude oil prices of Dated Brent (US \$ per barrel), WTI (US \$ per barrel) and Bonny light (US \$ per barrel)

Calculated mean of daily benchmark prices of world crude oil as per Platts have been considered for this study. Daily Crude Oil prices in terms of currency US dollar per Barrel for the period from 1st April 2010 to 31st Mar 2020 are taken for this study. All daily prices are converted into mean of calculated monthly average and then quarterly average thereafter it has been calculated on annual average basis. Crude oil sales are taken from annual reports available from ONGC.

Sales values are available in millions which are converted into crores for this study. The number of sales values are taken from each accounting year as on 31st March. For instance, 31st March 2011 is for the accounting period of 1st April 2010 to 31st March 2011. Like that 10 years data of sales are applied till 31st March 2020.

Findings

The multiple linear regression model summary as per Annexure-II (page No.9) shows that the R is .601 and R Square is .361 which means that the linear regression explains 60.10%% (R square=36.1%) of the variance in “Crude Oil Sales (₹ in Crores)” as dependent variable can be predicted from the independent variables “Dated Brent (US \$ per barrel), WTI (US \$ per barrel) and Bonny light (US \$ per barrel). R –Square is called the coefficient of determination Therefore the result shows that there is a relationship between dependent variable and independent variables. In this case R=60.1%, which is a strong relationship and R – Square is 36.1% (normal), suggests that the model is good predictor of the outcome of ONGC’s Crude Oil sales value at the end of accounting year.

The co-efficient table as per Annexure –II (page no.10) shows that Brent Crude Oil Price (US \$ per Barrel) has higher impact (beta=21.686) than WTI Crude Oil Price (US \$ per Barrel) (beta=-.757) and Bonney Light Oil Price (US \$ per Barrel) beta = -21.280). Brent Crude Oil Price has positive relationship with crude oil sales denotes if there is increase in prices crude oil sales will rises. The regression equation can be presented as follows:

Y predicted: Crude Oil Sales ₹ in Crores) = 730.018+77.73* Brent Crude Oil Price (US \$ per Barrel) + -3.304* WTI Crude Oil Price (US \$ per Barrel) + -75.555* Bonney Light Oil Price (US \$ per Barrel)

These estimates tell the amount of decrease/increase in crude oil sales depends on the changes in world benchmark prices such as Brent, WTI and Bonney light.

Discussions

The National Oil Company (NOC) namely ONGC’s sales depends on the realisation value of crude oil. It further depends on the world benchmark prices in the market. During covid times the realisation value changes due to crude oil price of Bonney Light FOB Nigeria London in international market, is settled US \$18.74 per barrel(bbl) on 30th Apr 2020, down US \$ 100.74/bbl (-84.32%) from US \$ 119.48/bbl on 30th April 2012. Exploration and Production (E&P) companies reduced the capital expenditures during pandemic time. Recently it recovered at US \$95.60 per barrel on 22nd Sep 2023.

Capital expenditure plan has been increased by ONGC during post pandemic period. ONGC sales has mainly depends on the changes in world benchmark oil prices such as Bonney light, Dated Brent and WTI. Changes the crude oil sales also has impacts on world GDP. The changes in oil prices effects the inflation rate as well. This study proves the significant relationship of volatility in world benchmark oil price and its impact on ONGC’s crude oil sales. Based on the trend of world benchmark crude prices the sales can be estimated accordingly ONGC can plan for capital and operational expenditures in short term as well as long term. This provides crucial information for managerial decision making by NOC. It also helps in making various strategic decisions. Hence this study provides significant information to the management of ONGC for taking various important decisions on exploration and production activities.

Conclusion

Crude oil sales are volatile in nature due to major influence of changes in world benchmark prices namely Dated Brent (US \$ per barrel), WTI (US \$ per barrel) and Bonny light (US \$ per barrel).

The findings of the research may have some policy implications in the context of the association between the changes in world benchmark crude oil prices and ONGC's crude oil sales. It can affect the long and short-term investment strategies in the world, which are largely driven by these variables. This provides crucial information for ONGC management for taking various strategic decisions on exploration and production activities in short term as well as long term. Hence this study provides significant information to the management.

It also had influence by various other factors such as oil field discovery and domestic increase/decrease in crude oil production, changes in financial markets, changes in world oil consumption and import regulations, alternative use of energies such as electric energy, wind energy and other natural energies to be discovered in place of petroleum products, political and economic risk factors also influence.

Limitations

The study made every effort to determine the relationship between Crude oil sales as dependent variable with independent variables such as world benchmark Crude Oil Prices viz. Dated Brent price, WTI and Bonny Light in terms of USD per barrel. However, research has several limitations. The study only looked micro level, but it might be expanded to look at additional important macro level variables. The study can be conducted on a global basis of world production such as OPEC production.

Policy implications

The changes in Policies of different countries, managerial decisions of international Exploration and Production (E&P) companies and their plan of production will have the impact on world benchmark prices. This will further influence the sales of crude oil of Indian E&P companies. Government policymakers, practitioners, consumers, and investors have great concern about the fluctuations in crude oil prices. The current study also has a very important implication for E&P Company to take expenditure decision and other investment decisions based on crude oil sales.

References

1. Rentcome, Allen McLin, Rick (2011), "Safety, cost drive oil and gas production to the seabed", Source: Offshore, Penn Well Publishing Co. Jun2011, Vol. 71 Issue 6, p64-65. 2p
2. Bent Flyvbjerg, Allison Stewart & Alexander Budzier (2016), The Oxford Olympics Study 2016: Cost and Cost Overrun at the Games, July 2016 Said Business School Research papers pp 1-18
3. Hsiao, Daniel F.,HuYan Lin, Jerry W.(2016), "The earnings management opportunity for US oil and gas firms during the 2011 Arab Spring event", Source: Pacific Accounting Review (Emerald Group Publishing Limited), Volume 28 Issue 1, p71-91. 21p.
4. Ross, Anthony Jayaraman, Vaidyanathan, Robinson, Powell (2007), "Optimizing 3PL service delivery using a cost-to-serve and action research framework", *International Journal of Production Research*. 1/1/2007, Vol. 45 Issue 1, p83-101. 19p.
5. 23. Russell, Alan D., Tran, Ngoc, Staub-French, Sheryl (2014), "Searching for value: construction strategy exploration and linear planning "Construction Management & Economics, 01446193, Jun2014, Vol. 32, Issue 6
6. 24. Ankit Sharma & Keyur Thaker(2015) "Market efficiency in developed and emerging markets", Afro-Asian Journal of Finance and Accounting, 2015 Vol.5 No.4, pp.311 - 333
7. Wakefield, James; Thambar, Paul (2019). "Applying Target Costing to the Service Sector: Sunline Auto Insurance Case. *Issues in Accounting Education*". Aug2019, Vol. 34 Issue 3, p1-19. 19p. 13 Charts. DOI: 10.2308/iace-52427. , Database: Business Source Corporate
8. McNally, Graeme M.; Lee Hock Eng. Abacus.(Dec80)," Management Accounting Practices and Company Characteristics." Vol. 16 Issue 2, p142-150. 9p. DOI: 10.1111/j.1467-6281. 1980.tb00094.x
9. 42. Shillinglaw, Gordon. *Journal of Management Accounting Research*. (1989), "Managerial Cost Accounting: Present and Future". Vol. 1, p33. 15p.
10. 43. Liao, Shu S. *Issues in Accounting Education*. (1988). "The Learning Curve: Wright's Model vs. Crawford's Model". Vol. 3 Issue 2, p302. 14p.
11. Jim Burkhard ,Lysle Brinker, Nick Thomson and Paul Markwell (24 August 2020) "The new dynamics of upstream supply and spending after COVID-19" IHS Markit ,Energy and natural resources Research and Analysis pp1-5

WEB References

1. [https:// reports.ongc.co.in](https://reports.ongc.co.in) and www.ongcindia.com
2. <https://www.opec.org/data>
3. <https://www.ebsco.com/products/research-databases/e-journals-database>
4. <https://www.eia.gov/petroleum>
5. <https://connect.ihs.com/PEPS>
6. <https://www.imf.org/external/datamapper/NGDPD@WEO/WEOWORLD>
7. <http://www.socialsciences/spsstutorial/multiple-regression>

Annexure-I
Input Variables

Year	Dated Brent (US \$ /BBL)	WTI Cushing Mo01 (US \$ /BBL)	Bonny Light FOB Nigeria London (US \$ /BBL)	ONGC's Crude Oil Sales (Rs. in Crores)
2010-11	86.75	83.37	88.68	448.65
2011-12	114.60	97.21	116.27	507.87
2011-12	110.11	91.96	111.33	533.27
2012-13	107.54	99.04	109.20	525.73
2013-14	85.53	80.68	87.47	536.64
2014-15	47.51	44.96	49.04	511.32
2015-16	48.62	47.84	50.03	548.04
2017-18	57.45	53.61	57.94	603.90
2018-19	70.37	63.13	71.59	775.73
2019-20	61.01	54.69	61.31	648.36

Source: Platts daily crude oil price, ONGC reports data

Annexure-II**Output of Multiple regression analysis in SPSS****Regression****Descriptive Statistics**

	Mean	Std. Deviation	N
Crude Oil Sales (Rs.in Crores)	5.6395E2	92.00349	10
Brent Crude Oil Price (US \$ per Barrel)	78.9490	25.66772	10
WTI Crude Oil Price (US \$ per Barrel)	71.6490	21.08150	10
Bonney Light Oil Price (US \$ per Barrel)	80.2860	25.91323	10

Variables Entered/Removed^b

Model	Variables Entered	Variables Removed	Method
1	Bonney Light Oil Price (US \$ per Barrel), WTI Crude Oil Price (US \$ per Barrel), Brent Crude Oil Price (US \$ per Barrel) ^a	None	Enter

a. All requested variables entered.

b. Dependent Variable: Crude Oil Sales (Rs.in Crores)

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df 1	df 2	Sig. F Change	
1	.601 ^a	.361	.041	90.09428	.361	1.128	3	6	.410	2.236

a. Predictors: (Constant), Bonney Light Oil Price (US \$ per Barrel), WTI Crude Oil Price (US \$ per Barrel), Brent Crude Oil Price (US \$ per Barrel)

b. Dependent Variable: Crude Oil Sales (Rs.in Crores)

ONGC's Crude Oil sales(₹ in crores) , $F(3, 6)=1.128$, $p=.410$. Here F (Regression df, Residual df) =F-Ratio, p =Sig.

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
1 (Constant)	730.018	117.684		6.203	.001	442.055	1017.980
Brent Crude Oil Price (US \$ per Barrel)	77.730	70.332	.21686	1.105	.311	-94.367	249.827
WTI Crude Oil Price (US \$ per Barrel)	-3.304	10.865	-.757	-.304	.771	-29.889	23.281
Bonney Light Oil Price (US \$ per Barrel)	-75.555	74.527	-.21280	-1.014	.350	-257.916	106.805

a. Dependent Variable: Crude Oil Sales (Rs.in Crores)

Coefficient Correlations^a

Model			Bonney Light Oil Price (US \$ per Barrel)	WTI Crude Oil Price (US \$ per Barrel)	Brent Crude Oil Price (US \$ per Barrel)
1	Correlations	Bonney Light Oil Price (US \$ per Barrel)	1.000	-.597	-.995
		WTI Crude Oil Price (US \$ per Barrel)	-.597	1.000	.514
		Brent Crude Oil Price (US \$ per Barrel)	-.995	.514	1.000
	Covariances	Bonney Light Oil Price (US \$ per Barrel)	5554.256	-483.657	-5214.433
		WTI Crude Oil Price (US \$ per Barrel)	-483.657	118.041	392.546
		Brent Crude Oil Price (US \$ per Barrel)	-5214.433	392.546	4946.618

a. Dependent Variable: Crude Oil Sales (Rs.in Crores)

