

Challenges Defied by Indian Petroleum Oil & Natural Gas Sector in Currency Risk Management

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Abstract

Foreign exchange risk turn out to be more and more imperative in graceful of the globalization and internationalization of world markets, and is one of the utmost challenging and persistent difficulties with which the financial administrators must handle. This study concentrates on the foreign exchange risk management practices of Petroleum oil & Natural Gas Companies, and inspects the association between numerous aspects that are supposed to shake the espousing of External foreign exchange risk management techniques, namely currency derivatives i.e. Futures, Forwards, options & swaps. The study emphases on transaction exposures as the root cause for foreign exchange differences (loss or gain) The outcomes are taken from annual reports of 7 years commencing from 2009 to 2016, 10 ONGC companies listed by BSE & NSE. The study uses one-way analysis of variances to analyze the data & Predictive analysis (multiple regression analysis), to assess the factors influence on the choice of derivative. To what extent losses are minimized through currency derivative. The results indicate that the use of foreign exchange risk management techniques such as financial derivatives is a common practice among ONGC firms due to large portion adverse exposure on revenue i.e 40%.

Keywords

Foreign exchange, ONGC Firms, transaction exposure, Currency Derivative.

I. Introduction

In recent years, foreign exchange risk management has received increasing attention in both corporate practice and literature. The management of this type of risk has increasingly become essential for survival of companies in today's volatile financial markets. The risk arises from exposure of an organization to potential fluctuations in foreign exchange rates. These fluctuations can occasion instability in profit margin, expected future cash flows as well as significant losses to organizations (Lei and Niannian, 2007). One among the highly exposed industry is petroleum industry.

India is projected to be one of the major supplier to non-OECD petroleum consumption growth universally. Aggregate oil imports dropped by 10 per cent year-on-year in February 2017. Fuel consumption in India augmented by 10.7 per cent to a 16-year high of 196.48 million tonnes (MT) in 2016. India is the fourth-largest Liquefied Natural Gas (LNG) shipper after Japan, South Korea and China, and accounts for 5.8 per cent of the total worldwide trade. Inland LNG demand is anticipated to propagate at a CAGR of 16.89 per cent to 306.54 MMSCMD by 2021 from 64 MMSCMD in 2015. The country's gas production is anticipated to reach 90 Billion Cubic Metres (BCM) in 2040 from 23.09 BCM in FY2016-17 (till December 2016). Gas pipeline infrastructure in the nation stood at 15,808 km in December 2015. State-owned Oil and Natural Gas Corporation (ONGC) leads the upstream slice (exploration and production), manufacturing roughly 25.93 MT of crude oil, which is around 60.5 per cent of the country's 36.95 MT oil output, as of March 2016.

II. Problem Statement

The main concern that will be addressed through this research paper is "To study what are the varied external hedging instruments like forwards, futures, options and swaps are

used, for plummeting currency risk for chosen Indian ONGC firms listed on BSE & NSE. These firms exchange exposure account for 35% of total revenue and reported exchange loss of 38.2% of net profit. Developing economy like India which has constantly portrayed depreciation in home currency against mighty currencies of world. Hence it has posed a major challenge for Indian ONGC sector. Finance managers inevitably required to use all possible techniques to minimize the exchange risk.

II. Literature Review

Madura (1989) defines exchange rate risk as the possible direct loss (as a result of an unhedged exposure) or indirect loss in the firm's cash flows, assets and liabilities, net profit and, in turn, its stock market value from an exchange rate move. According to Armitage et al (2002), foreign exchange risk is the risk that profits will change if foreign exchange rates change. According to Shapiro (1996), there are three types of foreign exchange rate risks that are faced by companies: translation or accounting risk, transaction risk, and economic risk. Often firms consolidate the financial statements of their foreign subsidiaries with that of the home country. In order to do this, firms must first restate the financial statements of these subsidiaries from foreign currency to that of the home or parent currency. Translation risk is the result of this restatement of a firm's foreign currency denominated accounts, where the exchange rate used causes changes in the value documented in the parent company's financial statements. In essence, translation risk is the effect exchange rates have on the figures shown on the parent company's consolidated balance sheet. Transaction risk, on the other hand, is the extent to which a given exchange rate will change the value of foreign-currency-denominated transactions, which have already been entered into by a company. In other words, when a business contract is entered into, with the agreement that payment will be settled at a future date, the exchange rates that exist on the date the contract is entered into and the date that the contract is settled, may be different. As a result, the cash that is received on the date of settlement may be different from what was expected when the contract was entered into. Consequently, the cash flow to the firm is directly affected. Finally, economic risk is the extent to which the value of the firm will change due to a change in the exchange rate. Further, Dhanani (2000) states that economic risk is the effect of longterm exchange rate movements on a firm's future expected cash flows and is hard to identify because the cash flows linked to the risk are not certain to materialize. Under today's system of floating foreign exchange rates, currencies often move dramatically over short periods. Empirical studies demonstrate that foreign exchange volatility can have significant impact on companies' profits (Armitage et al, 2002). In addition, David (1997) observes that under current system of floating exchange rates, investors have experienced significant real and paper volatility in earnings as a result of relative fluctuations in foreign exchange rates. Most researchers have measured the impact by studying how changes in foreign exchange rates affect market capitalization (Bodnar and Richard, 1998). Researchers consistently find that periods of significant foreign exchange movements produce substantial changes in stock market capitalization (Dahlquist, 1999). Earlier studies by Nance and Smith (1993), Rawls and Smithson (1990), Berkman and Brandbury (1996) and Smithson (1995) suggested that foreign exchange risk management would benefit companies. In addition Chow and Lee (1997) argued that risk management could reduce the effect of foreign exchange risk volatility on companies. Hence, foreign exchange risk management gives positive effect to share holders. Dolde (1993) in a study on United States companies showed that foreign exchange risk management adds value to them. This is supported by Makar and Huffman (1997) that foreign exchange risk management has a positive correlation with foreign exchange risk. Organizations manage foreign exchange risk using a variety of strategies and products. Strategies for managing this type of risk often entail use of financial derivatives. These are securities whose value is derived from the value and characteristics of underlying security. The most common types of derivatives include: forward contracts, future contracts, options and swaps. The derivatives are traded widely among financial institutions and on organized exchanges (Horcher, 2005).

Methodology

a) Objective Of Study

1. To examine the transaction exposure transpired to the foremost ONG companies listed on BSE & NSE.
2. To analyze the impact of such foreign exchange exposure on foreign exchange loss or gain and profitability of the selected companies.
3. To examine the different currencies they are exposed to and derivative instruments used for hedging such exchange risk.
4. To investigate the impact of deploying derivative on the exchange loss minimization.

b) HYPOTHESIS

1. H_{01} : Foreign exchange exposure remains uniform, across the ONG industry irrespective of size of the firm
2. H_{02} : Foreign exchange exposure has bearing on profitability of the firm to the greater extent.
3. H_{03} : Foreign exchange losses can be substantially minimized through currency derivatives and multiple currency invoicing

c) RESEARCH DESIGN

The study basically follows “Descriptive Study” particularly through the study of secondary sources like annual reports of various auto part makers.

d) SAMPLING TECHNIQUE :

Sample Population	Indian ONG Companies involved in international operations
Sample unit	10 Indian ONG Companies listed on BSE & NSE
Sampling method	Systematic sampling, only listed companies are taken for the study based on market capitalization ranging from large to small cap firms

e) LIMITATIONS OF THE STUDY

- 1) The study being confined to 7 financial years 2009-2016.
- 2) Secondary data as published by annual reports is used for analysis.

f) METHODS OF DATA COLLECTIONS

Overall research paper will be based on secondary data provided by selected companies through 1. Annual report of Financial Year 2009-10 to 2015-16. 2. Official websites of companies 3. Market research reports. 4. Newspaper articles. 5. Financial Magazines

g) DATA PREPARATION:

The data will be critically analyzed and conclusion will be based on data provided by companies, through its annual reports. The information on conservation of energy, technology absorption and foreign exchange earnings and outgo stipulated under Section 134(3)(m) of the Act, read along with Rule, 8 of the Companies (Accounts) Rules, 2014 is to be annexed along with director's report

Accounting Standard 30- Financial Instruments: Recognition and Measurement derivative instruments used need to be specified in financial statements. Accounting standard 11 – foreign exchange transaction and translations loss/ gain need to be recorded in profit

and loss account. For the purpose of analysis such valid and reliable information is used. It is compiled in accordance with requirement of author.

DATA ANALYSIS:

For the chosen 9 companies in Oil and Gas Industry namely BPCL, CASTROL, DEEP INDUSTRIES, GAIL, HPCL, IOCL, OIL INDIA, ONGC, PETRONET, LNG LTD.

Following financial facts have been observed with respect to its international operations and foreign exchange risk management practices, for the financial year beginning from 2009-10 to 2015-16.

Table 1.1: Table showing foreign exchange operations of Bharath Petroleum Corporation Ltd. for the years 2009 to 2016

(Rs. In Crs)

YEAR	Total revenue	Exchange inflow	Exchange Outflow	Net exposure	Net exchange (loss) / Gain	Net Profit	exchange difference on Net	Derivatives used	exposure in
2009-10	1,31,285.02	9,504.36	43,048.29	-33,543.93	556.87	1,719.98	32.38	Forwards, Futures, Options, Swaps & un hedged	USD
2010-11	1,54,541.41	12,380.37	52,221.91	-39,841.54	-235.53	1,742.06	-13.52		
2011-12	2,13,596.23	19,315.61	75,060.25	-55,744.64	-2,165.29	851.28	-254.36		
2012-13	2,43,709.97	18,455.61	81,893.37	-63,437.76	-1,674.20	1,880.83	-89.01		
2013-14	2,65,807.81	19,122.06	91,471.64	-72,349.58	-1,500.10	3,910.68	-38.36		
2014-15	2,44,718.55	12,364.27	80,736.57	-68,372.30	142.56	4,806.57	2.97		
2015-16	1,90,392.25	7,137.95	50,701.31	-43,563.36	-681.16	7,981.51	-8.53		
Mean	206293	14040	67876.2	-53836.2	-793.836	3270.42	-52.6346		
SD	50048.58	4949	18826.8	15072.2	1014.92	2499.57	96.61975		
Range	134522.8	12178	48423.4	38805.7	2722.16	7130.23	286.7335		
Minimum	131285	7138	43048.3	-72349.6	-2165.29	851.28	-254.357		
Maximum	265807.8	19316	91471.6	-33543.9	556.87	7981.51	32.37654		
Sum	1444051	98280	475133	-376853	-5556.85	22892.9	-368.442	4	1

Source : compiled from annual reports of BPCL

Table 1.1 relevant to the maker of LPG, Aviation fuel, lubes India’s largest Oil refinery firm Bharath Petroleum Corporation Ltd has shown following financial performance pertaining to its international operation for the reference period of 2009 to 2016. For the reporting period it has earned mean revenue of Rs.206293Cr, out of which net exposure was 53286Cr, this is 25.83% adverse. Exchange losses reported highly volatile and consistent to the extent of C.V 127%. Exchange losses as a % net profit was 52%.

With high adverse net exposure & large % of exchange losses on net profit, it has employed all currency derivative instruments like Forward, Future, option & swap to mitigate foreign exchange risk. It is exposed only one majorly traded currency that is USD.

Table 1.2: Table showing foreign exchange operations of Castrol India Ltd. for the years 2009 to 2016

(Rs. In Crs)

YEAR	Total revenue	Exchange inflow	Exchange Outflow	Net exposure	Net exchange (loss) / Gain	Net Profit	exchange difference on Net	Derivatives used	exposure in
2009-10	2,774.26	17.35	122.62	-105.27	0.28	490.31	0.06	Forwards & unhedged	USD, GBP, EURO, JPY, AUD, CNY, SGD, CHF
2010-11	3,066.36	25.58	136.86	-111.28	-1.97	481.03	-0.41		
2011-12	3,151.70	23.63	150.8	-127.17	-3.24	447.39	-0.72		
2012-13	3,214.68	16.38	163.51	-147.13	-4.01	508.57	-0.79		
2013-14	3,408.39	13.92	205.38	-191.46	-4.19	474.56	-0.88		
2014-15	3,350.61	15.63	209.55	-193.92	3.12	615.26	0.51		
Mean	3161	18.75	164.79	-146	-1.67	502.85	-0.37		
S D	227.44	4.71	35.8	38.94	2.87	58.61	0.55		
Range	634.13	11.66	86.93	88.65	7.31	167.87	1.39		
Minimum	2774.26	13.92	122.62	-193.9	-4.19	447.39	-0.88		
Maximum	3408.39	25.58	209.55	-105.3	3.12	615.26	0.51		
Sum	18966	112.5	988.72	-876.2	-10.01	3017.1	-2.24	1	8

Source : compiled from annual reports of Castrol India Ltd

Table 1.2 relevant to well-known lubricating oil and grease maker Castrol India Ltd, revealed following financial figures pertaining to international operation. For the financial year 2009 to 2016, it has earned total revenue of 18966.02Cr out which adverse net exposure was Rs.876.23 Cr, this is 4.6% of total revenue. Average net exchange loss reported was Rs.1.67Cr. which is 0.37% of net profit.

Low margin of net exposure and thin exchange loss on net profit has resulted in choosing only forward contract, kept remaining exposure un hedged to manage foreign exchange risk. USD, GBP, EURO, JPY, AUD, CNY, SGD and CHF were the currencies used for international operation.

Table 1.3 showing foreign exchange operations of Deep Industries Ltd.for the years 2009 to 2016

(Rs. In Crs)

YEAR	Total revenue	Exchange inflow	Exchange Outflow	Net exposure	Net exchange (loss) / Gain	Net Profit	exchange difference on Net	Derivatives used	exposure in
2009-10	56.08	0	6.0292	-6.0292	0.33	14.36	2.3	Forwards, Options, &unhedged	USD
2010-11	51.19	0	10.5839	-10.5839	0.1	11.85	0.84		
2011-12	61.35	0	66.1646	-66.1646	-0.34	12.03	-2.83		
2012-13	66.89.	0	4.5167	-4.5167	-0.95	12.13	-7.83		
2013-14	91.98	0	26.7324	-26.7324	-0.41	20.04	-2.05		
2014-15	102.59	0	21.52	-21.52	-2.689	21.23	-12.67		
2015-16	170.02	2.46	41.83	-39.37	-0.168	40.95	-0.41		
Mean	85.73	0.35	25.34	-24.99	-0.59	18.94	-3.23		
S D	41.73	0.93	22.28	22	1.01	10.46	5.27		
Range	118.83	2.46	61.65	61.65	3.02	29.1	14.96		
Minimum	51.19	0	4.52	-66.16	-2.69	11.85	-12.67		
Maximum	170.02	2.46	66.16	-4.52	0.33	40.95	2.3		
Sum	600.1	2.46	177.38	-174.9	-4.13	132.59	-22.64	2	1

Source : compiled from annual reports of Deep Industries Ltd

Table 1.3 refers to Deep industries Ltd. which is into the business of Oil and Gas exploration & production services. For the financial year 2009 to 2016, its financial results relevant to the international operation were as follows. Its revenue was mounted by 3 times with a CAGR of 17.16%. due to nil foreign exchange earning it had a negative exchange exposure for all the years. Total adverse exposure was 29.19%.

Exchange losses lodged average of 3.23% with Rs.0.59Cr. high exchange exposure on total revenue has resulted in choosing forward & options to minimize the exchange losses. Its exposure was in USD

Table 1.4: Table showing foreign exchange Operations of GAIL Ltd. for the years 2009 to 2016

(Rs. In Crs)

YEAR	Total revenue	Exchange inflow	Exchange Outflow	Net exposure	Net exchange (loss) / Gain	Net Profit	exchange difference on Net	Derivatives used	exposure in
2009-10	27634.91	0	189.66	-189.66	6.75	3327.83	0.2	Forwards, Swap and unhedged	USD & EURO
2010-11	35664.01	4.72	4060.86	-4056.14	2.11	4020.97	0.05		
2011-12	44664.01	8.85	6423.6	-6414.75	-57.48	4443.61	-1.29		
2012-13	51923.71	32.02	5730.46	-5698.44	12.66	2241.18	0.56		
2013-14	62836.52	210.01	9233.45	-9023.44	23.71	2194.83	1.08		
2014-15	61,567.38	644.49	2102.08	-1457.59	49.35	3160.05	1.56		
2015-16	55,716.79	866.54	1792.06	-925.52	84.27	2251.62	3.74		
Mean	48572.5	252.4	4218.9	-3967	17.34	3091.4	0.84		
S D	13259.5	357.2	3133.7	3275.7	43.8	911.51	1.56		
Range	35201.6	866.5	9043.8	8833.8	141.75	2248.8	5.04		
Minimum	27634.9	0	189.66	-9023	-57.48	2194.8	-1.29		
Maximum	62836.5	866.5	9233.5	-189.7	84.27	4443.6	3.74		
Sum	340007	1767	29532	-27766	121.37	21640	5.91	2	2

Source : compiled from annual reports of GAIL India Ltd

Table 1.4 relevant to India’s youngest Maharathna, & no.1 Gas Company of India GAIL Ltd. For the financial commencing from 2009 to 2016 it has furnished following financial information about its international operation. Its exchange earning was nil in the year 2009 whereas gone up 866.54Cr in the year 2016. Expenditure in foreign currency was highly volatile mean of which is Rs.4218.8Cr. net exposure stood adverse year on year with average of Rs.3966.51Cr this is 8.68% of total revenue.

Exchange gain reported was Rs.17.34Cr p.a with the volatility ranging from loss 57.48Cr to Gain 84.27Cr. Its % on net profit is 0.84%. It has employed Swap and forwards to mitigate foreign exchange risk. USD & EURO was the denominated currency in its international operation.

Table 1.5: Table showing foreign exchange operations of HPCL Ltd. for the years 2009 to 2016

(Rs. In Crs)

YEAR	Total revenue	Exchange inflow	Exchange Outflow	Net exposure	Net exchange (loss) / Gain	Net Profit	exchange difference on Net	Derivatives used	exposure in
2009-10	113301.68	6382.26	55293.56	-48911.3	595.56	9996.19	5.96	Forwards, Swap, Options and hedges	USD, JPY & EURO
2010-11	139985.9	5522.8	59052.04	-53529.24	268.98	1703.6	15.79		
2011-12	186304.31	7782.48	101312.57	-93530.09	-2239.72	174.65	-1282.4		
2012-13	217209.61	6416.82	89920.3	-83503.48	-1667.1	501.3	-332.56		
2013-14	235591.52	4231.03	118574.86	-114343.8	-1630.45	1080.37	-150.92		
2014-15	2,18,508.87	5313.98	89920.3	-84606.32	-279.17	1498.48	-18.63		
2015-16	1,88,736.39	1810.68	57842.9	-56032.22	-787.07	4921.29	-15.99		
Mean	185663	5351	81702	-76350.93	-819.85	2839.4	-254.11		
SD	44533.3	1912	24695	24305.37	1070.3	3519.1	470.25		
Range	122290	5972	63281	65432.53	2835.3	9821.5	1298.19		
Minimum	113302	1811	55294	-114343.83	-2239.7	174.65	-1282.4		
Maximum	235592	7782	118575	-48911.3	595.56	9996.2	15.79		
Sum	1299638	37460	571917	-534456.48	-5739	19876	-1778.75		

Source : compiled from annual reports of HPCL Ltd

Table 1.5 relevant to HPCL group engaged in the business of downstream i.e. refining, marketing and transportation of petroleum products, exploration and production of hydrocarbons. For the financial year 2009-10 to 2015 – 2016 it has portrayed following information through annual reports pertaining to its international operation.

Total revenue earned for the span of 7 years was Rs. 1299638.28Cr, total adverse net exposure was Rs. -534456.48Cr, and this is 41.12% on total revenue. Aggregate exchange loss for the reporting period was Rs. -5738.97Cr. Exchange loss ratio on net profit was 28.87%. There is wide range of difference can be found in the above table in terms of exchange losses.

Large amount adverse exposure accompanied with high margin exchange loss demands the company to enforce a policy of strategic and stringent foreign exchange risk management practice, which might have lead the company to choose Forwards, Swap, Options and natural hedge. It has exposure in highly volatile and majorly traded currencies like USD, JPY and EURO.

Table 1.6: Table showing foreign exchange operations of IOCL Ltd.for the years 2009 to 2016

(Rs. In Crs)

YEAR	Total revenue	Exchange inflow	Exchange Outflow	Net exposure	Net exchange (loss) / Gain	Net Profit	exchange difference on Net	Derivatives used	exposure in
2009-10	262966.05	13743.75	132895.81	-1,19,152	1850.87	10713.2	17.28	Forwards, Swap, and unhedged	USD, JPY & EURO
2010-11	313241.77	16,967.55	171424.79	-1,54,457	431.44	7830.72	5.51		
2011-12	412111.16	19,829	240481.9	-2,20,653	-4300.21	4225.98	-101.76		
2012-13	465291.15	18,558.61	212775.82	-1,94,217	-2919.07	4449.01	-65.61		
2013-14	491787.31	21,608.13	230120.52	-2,08,512	-4650.21	7085.59	-65.63		
2014-15	4,53,712.65	16,009.99	194274.61	-1,78,265	-1012.73	4912.02	-20.62		
2015-16	3,58,172.70	13,923.66	136188.66	-1,22,265	-2478.92	11219	-22.1		
Mean	393898	17234	188309	-171074.53	-1868.4	7205.1	-36.13		
SD	85160.4	2953.2	43159.9	40417.33	2414.7	2902.7	42.95		
Range	228821	7864.4	107586	101501.1	6501.1	6993	119.03		
Minimum	262966	13744	132896	-220653.16	-4650.2	4226	-101.76		
Maximum	491787	21608	240482	-119152.06	1850.9	11219	17.28		
Sum	2757283	120640	1318162	-1197521.7	-13079	50436	-252.92	2	3

Source : compiled from annual reports of IOCL

Table 1.6 relevant to the producer of crude oil, Natural Gas, LPG and involved in pipeline operations IOCL, has publicized its financial results pertaining to international operations for the period of 2009 to 2016. Total revenue earned for the whole 7 years was Rs. 2757282.79, of which net exposure was Rs. -1197521.68 this is 43.43%. This value infers that the company very high degree of exposure.

Average exchange loss reported is Rs.1868.40Cr; this is 36.13% of net profit. IOCL had earned very low margin, which is 1.82% on revenue. The volatility in exchange rate particularly USD can erode whole profits of the firm.

Above financial figures demand for very strategic and highly tightened policy for managing the exchange risk it has used only Forwards, Swap, kept some receivables and payables unhedged. USD, JPY & EURO was the currencies used for international operation.

Table 1.7: Table showing foreign exchange operations of Oil India Ltd.for the years 2009 to 2016

(Rs. In Crs)

YEAR	Total revenue	Exchange inflow	Exchange Outflow	Net exposure	Net exchange (loss) / Gain	Net Profit	exchange difference on Net	Derivatives used	exposure in
2009-10	8859.93	1.87	464.03	-462.16	4.77	2610.77	0.18	Unhedged	USD & EURO
2010-11	9194.46	1.56	333.74	-332.18	-4.86	2883.76	-0.17		
2011-12	11308.6	1.64	284.37	-282.73	25.4	3469.18	0.73		
2012-13	11498.23	1.29	324.49	-323.2	21.7	3592.5	0.6		
2013-14	11323.93	0.26	298.13	-297.87	215.78	2941.98	7.33		
2014-15	11,236.77	9.14	1069.32	-1,060.18	11.95	2608.4	0.46		
2015-16	11,104.07	23.75	1189.43	-1,165.68	-95.86	2003.91	-4.78		
Mean	10646.6	5.64	566.22	-560.57	25.55	2872.9	0.62		
S D	1116.6	8.51	390.67	383.01	93.53	543.46	3.54		
Range	2638.3	23.49	905.06	882.95	311.64	1588.6	12.12		
Minimum	8859.93	0.26	284.37	-1165.68	-95.86	2003.9	-4.78		
Maximum	11498.2	23.75	1189.43	-282.73	215.78	3592.5	7.33		
Sum	74526	39.51	3963.51	-3924	178.88	20111	4.36	0	2

Source : compiled from annual reports of OIL India Ltd

Table 1.7 relevant to the producer of crude oil, natural gas, LPG and involved in pipeline operations Oil India Ltd. has publicized its financial results pertaining to international operations for the period of 2009 to 2016. Total revenue earned for the whole 7 years was Rs. 74525.99, of which net exposure was Rs. --3924.00 this is 5.2%. This value infers that the company very low degree of exposure among petroleum products maker.

Average exchange gain reported is Rs.25.55Cr; this is 0.62% of net profit. IOCL had earned very high margin, which is 27% on revenue. The volatility in exchange rate particularly USD can erode whole profits of the firm.

Above financial figures demand for very strategic policy for managing the exchange risk it has not used any currency derivatives, kept receivables and payables in foreign currency un hedged. USD & EURO was the currencies used for international operation.

Table 1.8: Table showing foreign exchange operations of ONGC Ltd. for the years 2009 to 2016

(Rs. In Crs)

YEAR	Total revenue	Exchange inflow	Exchange Outflow	Net exposure	Net exchange (loss) / Gain	Net Profit	exchange difference on Net Derivatives used	exposure in
2009-10	1,07,025.38	4,587.09	14,613.89	-10,026.80	105.96	19,403.53	0.55	USD, GBP, EURO, JPY, CHF, AUD, AED, NOK, OMR, SEK, SGD
2010-11	1,24,544.06	4,711.55	37,115.41	-32,403.86	-60.31	22,455.93	-0.27	
2011-12	1,52,078.32	6,315.27	30,169.86	-23,854.59	-1,187	28,143.61	-4.22	
2012-13	1,67,893.21	7,472.34	37,630.93	-30,158.59	-42.05	24,219.64	-0.17	
2013-14	1,81,370.76	7,488.98	38,384.45	-30,895.47	64.98	26,506.53	0.25	
2014-15	1,67,137.01	5,022.79	18,919.79	-13,897.00	46.47	17,702.63	0.26	
2015-16	1,38,520.63	3,033.20	23,024.05	-19,990.85	-46.76	14,300.93	-0.33	
Mean	1 0646.6	5 . 6 4	566.22	-560.57	25.55	2872.9	0.62	
S D	1 1 1 6 . 6	8 . 5 1	390.67	383.01	93.53	543.46	3.54	
Range	2 6 3 8 . 3	2 3 49	905.06	882.95	311.64	1588.6	12.12	
Minimum	8 859.93	0 . 2 6	284.37	-1165.68	-95.86	2003.9	-4.78	
Maximum	1 1 4 9 8 . 2	2 3 75	1189.43	-282.73	215.78	3592.5	7.33	
S u m	7 4 5 2 6	3 9 51	3963.51	- 3 9 2 4	178.88	20 1 1 1	4.36	1 11

Source : compiled from annual reports of ONGC Ltd

Table 5.85 relevant to Crude oil, Natural Gas, LPG, Propane, Naphtha, HSD,SKO, LSHS & Aviation turbine Fuel manufacturer ONGC had shown following financial results for the financial year 2009 to 2016. It has mean revenue of Rs.148367.05Cr, of which net exposure was Rs.23032.45; this is 15.52% of Total revenue.

Average exchange loss reported per year is Rs.-159.89Cr; its ratio on net profit is 0.56%. both exposure and exchange loss has shown low margin on total revenue and net profit this has resulted in using only forward to hedge foreign exchange loss.

It has used USD, EURO, GBP, JPY, CHF, AUD, AED, NOK, OMR, SEK and SGD in its international operations.

Table 1.9: Table showing foreign exchange operations of PETRONET LNG Ltd.for the years 2009 to 2016

(Rs. In Crs)

YEAR	Total revenue	Exchange inflow	Exchange Outflow	Net exposure	Net exchange (loss) / Gain	Net Profit	exchange difference on Net Profit	Derivatives used	exposure in
2009-10	10,746.91	0.67	9,321.09	-9,320.42	51.89	404.49	12.83	Forwards & unhedged	USD,JPY, EURO & GBP
2010-11	13,265.66	0.63	11,475.84	-11,475.21	14.03	619.62	2.26		
2011-12	22,780.74	0.84	20,584.62	-20,583.78	-57.08	1,057.54	-5.4		
2012-13	31,556.14	12.6	27,942.49	-27,929.89	-23.93	1,149.28	-2.08		
2013-14	37,831.33	15.1	33,874.39	-33,859.29	-3.74	711.92	-0.53		
2014-15	39,783.40	440.69	36,090.42	-35,649.73	-13.05	904.8	-1.44		
2015-16	27,395.56	349.59	23,164.67	-22,815.08	2.3	928.53	0.25		
Mean	26194.3	117.16	23207.7	-23090.49	-4.23	825.17	0.84		
S D	11311.5	191.8	10324.1	10230.76	33.63	260.8	5.78		
Range	29036.5	440.06	26769.3	26329.31	108.97	744.79	18.23		
Minimum	10746.9	0.63	9321.09	-35649.73	-57.08	404.49	-5.4		
Maximum	39783.4	440.69	36090.4	-9320.42	51.89	1149.3	12.83		
Sum	183360	820.12	162454	-161633.4	-29.58	5776.2	5.89	1	4

Source : compiled from annual reports of Petronet LNG Ltd

Table 5.86 relevant to the Liquefied Natural Gas manufacturer Petronet Ltd. had shown following financial results for the financial year 2009 to 2016. It has mean revenue of Rs. 26194.25Cr, of which net exposure was Rs. -23090.49; this is 88.14% of Total revenue.

Average exchange loss reported per year is Rs.-4.23Cr; its ratio on net profit is 0.84%. this has resulted in using only forward to hedge foreign exchange loss. It has used USD, EURO, GBP and JPY in its international operations.

H₀₁: Foreign exchange exposure has a bearing on profitability of the firm to the greater extent.

To test the above hypothesis 10 sample companies net exposure, exchange outflow & inflow is chosen. Impact of exchange outflow, inflow & net exposure on exchange losses is tested through multiple regression test.

Table 5.88 (a) Showing Summary of regression test statics for hypothesis testing of Oil & Natural Gas Industry

<i>Regression Statistics</i>	
Multiple R	0.704958106
R Square	0.496965931
Adjusted R Square	0.462964776
Standard Error	788.0023606
Observations	62

Table 5.88 (b) Showing Summary of F test statics for hypothesis testing of Oil & Natural Gas Industry

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	3	36193973.6	12064658	29.14414	1.27548E-11
Residual	59	36635915.5	620947.7		
Total	62	72829889.1			

Table 5.88 (c) Showing Co-efficient, P-Values of regression test statics for hypothesis testing of Oil & Natural gas Industry

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	157.1410339	125.389056	1.253228	0.215067
Foreign Exchange inflow	-0.01321811	0.03050461	-0.43332	0.666366
Foreign Exchange outflow	-0.01123907	0.00327982	-3.42673	0.001119
Net Exposure	0	0	65535	0

Regression Test static infers the following. The test considered to be significant because Multiple R Value is 0.70 that indicates high degree of impact exists between foreign exchange exposure on foreign exchange losses. In other words Probable exchange losses can be estimated to the extent of 70% of foreign exchange exposure of the in Industrial machinery industry. R square 0.49 indicates degree of correlation coefficient between exchange exposure and exchange losses.

P value of test static is less than 0.05 which is,0.0011 ,0 for exchange outflow, & net exposure respectively. This value reveals that the test is significant in context of exchange exposure has an impact on exchange losses of the firm, compared to exchange inflow and outflow independently.

From the summary result, it is possible to infer that test is significant because the F value is less than 0.05 which is 1.27548E-11. F calculated value is more than the table value i.e 29.14>1.27548E-11. This test resulted in rejection of null hypothesis.

Implication of the test : foreign exchange losses in oil an gas industry is dependent to exchange exposure to some extent, residual exchange loss is contributed by several other parameters like translation loss (foreign exchange rate adjusted assets and liabilities). Foreign exchange loss can be estimated through predictive analysis (multiple regression test).

<p>Exchange losses in oil and gas industry = 157.14+foreign exchange outflow (-0.01123907)+Net exposure(0)</p>

H02: Choice of currency derivatives is independent to the exchange losses, exchange inflow, exchange outflow, net exposure & no. of currency exposed to.

Table 5.89 (a) Showing Summary of regression test statics for hypothesis testing of Oil & Natural Gas Industry

<i>Regression Statistics</i>		<i>Regression Statistics</i>	
Multiple R	0.460653	Multiple R	0.695750973
R Square	0.212202	R Square	0.58318443
Adjusted R Square	0.139374	Adjusted R Square	0.5719068
Standard Error	1.111696	Standard Error	89.543219
Observations	62	Observations	62

Table 5.89 (b) Showing Summary of F test statics for hypothesis testing of Oil & Natural Gas Industry

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	5	18.97493	3.794986	3.838384	0.004635524
Residual	57	70.44442	1.235867		
Total	62	89.41935			

Table 5.89 (c) Showing Co-efficient, P-Values of regression test statics for hypothesis testing of Oil & Natural gas Industry

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	2.30539	0.285511	8.074622	5.17E-11
Foreign Exchange inflow	0.000124	4.31E-05	2.881527	0.00557
Foreign Exchange outflow	-9E-06	5.08E-06	-1.7803	0.0080358
Net Exposure	0	0	65535	0
Net exchange (loss) /Gain	-3.4E-05	0.000184	-0.18274	0
no.of currencies	-0.10436	0.051136	-2.04083	0.045908

To test the above hypothesis multiple regression test is used, the test considered to be significant due to Multiple R 0.46, adjusted R square 0.23. P value of exchange inflow, exchange outflow, net exposure, no. of currencies used in foreign operations is lower than 0.05.

For the observation of 9 companies for 7 financial years it is possible to infer that Foreign exchange inflow, outflow, Net exposure, Exchange losses & No. of currencies involved

in international operation have substantial impact on the choice of currency derivative. It is possible to derive a model of predictive analysis.

Choice of derivative = 2.30+EOF(-9E-06)+NE(0)+Exchange loss(-3.4E-05)+ number of currencies(-0.10436)

Implication of the test: irrespective exposure, exchange loss companies in oil and gas industry is using forward contracts & other derivative.

H₀₃: Foreign exchange losses can be substantially minimised through currency derivatives and multiple currency invoicing

Table 5.90 (a) Showing Summary of regression test statics for hypothesis testing of Oil & Natural Gas IIndustry

Table 5.90 (c) Showing Co-efficient, P-Values of regression test statics for hypothesis testing of Oil & Natural gas Industry

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	-298.276147	389.4445111	-0.7659	0.0446788
No.of currencies	39.65795051	51.20405231	0.774508	0.0441723
No.of derivatives	-127.228998	119.739057	-1.06255	0.0292315

To test the above specified hypothesis multiple regression test is used. The summary output of the test infers that, test is significant because P value of no.of derivative instrument used & multiple currency invoicing are lower than 0.05i.e0.044, 0.0292

Multiple R 0.69 indicates that to the extent of 69% exchange losses can be minimized through currency derivatives and multiple currency usage, where as these parameters are having correlation in the tune of 58%.

From the above table values it is possible to derive the equation i.e $Y=a+bx+ej$

Exchange losses of oil & gas industry can be minimized = -298.27 +No. Derivatives used (39.65) + No.of currencies used for invoicing (-127.23)

For the total observation of 10 chemical makers for the data of 7 years F test static.1.17>0.31i.e infers to reject the null hypothesis and accept the alternative hypothesis. Foreign exchange losses cannot be completely minimized through employing number of currency derivatives& multiple currency invoicing.

For the chosen 9 companies in Oil and Gas Industry namely BPCL, CASTROL INDIA LTD. DEEP INDUSTRIES LTD. GAIL LTD. HPCL. IOCL.OIL INDIA LTD.ONGCPETRONET LNG LTD. Following financial facts have been observed with respect to its international operations and foreign exchange risk management practices, for the financial year beginning from 2009-10 to 2015-16. Summary of it is presented in the following table.

Table 5.91: Table showing descriptive statistics of selected companies in Oil and Natural Gas Industry

Descriptive statistics	Total revenue	Foreign Exchange inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) / Gain	Net Profit	% Exchange loss on Net Profit
Mean	115435.50	4802.47	44551.38	-39748.91	-407.05	4784.09	-38.92
Standard Deviation	131314.32	6630.44	61667.71	56018.85	1092.67	6842.58	170.88
Range	491736.12	21608.13	240477.38	220648.64	6501.08	28131.76	1314.78
Minimum	51.19	0.00	4.52	-220653.16	-4650.21	11.85	-1282.40
Maximum	491787.31	21608.13	240481.90	-4.52	1850.87	28143.61	32.38
Sum	7157000.84	297753.14	2762185.66	-2464432.52	-25237.38	296613.60	-2412.76
C.V	113.76	138.06	138.42	-140.93	-268.43	143.03	-439.09

Table 5.91 is prepared to analyse the foreign exchange operations of Oil and natural gas industry. The average revenue earned by the chosen companies is Rs.115435.50Cr, mean exchange inflow is Rs.4802.47Cr, whereas exchange outflow is Rs.44551.38Cr. foreign currency outflows are greater than inflow. Mean adverse exchange exposure reported is Rs.39748.91Cr, which is the risk faced by the oil and gas industry. All the year the chosen companies reported adverse net exposure i.e. foreign currency outflows are greater than the inflow. ANOVA test infers that there is no uniformity in exchange exposure which remains different across the companies due to the tune of revenue, foreign exchange inflow and out flow.

Due to the adverse net exchange exposure reported, industry has undergone Mean exchange loss of Rs 407.05Cr; its ratio on net profits is 38.92%. Hypothesis testing reveals the fact of Implication of the test: foreign exchange losses in oil and gas industry are dependent to exchange exposure and exchange inflow; it is contributing to the extent of 70% on exchange losses. It is also influenced by several other parameters like forward premium written off, translation loss etc.

Foremost companies in oil and gas industry chosen for the study have used, the following Currency derivatives for minimizing the foreign exchange risk

Table 5.92 : Table showing derivatives used in selected companies of oil and gas Industry

Derivatives	Castrol	BPCL	Deep Industries	Gail	HPCL	IOCL	Oil India	ONGC	Petro Net
Forwards	YES	YES	YES	YES	YES	YES	NO	YES	YES
Futures	NO	YES	NO	NO	NO	NO	NO	NO	NO
Options	NO	YES	YES	NO	YES	NO	NO	NO	NO
Swaps	NO	YES	NO	NO	YES	YES	NO	NO	NO
Unhedged	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 5.92 exhibits derivatives used in selected companies of oil and gas Industry out of 9 companies chosen for the study among the oil and gas industry, all the companies have used natural hedging strategies. 8 out of 9 companies have chosen Forwards contracts to mitigate foreign exchange risk. Whereas options are being used by 3 companies, Swaps are used by 3 companies. Only one company has used Futures. BPCL has employs all the forms of derivatives. Hypothesis testing infer that there is a great impact of net exposure, exchange outflow, exchange losses and multiple currency invoicing on the choice of derivative.

All the 9 companies are commonly having exposure in USD, followed by EURO 6 Companies, GBP 3 companies, JPY 4 companies; CHF 2 companies apart from it other currencies like, AUD, CNY, SGD, AED, NOK, OMR ere used for international operations. Hypothesis testing reveals that multiple currency invoicing has reduced desired minimization of exchange losses in oil and gas industry.

Findings & Suggestion of Oil and Gas Industry:

For the chosen 9 companies in Oil and Gas Industry Following financial facts have been observed with respect to its international operations and foreign exchange risk management practices, for the financial year beginning from 2009-10 to 2015-16. Summary of it is presented in the following sentences.

- 1) Average revenue earned by the chosen companies is Rs.115435.50Cr, mean exchange inflow is Rs.4802.47Cr, whereas exchange outflow is Rs.44551.38Cr. foreign currency outflows are greater than inflow.
- 2) Mean adverse exchange exposure reported is Rs.39748.91Cr, which is the risk faced by the oil and gas industry. All the year the chosen companies reported adverse net exposure i.e. foreign currency outflows are greater than the inflow. ANOVA test infers that there is no uniformity in exchange exposure which remains different across the companies due to the tune of revenue, foreign exchange inflow and out flow.
- 3) Due to the adverse net exchange exposure reported, industry has undergone Mean exchange loss of Rs 407.05Cr; its ratio on net profits is 38.92%. Hypothesis testing reveals the fact of Implication of the test: foreign exchange losses in oil and gas industry are dependent to exchange exposure and exchange inflow, it is contributing to the extent of 70% on exchange losses. It is also influenced by several other parameters like forward premium written off, translation loss etc.
- 4) Out of 9 companies chosen for the study among the oil and gas industry, all the companies have used natural hedging strategies. 8 out of 9 companies have chosen Forwards contracts to mitigate foreign exchange risk. Whereas options are being used by 3 companies,

Swaps are used by 3 companies. Only one company has used Futures. BPCL has employs all the forms of derivatives. Hypothesis testing infer that there is a great impact of net exposure, exchange outflow, exchange losses and multiple currency invoicing on the choice of derivative.

5) All the 9 companies are commonly having exposure in USD, followed by EURO 6 Companies, GBP 3 companies, JPY 4 companies; CHF 2 companies apart from it other currencies like, AUD, CNY, SGD, AED, NOK and OMR were used for international operations. Hypothesis testing reveals that multiple currency invoicing has reduced desired minimization of exchange losses in oil and gas industry.

6) Mean adverse exchange exposure reported by oil and gas industry is Rs.39748.91Cr, which is the risk faced by the industry. ANOVA test infers that there is no uniformity in exchange exposure which remains different across the companies due to the tune of revenue, foreign exchange inflow and out flow. Hence demands for customized approach to minimize the foreign exchange exposure which is company specific in nature.

7) Due to the adverse net exchange exposure reported, industry has undergone Mean exchange loss of Rs.407.05Cr; its ratio on net profits is 38.92%. Hypothesis testing reveals the fact of Implication of the test: foreign exchange losses in oil and gas industry are dependent to exchange exposure and exchange inflow, it is contributing to the extent of 70% on exchange losses. It is also influenced by several other parameters like forward premium written off, translation loss etc.

8) To the tune of 70% transaction exposure has an impact on exchange losses undergone by the industry. By regressing the factor following model has been developed for anticipating the exchange losses in oil and gas industry.

Exchange losses in oil and gas industry = 157.14+foreign exchange outflow (0.01123907)+Net exposure(0)

9) Out of 9 companies chosen for the study among the oil and gas industry, all the companies have used natural hedging strategies. 8 out of 9 companies have chosen Forwards contracts to mitigate foreign exchange risk. Whereas options are being used by 3 companies, Swaps are used by 3 companies. Only one company has used Futures. BPCL has employs all the forms of derivatives. Hypothesis testing infer that there is a great impact of net exposure, exchange outflow, exchange losses and multiple currency invoicing on the choice of derivative. Currency futures and options usage is minimal among the chemical makers, which can be popularized by rendering appropriate training to the finance managers, instead of using only forwards or keeping natural hedging positions. Choice of derivative can be done through by following model

Choice of derivative = 2.30+EOF(-9E-06)+NE(0)+Exchange loss(-3.4E-05)+ number of currencies(-0.10436)

10) All the 9 companies are commonly having exposure in USD, followed by EURO 6 Companies, GBP 3 companies, JPY 4 companies; CHF 2 companies apart from it other currencies like, AUD, CNY, SGD, AED, NOK, OMR ere used for international operations. Hypothesis testing reveals that multiple currency invoicing has reduced desired minimization of exchange losses in oil and gas industry. Hence apart from usage of derivative other techniques like cross currency invoicing would be useful for the firm.

11) Recommended predictive analysis model to minimize exchange losses is

Exchange losses of oil and natural gas industry can be minimized = -298.27 +No. Derivatives used (39.65) + No.of currencies used for invoicing (-127.23)

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