Petro Exchange in India: A Viability Check

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Abstract

Efficient, reliable and competitively priced energy supplies are prerequisites for accelerating economic growth for any developing country. In global scenario while trade exchanges have existed for a long time, future markets for petroleum products only assumed some importance for the industry after mid-eighties. The reason for the same may be attributed to notorious price fluctuations. Though many exclusive global petro exchanges have been contributing to a great extent towards crude trade, in Indian context, it is still a measure to be undertaken. This paper attempts to highlight the prerequisites, requisites, structured process and financial feasibility of setting up an exclusive petro product exchange in India.

Keywords: Pricing derivatives; Financial feasibility; Product exchange; Petro exchange; Commodity exchange

Introduction

The shape of exchanges, including those that trade commodities, has changed drastically over years. The main rationale of creation of these exchanges has been reduction of transaction costs, and organizing a physical market place where buyers and sellers could be sure of finding a ready market. Though in Indian context it goes back to early twenties but it was in seventies when the market got a boost with support of full convertibility of the rupee, process of economic liberalization and the Indian economy’s opening to the world market. Though the volumes of trades in the commodities derivative market has increased manifold after setting up of electronic exchanges but with reference to petro products a dedicated exchange is still a stage of evolution.

Globally the growth and development of commodity or future market in oil has allowed for substantial growth to this sector. Since these markets provide depth to the commodity, the necessity of its success increases manifold. The success of an oil exchange is a resultant of uncontrollable external as well as controllable internal factors governing these exchanges. The important external factors may be price benchmarks, rate of production, volatility, forecasting properties of the oil products being traded, and seasonality in demand and availability of competing and complimentary supply chain options. The internal factors namely rate of production, inventory levels, cost of carry, liquidity; storage and availability of physical markets determine the volume of trade and in turn the revenue for the market.

The profitability of a petro exchange depends to a great extent on the margins implied, historical price volatility of the commodity, the variance risk premium charged and the prevailing market prices of the risk. Further the impacts of petro exchange on the retail petroleum prices will depend to a large extend on the severity of impact of information or actual unexpected price shocks and the effectiveness of future hedging. The revenue risk involved may be reduced through market diversification, longer time to maturity and higher hedge ratio.

Williams [1] reports on the first energy future contract in the Middle East launched by Dubai Mercantile Exchange. According to the author, the factors defining the success of the exchange are identified to be liquidity, storage facility, physical markets and prevailing pricing benchmarks of crude oil future. Pindyck [2] has discussed the short-run dynamics of commodity prices, production, and inventories, as well as the sources and effects of market volatility. It has attempted to explain how prices, rates of production, and inventory levels are interrelated, and are determined via equilibrium. Lautier et al. [3], focuses on the volatility of crude oil futures prices on the New York Mercantile Exchange. It has aimed at examining whether this market creates excess volatility, which would not be observed in the absence of such a market. The study shows that a significant part of the volatility recorded during exchange trading hours is caused by mispricing errors. Marzo et al. [4], have studied the forecasting properties of linear GARCH models for closing-day futures prices on crude oil. The study shows that the GARCH-G model fares best for short horizons from 1 to 3 days ahead. For horizons from 1 week ahead, no superior model may be identified.

Zyren et al. [5] have investigated the changing relationship between price and volume traded of short- and long-maturity. The study observes the impacts excess production on the NYMEX WTI futures markets. The analysis has attempted to determine if futures contract information can provide an early indication of market regime shifts and improve short-run crude oil spot price forecast models. Suenaga and smith [6] have examined the volatility dynamics of three major petroleum commodities traded on the NYMEX: crude oil, unleaded gasoline, and heating oil. Using the partially overlapping time-series (POTS) the research models jointly all futures contracts with delivery dates up to a year into the future and extract information from these prices about the persistence of market shocks. The model depicts highly nonlinear volatility dynamics that are consistent with the observed seasonality in demand and storage of the commodities.

Nesbitt and Scotcher [7] have explained the spatial nature of commodity markets of natural gas, oil, coal, or electricity. The research examines spatial market equilibrium from a methodological perspective and puts forth results that explain interrelationships of prices and quantities of commodity throughout a market of competing/ complementary supply chains.

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Mcaleer and Sequeira [8] has found that on the basis of tests of zero restrictions, the system for the augmented unbiased expectations hypothesis is found to be superior empirically to the system for the standard Unbiased Expectations hypothesis, and the augmented cost-of-carry system is also found to be superior empirically to the standard cost-of-carry system for both SIMEX Brent futures and IPE Brent futures contracts.

Murdock and Richie [9] in their study have examined the relation between spot and futures prices in the crude oil market since the inception of the commodity exchange-traded fund. The results show that investors who rely on the USOF returns to hedge their exposure to crude oil markets face basis risk because USOF prices deviate from crude oil futures, particularly during periods of contango. Todorova, [10] analyzes the price dynamics of two important energy futures namely crude oil and natural gas along with estimation of model on natural gas prices, Variance-covariance structure of natural gas returns, Models recognizing seasonality in natural gas prices.

Genman and Yih [11] have introduced the constant elasticity of variance (CEV) model for commodity prices and examines its calibration to strategic commodity trajectory prices. It also shows that the constant elasticity of variance exponent can efficiently account for the stochastic volatility observed in commodity prices. Chang [12] confirms that incremental information over a buy-and-hold strategy and a naive forecast, are both statistically and economically significant. Further comparisons against the profitability of commodity-based momentum strategies strongly suggests that not only are there incremental profits to be gained from harnessing and combining economic links among commodity futures, the resultant incremental profits are economically significant against other proven commodity-based trading strategies.

ICIS Chemical Business assigns the increase in various fuel prices on several commodity price exchanges to costs and supply tight. It has been suggested to restore margins to prevent business from becoming unaffordable and to avoid having to make asset decisions at a time when is a strong demand. Day and Lewis [13] proposes two value-based standards for setting the initial margin requirements on futures positions based on the observation that the distributions of the payoffs to futures traders and the potential losses to the futures clearinghouse can be described in terms of the payoffs to barrier options. The results suggest that, on average, the initial margin requirements set by the New York Mercantile Exchange exceed the minimum margins required under our option-based standards for adequacy.

Lee and Zyren [14] in their research has utilized calculated historical volatility and GARCH models to compare the historical price volatility behavior of crude oil. The study has concluded that there is an increase in volatility as a result of a structural shift to higher crude oil prices and persistence of volatility in all commodity markets is quite transitory.

Trolle and Schwartz [15] investigates variance risk premium in energy commodities, particularly crude oil and natural gas, using a robust model-independent approach. The study finds that the average variance risk premium is significantly negative for both energy commodities. The return profile of a natural gas variance swap resembles that of a call option, while the return profile of a crude oil variance swap, of anything, resembles the return profile of a put option.

Deaves and Krinsky [16] has investigated the risk premium and efficiency of the New York Mercantile Exchange’s (NYMEX) Crude Oil futures contract. The research suggests that growth in the trading of energy futures is strongly correlated to information on the risk premium.

Jaimungal and Samuel [17] has constructed forward price curves and valued a class of two asset exchange options for energy commodities. The study has provided a calibration procedure and model for the NYMEX Light Sweet Crude Oil spot and futures data, allowing extracting the implied market prices of risk for these commodities.

Wlazlowski [18] in their study propagates that crude oil prices have a significant impact on retail petroleum product prices and were shown to affect inflation and other key economic indicators. Spyrou [19] shows that investors in commodity futures contracts may not react efficiently to information contained in price shocks. More specifically, the results suggest that investors in the IPE Brent Crude Oil Futures contract overreacted to positive market shocks where as a zero-investment trading strategy for the IPE Brent Crude Oil Futures contract generates significant arbitrage profits, indicating that these pricing inefficiencies may be exploitable in practice.

Odusami [20] examines whether nonlinear crude oil effect observed in aggregate US stock return can be explained by unexpected shocks from the crude oil market. The study finds that unexpected crude oil shocks have nonlinear effect on excess US stock market return. Contemporaneous and lagged returns on crude oil futures have significant negative effect on jump distribution in US stock market returns. The empirical result reveals no significant feedback effect from OPEC proceedings to the US stock markets.

Rahgozar and Najafi [21] examines effects of market diversification, contract maturity and hedging on managing revenue and risk. The hedging effectiveness of several hedging models has been investigated and the effects have been quantified.

The literature above discussed identifies and discusses the importance, various controllable and uncontrollable factors deriving the functioning and growth of petro exchanges. It is of utmost importance to ensure proper identification, estimation and quantification of these factors while conceptualizing a petro exchange. In Indian context the importance of the same is further high since petroleum has been the largest component of import basket. The present paper aims at looking at the need, conceptualization, requisites and feasibility of a petro exchange in India

Need of petro product exchange

The development of futures markets has allowed for large strides in the management of world oil markets. They have provided better protection against price fluctuations. Also these markets have improved financial liquidity as well as better inventory control. Improved transparency is one of the other major advantages of this exchange and thus helps to combat dominant positions held by a company over a given product [22-24].

Producer of the petro products can also expect a benefit from this exchange. These producers can anticipate future markets with a slightly clear but not absolutely accurate idea of the possible development in these markets. Yet the problem is that producer is not having complete or definitive coverage. The situation gets worse if the product basket of the producer involves different products. The choice of the product at the user end may differ resulting in risk.

In Indian context a petro exchange may provide the following benefits to the players, producers, consumers and economy at large.
Improving the supply chain inadequacies

Supply Chain Management may be best described as the natural extension of the downsizing and re-engineering performed by any organization. Downsizing and re-engineering transforms the enterprises into lean and mean competitive units by the measures of cost cutting and process simplifications with an objective of optimization. These strategies may lead to increased productivity and profitability of the organizations.

In order to obtain the same logistics which includes the cost of procuring material from supplier and shipment of finished goods plays a major role since it consists nearly 20% of the sales costs. Considering the above facts it may be stated that supply chain management has a significant impact on the firm’s performance. Exchange may be effectively used to counter the risks involved under the normal as well as contingent conditions.

Under normal conditions a petro product exchange may be utilized to control the transportation cost such as in situations of transportation of petro products to far flung areas involving significant transportation costs. The supplier may undertake a contract on the exchange with another refinery in the location to supply the need. This may be an effective way to control the transportation costs.

During contingencies the petro product exchanges may be effectively utilized to prevent delay in supply of petro products e.g. In case of annual maintenance Refineries may ensure the supply of refined products by outsourcing the requirement to other company through exchange traded contracts and in turn ensuring the trust with their customers. Figures 1 and 2 make a graphical representation of a petro products supply chain in the absence and presence of a petro exchange.

Petroleum products reach the final consumer from refineries through a complex logistic network consisting of pipelines, ships, railways and trucks. Nowadays petroleum products have to meet stringent standards and long distances coupled with variety of modes of transportation pose problems of contamination and degradation. The established network of petro exchange will not only curtail the transportation cost but also will be a boon in checking the problems of contamination. Petro product exchange will also be a boost to the small players since they can come up with retail outlets by purchasing petro products from the spot market. This can effectively improve supply chain in rural and some remote parts of the country.

![Figure 1: Supply chain flow in absence of a petro exchange.](image1)

![Figure 2: Supply chain flow in presence of a petro exchange.](image2)
Improvement in performance and in return lesser burden of subsidy

The selling price of petro products in India is based on cost plus system where the price of products is fixed based on the total cost incurred and a predetermined margin thereupon. This system has an inherent deficiency of the possibility of passing operational and technological inefficiencies to the end customers. Since the prices are subsidized there is no imperative requirement for the Oil Marketing Companies to work on these. A strong network of petro exchange will encourage market driven pricing or in fact encourage the government to subsidize the prices through exchange. In long run it will encourage to have a market where there will be hardly any room left for inefficiencies.

Benefits to natural gas industry

In India well connected natural gas network to provide PNG hardly exists. Existence of Spot market in Petro product exchange may be useful in changing this scenario. In an environment where natural gas is actively traded in the exchanges, it encourages many small players to enter the distribution business. These players will also be encouraged to come up with natural gas distribution in smaller geographical location. This will encourage us to shift our fuel choice from more polluting diesel and gasoline to less polluting natural gas thus addressing the problem of global warming as well.

Better inventory control: The development of the future market has improved the way inventory was managed. They have provided protection against price fluctuations and also will be having better estimation as to what will be the future demand. Key to better inventory planning is having exact idea on quantum of supply, demand and product under process.

Improvement of cross country pipelines for crude and petro products: In Planning Commission Report (Report of the Working Group on Petroleum and Natural Gas Sector for the XII Plan (2012-17) it has been emphasized that cross country pipelines should be the preferred mode of transportation. This may be due to the reasons of its being Cost Effective, Safe and Environment friendly. With the introduction of petro product exchange even small players may enter this business and will come up with localized networks thus catering to the needs of the farther and smaller geographical locations.

Setting up of a petro exchange: A requisite framework: Prior to setting up a petro exchange it is of utmost importance to define the objectives along with analyzing the prerequisites and requisites (Figure 3).

Defining the Objectives

Though various objectives of setting up a petro exchange may be quoted but considering Indian scenario a lot of care should be taken to prioritize them. It is necessary to avoid differences of opinion amongst decision makers to have the preferences fixed. The objectives may be quoted as follows in that preferential order:

1. To facilitate competitive environment
2. To have transparent deals
3. To have control on transportation costs of oil marketing companies.

Along with these objectives promoters of the exchanges may be interested in getting the revenue in compliance with intended ROI (Return on Investment). A well stated business plan should be in place to ensure the laid down objectives be achieved.

Pre-requisites of an exchange

Crucial pre requisites is required to be met with for ensuring an effective functioning of any petro products exchange may be summarized as follows:

A logical geographical location: It is said that for any business to succeed three important factors are- Location, Location and Location. It is important because of the following reasons:

- Transportation of the raw material
- Highly networked banking as it has to conclude large number of financial transactions

Figure 3: Structure of the petro exchange.
Liquidity of the article: The underlying asset should be available in sufficient quantity, but also in manageable units. Majority of the times manageability of high volume of crude or other products poses problems as it becomes too difficult to achieve a standard quantity through future market. There must also be sufficient parties willing to participate in this exchange. It can be improved by effective marketing and wooing some major players both on the supply and consumer side.

Political stability: Political will can convert any viable project unviable and vice versa. There must be a certain degree of political stability in the country where exchange is established. This becomes more and more predominant when huge financial interests are connected with the future trade.

Requisites of petro products exchange

A petro exchange prior to its set up should ensure the following requisites for the efficient and uninterrupted function in the long run.

Enabling policy environment and infrastructure facilities: There should be consistent policies from Government to protect the interest of the investors who are coming up with the exchange. This needs huge outlays and clear policies which may be classified under the heads of financial, legal and trade Policies. These policies should be designed taking into consideration the modern trading concepts as well as modern trading instruments.

Market support: Strong market support is needed even after having strong promoters, motivated team, people, system, contracts and other facilities. Monetary commitment from market participants is necessary to sustain the operations of the exchange. This is especially true in the case of Financial Intermediaries and their financial commitment.

At the same time it should also be noted that market support is a function of value addition that the exchange is going to bring in. Thus market support can be expected only if exchange is bringing in value addition to the market participants, thus ensuring a win-win situation.

Good trading and clearance house: Trading system must be advanced and should cater to the national market. It should offer hassle free service, a transparent trading system and an efficient clearing house. A Clearing house is a financial institution that provides clearing and settlement services for financial and commodities derivatives and in this case especially commodity stands for Petro products. A Clearing House reduces the settlement risks by netting offsetting transactions between multiple counterparties (‘netting’), by requiring collateral deposits (i.e. margin deposits), by providing independent valuation of trades and collateral, by monitoring the credit worthiness of the clearing firms, and in many cases, by providing a ‘guarantee fund’ that can be used to cover losses that exceed a defaulting clearing firm’s collateral on deposit.

Clearing House comes into picture once the trading in the exchange is over since it steps between the two original traders’ clearing firms and assumes the legal counterparty risk for the trade. As the Clearing House concentrates the risk of settlement failures into itself and is able to isolate the effects of a failure of a market participant, it also needs to be properly managed and capitalized in order to ensure its survival in the event of a significant adverse event, such as a large clearing firm defaulting or a market crash. Trading and clearance houses should be such that they should ensure confidence in the investors mind.

Products/Instruments: Exchange should come up with trading products or instruments that are suitable for every customer. It should also take care that even a small consumer of petro product is in a position to trade from the exchange and get the required product delivered.

Education: Educating the potential customers is an important aspect of improving the number of the customers. It ensures that more number of people involve in trading through exchanges. It is a continuous process and exchange can work with a NGO or Governmental organization. This is a process which involves sufficient funding but it has no direct cash inflows. But this mission will helpful to increase the number of traders whom we can safely call ‘Informed Investor’. Education is a part of marketing plan.

Finally it can be said that education should be ongoing and should be aimed at market participants, potential market participants, media, and Government officials and educational

Government role: The active role of the government in the form of regulatory as well as supporting institution may not be understated. The various roles of the government in assisting and ensuring smooth functioning of the exchange may be summarized as follows:

Surveillance: Primary role of the Government is to regulate the exchange. Government should come up with statutory body which will regulate the petro product market. This is essential to maintain integrity and honesty amongst the traders as these qualities are of paramount importance. Government should also act decisively so as to avoid any ambiguity amongst the investors and traders. The duty of the Government may also to come up with the clear and balanced rules for ongoing surveillance.

Role of oversight: Disciplinary actions against those who try to manipulate the markets for the self benefit needs to be taken. With this Government can make fair market prices to sustain in the exchange.

Enabling role: Government has to function as an enabler. It should provide the necessary legal and regulatory framework and even a part of the infrastructural framework or assistance without which market actors cannot function properly.

It is of utmost importance for the government to avoid over regulation to ensure the exchange functions competitively following economic rules. Also in sufficient knowledge of the market may lead to inadequate policies framed by the Government leading to jeopardizing the exchange and the interests of public at large. Government has to take care of the exchange so that participants are assured of fair market conditions. It also has to ensure that the exchange is functioning for the benefit of the public at large rather than a particular private interest by providing targeted support.

Setting of a Petro Exchange: A Structured Methodology

After ensuring the prerequisites and requisites in place, a structured approach has to be undertaken to set up the physical exchange. A structured procedure to be followed in establishing the petro exchange may be as follows:

Procedure

Government of India has issued guidelines to set up Commodity Exchanges and Forward trading in commodities under the provisions of the Forward Contracts (Regulation) Act, 1952 (FCR Act). The Associations / companies organizing such trading are required to obtain recognition from the Government of India under the act. The revised guidelines for making an application for setting up of a nationwide multi-commodity Exchange is as under:
Stage I - Obtaining in-principle approval: The application for setting up of a Nation-wide Multi Commodity Exchange may be submitted by reputed associations/companies/organizations or consortium of such entities to the Government through the Forward Markets Commission. The Government, on being satisfied that it would be in the interest of trade and also in the public interest to do so, may grant in principle approval for setting up of a National Commodity Exchange. In-principle approval may be granted to the applicant on fulfilling the following criteria:

a) The proposed Exchange, sponsored/promoted by Associations/companies/organizations or a consortium of such entities should be registered as a public limited company incorporated under the Companies Act, 1956 with a minimum authorized equity capital of Rs. 100 crore.

b) The proposed Exchange shall have a demutualised structure, i.e., the share holders of the Exchange shall not have any trading interest either as a trading member or client at the Exchange.

c) While applying for in-principle approval, the proposed equity shareholding pattern of the Exchange should be as under:
   i. One or more of the initial partners/members of the promoter consortium must be a Government Company/Companies, as defined in the Companies Act 1956, contributing at least 26% of the paid up equity capital of the proposed Exchange.
   ii. The shareholding of institutional investors i.e. Stock/Commodity Exchanges, Banks, public financial institutions, Government Companies as defined in the Companies Act, 1956, Co-operative Societies as defined in the Societies act, Federations shall not be less than 20%.
   iii. No individual shall hold more than 1% of the paid up equity capital of the Exchange.
   iv. Subject to the above shareholding limits no single shareholder either individually or together with persons acting in concert shall be allowed to hold more than 40% of the paid up equity capital of the proposed Exchange.
   v. Investment in the initial paid up capital by shareholders shall be subject to a lock-in period of three years from the date of recognition of the Exchange. However, in exceptional cases the period can be relaxed by up to one year by the Forward Markets Commission.

vi. Any investor having shareholding in excess of 26% has to bring it down to 26% or below within two years beginning with the 4th year from the date of recognition of the Exchange.

vii. The Exchange shall ensure complete separation of ownership and management. It shall have a Professional management headed by a Chief Executive Officer. The appointment, renewal and removal of the CEO shall be done in the manner as prescribed by the Commission.

viii. The promoters of the proposed Exchange shall submit a formal agreement amongst promoters/investors (including institutional investors) on issues related to the setting up of the Exchange, authorized and paid up capital of the Exchange, main place of business and registered office, etc.

d) The detailed proposal should be sent to the Chairman, Forward Markets Commission, and Government of India along with the following:
   i. A non-refundable processing fee of Rs.5,00,000/- (Rupees Five Lakh only) in the form of crossed demand draft issued by any nationalized bank in favour of Forward Markets Commission, payable at Mumbai.
   ii. Details of the present business of each of the promoters/constituents.
   iii. Net worth of each of the promoters/constituents.
   iv. Audited accounts of each of the promoters/constituents for the last 3 years.
   v. Business plan for the proposed Exchange and schedule for operationalisation of the Exchange from the date of in-principle approval.
   vi. Proposed capital expenditure and sources of funds.
   vii. Clear confirmation of the location of the registered office and main place of business of the proposed Exchange.
   viii. Affidavit by the authorized signatory of each of the promoters of the Exchange affirming that they don’t attract the disqualifications.

e) The proposal should be submitted in the form of a comprehensive Project Report giving, inter-alia, justification for setting up the exchange, management structure, and system of trading, clearing and settlement, customer protection and details of infrastructure for handling physical delivery.

The government may grant in-principle approval after taking into account the recommendations of the Commission. An applicant granted in-principle approval may be required to submit to the FMC a bank guarantee of Rs. 50,00,000 (Rupees Fifty Lakh only) issued by a nationalized bank with a validity period of 21 months and a further claim period of 3 months within fifteen days of grant of in-principle approval for setting up the Exchange.

Stage II - Compliance of applicant granted in-principle approval: An applicant who has been granted in-principle approval is supposed to comply with the following conditions within a period of one year from the date of grant of in-principle approval.

The Exchange shall:
   i. Bring paid up capital of at least Rs. 100 crore as per the proposed equity capital structure.
   ii. Set up facilities for online trading with national reach and an efficient real time monitoring and surveillance system.
   iii. Provide for an efficient clearing and settlement system including establishment of a Settlement Guarantee Fund.
   iv. Arrange for an efficient delivery mechanism through an adequate network of accredited warehouses.
   v. Have an independent and professional management.
   vi. Provide for adequate infrastructure for dissemination of real time price and trade information.
   vii. Provide for adequate infrastructure for research and development on commodities, contracts and development of trade.
feasibility has been carried out with estimation of costs i.e. capital and revenues and volume. On the basis of the response obtained a financial commodity exchanges with reference to the cost factors, margins, techniques of random number generation may be carried out in this
The actual cost will lie between these ranges. The cost may be any same time range bound values for different costs may be estimated.

Structure of the exchange

The physical structure of the petro exchange may be built around trading, clearing, banking interface and surveillance and reporting. The Figure 3 depicts the flow and physical structure of the exchange.

Financial feasibility of setting up a petro product exchange in India: The global exchange industry has witnessed a growth of over 20% in the last couple of decades whereas started recently global commodities exchange is expected to grow at a CAGR of 32% (ET Bureau, 23 August 2009).

In Indian context there is still scope for newer players to enter the market and concentrated exchanges such as petro product exchanges could be a possibility. The rationale is based on the premise that there is enough depth in the Indian market for the concentrated exchanges to survive and have a profitable business model.

Establishing a petro product exchange is a capital intensive proposition and it affects the investors over a number of years since capital outlays on year 0 (zero) is very high and cash inflows are accrued over the number of years. The reason of high project cost may be attributed to the need of building and well connected nationwide network systems. According to the IDFC-SSKI Securities report the operating margins of exchange ranges from 60% to 80% with employee cost being the major cost followed by software maintenance. In the business of exchanges, one continues to reap benefits after an initial outlay as the operating expenses are very low.

Since benefits are based on the future events and the ability to see future is imperfect, considerable efforts have to be ensured to evaluate this investment opportunity as accurately as possible. The most difficult task in the process of estimating the investment proposition is to gather data related to capital expenditure. It becomes trickier to come up with estimation regarding trade volume. In order to study the feasibility of petro product exchange a reverse engineering technique has been adopted. According to this method quantum of revenue expected from this venture has been estimated. Depending on this trade volumes and ROI has been estimated. Now it may be up to the marketing team to meet the set target.

In real life it is difficult to estimate the costs accurately. But at the same time range bound values for different costs may be estimated. The actual cost will lie between these ranges. The cost may be any random number in this range depending upon the circumstances. The techniques of random number generation may be carried out in this regard. The study has undertaken a primary feedback from the existing commodity exchanges with reference to the cost factors, margins, revenues and volume. On the basis of the response obtained a financial feasibility has been carried out with estimation of costs i.e. capital and operating followed by estimation of revenues, payback and NPV.

Estimation of cost: In order to estimate cost to be incurred in the project minimum and maximum costs possible under different heads have been noted. These projected costs are under best case and worst case scenario. During project execution cost incorporated lies between these two extremities. Costs considered here are the indicative costs and they do not correspond to the real time costs. These have to be estimated by the Project Management to which the execution of this project has been assigned. The capital expenditures thus calculated are shown in Table 1 as follows:

The Operating Expenditure has been considered over a period of first five (5) years. The estimated operating expenditures for the two cases as stated above over five years are shown in Table 2 as follows:

In order to calculate the number of random variables standard deviation (σ) of the entire population has been calculated. A gross estimation of random variable is the average of the maximum and minimum value. Thus the absolute error of 2% has been calculated as average divided by 50. The number of iteration to obtain a result with an error of less than 2% has been calculated as;

Number of iteration (N)=(3*σ/ ε)^2

Table 3 shows the number of iterations for different Capex and Opex cost heads:

Expected Project cost can be calculated using function average (range) which refers to the total cost and the total cost in turn is the sum of individual costs. The expected project cost and median has been estimated to Rs. 16.7008 Crores and Rs. 16.69 Crores respectively.

The percentage difference in the expected project cost and median=(16.7008-16.69)/16.7008=0.06%.

Hence the cost follows Normal Distribution curve shown in the Table 4 and Chart 1 as follows:

Estimation of revenue: The Exchange will act as an intermediary between parties wanting to hedge risks, or speculate on future market direction. The Exchange has to list a range of future and option contracts with prices tied to certain underlying financial instruments. Futures provide a legally binding agreement to buy or sell an instrument or commodity at some point in the future whereas options provide the right, but not obligation to buy or sell an instrument at some point in the future. These contracts are commonly referred to as derivatives because they derive their price from some underlying asset. An Exchange provides the service of standardizing the terms of these agreements, providing legal enforcement of the contracts, provide a place for customers to quickly find counter-parties and discover market prices. For this service, they charge a fee for each contract traded through the exchange. The Fees may vary based upon whether the customers are members of the exchange and the volume they are transacting. Apart from this the fees the other identified sources of revenue may be registration charges from brokerage firms, exchange fees from

<table>
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<tr>
<th>Capital Expenditure</th>
<th>Min (In Crores)</th>
<th>Max (In Crores)</th>
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<td>Building</td>
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<td>8</td>
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<tr>
<td>Technological infrastructure</td>
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<td>2</td>
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<tr>
<td>Registration fees to Govt.</td>
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<td>Compensation to the Project Management Team</td>
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<tr>
<td>Sum</td>
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Table 1: Capital expenditure.
Operating Cost (in Rs. Crores) | Y1 | Y2 | Y3 | Y4 | Y5  
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<td>Min Max Min Max Min Max Min Max Min Max</td>
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<td>0.03</td>
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</tr>
<tr>
<td>Total Opex</td>
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<td>1.24</td>
<td>1.68</td>
<td>1.455</td>
</tr>
<tr>
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<td>13.56</td>
<td>Max</td>
<td>20.62</td>
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**Table 2:** Operating cost.

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<td>0.59</td>
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<td>0.10</td>
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<td>1.18</td>
<td>0.31</td>
<td>0.71</td>
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<td>0.34</td>
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</table>

**Table 3:** Iterations for Capex and Opex.

<table>
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<th>Total cost (in Rs. Crores)</th>
<th>Frequency Distribution</th>
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<tbody>
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<tr>
<td>14-15</td>
<td>29</td>
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<td>18-19</td>
<td>71</td>
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<tr>
<td>19-20</td>
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</tbody>
</table>

**Table 4:** Distribution of cost.

**Chart 1:** Bar Chart showing Total Cost v/s Frequency.

Expected present value of the capex (after using average function) = Rs. 8.82 Cr. In order to calculate PV of Opex, average of minimum and maximum value has been taken into account with an assumed cost of capital of 10%. The Table 7 shows the estimated present value of operating expenditure on a period of 5 years.

\[
\text{Expected present value of the capex} = \text{Rs. 8.82 Cr}
\]

\[
\text{Expected present value of the Opex} = \text{Rs. 6.03 Cr}
\]

Therefore PV of investment = PV of Capex + PV of Opex

\[
= 8.82 + 6.03 = \text{Rs. 14.85 Cr}
\]

Since the NPV of the project is positive hence it may be considered for implementation.
Conclusion

The recent past experiences show many similar projects globally had trouble in getting off the ground. Hence instead of rushing to start the new venture, the players and regulators should prefer to analyse the market reactions before committing. In Indian scenario the exchange is likely to pose some extremely complex processes with some big operational issues for which an operational model encouraging cross over between products needs to be drawn.

The exchange apart from providing the much needed depth will serve as a price indicator to help the regulators in setting up official prices provided the forward prices to consumers or traders should be based on daily settlement prices rather than pricing derivatives based on historical prices. Though the proposed exchange has the potential to reshape the market for physical oil as well as that for crude futures in India, its success will hinge on trading volumes with liquidity being the key. The other major challenge will lie in attracting strategic partnership.
and convincing the global traders and investors that the new exchange has the momentum to prosper where others have not succeeded.

In light of the study an Indian petro exchange may be assumed to be a feasible and profitable venture in long run. The exchange also has the potential to replace the multi-product commodity exchange petro window but it will take years to reach that tipping point.

References