

# Risk Management in the Indian Petrochemical Industry (with special reference to Haldia Petrochemicals Ltd.)

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This study focuses on the identification and acceptance or offsetting of the risks threatening the profitability and existence of any petrochemical organization. It deals with the foreign exchange risk management policy of Haldia Petrochemicals Ltd. and how it could be implemented in the risk minimization or the profit maximization of the company. It applies theories about risks and offers insights and recommendations to the company regarding their management of risk exposures.

**Keywords:** Risk management, risk assessment, foreign exchange rate risk

The Indian petrochemical industry is small by international standards. India's ethylene capacity of around 2.48 million tonnes per annum accounts for only 2.1% of global capacity. However, this capacity had registered increases during the early 2000s. The Indian petrochemical industry is almost a monopoly; it is concentrated among few players. Reliance, along with its 51% subsidiary Indian Petrochemical Corporation, accounts for two-thirds of the entire industry. GAIL India Ltd. is the other major player. Haldia Petrochemicals Ltd., post-restructuring, has emerged as a major player in the eastern region.

In the Indian petrochemical industry, competition levels are high during overcapacity, especially in the domestic market. During times of overcapacity, the petrochemical producers also compete on parameters other than prices in an effort to increase capacity utilization. Previously,

with plastic processors and other buyers depending substantially on imports, the degree of competition among polymer resin manufacturers was low. However, significant petrochemical capacity additions over the last seven years have caused over-capacity and increased competition. This increased competition has not only forced domestic prices of petrochemicals to rule at discounts to landed costs but has also lowered capacity utilization, thereby further impacting profitability in the absence of any significant competitive advantage in the export markets.

Over the last two decades, petrochemical products have become one of the most important commodities in the world; and over the past several years, the single biggest development affecting the global petrochemicals industry has been the surge in price volatility. Gone are the days of stable, predictable prices. Prices of petrochemicals have

become hypersensitive to swings in crude oil prices; yet, when compared to oil, petrochemical markets remain small and opaque, with the flow of trade concentrated between Middle East swing producers and the giant consuming centers of China. Combined, these factors have contributed to unprecedented volatility, making the need for risk management more acute.

This study specifically focuses on the identification and acceptance or offsetting of the risks threatening the profitability and existence of any petrochemical organization. This study deals with the foreign exchange risk management policy of Haldia Petrochemicals Ltd. and how it could be implemented in the risk minimization or the profit maximization of the company. The value of the report comes from practical examples for hedging price risks and from general recommendations in regards to hedging with derivative instruments.

### **COMPANY PROFILE OF HALDIA PETROCHEMICALS LTD.**

This study discusses the various risk exposures in a petrochemical industry by taking Haldia Petrochemicals Ltd. (HPL) as an example. HPL is a naphtha-based petrochemical complex. It is the second largest integrated polyolefin producer and the largest buyer of naphtha in India. The company is jointly promoted by West Bengal Industrial Development Corporation, The Chatterjee Petrochem (Mauritius) Co. Ltd., and the Tata Group with an investment of USD1.2 billion. The products of the company include polymers namely Linear Low Density Polyethylene (LLDPE), High Density Polyethylene (HDPE), Polypropylene (PP), and other chemical products.

HPL has established an efficient distribution network for polymers through regional offices at Kolkata, Delhi, Mumbai, and Chennai, and area sales offices at Bangalore, Hyderabad, Ludhiana, Kanpur, Jaipur, Indore, and Ahmedabad. In addition, HPL has established 65 distribution outlets through consignment stockist agents (CSAs) who sell from various stock points located all over India.

HPL's marketing team is supported by an efficient logistics network, which ensures timely delivery and has proven the capability of dispatching over 6,000 metric tons of polymers in a single day. The logistics team at HPL continuously explores the possibility of alternate cost-effective modes of transportation as well as shorter transit time for delivery.

### **RISK MANAGEMENT**

According to Merritt (2002), risk management is the total process of identifying, measuring, and minimizing uncertain events affecting resources. Risks can never be entirely removed. The trick then is not trying to remove all risks, but to manage them. The secret of effective risk management is the ability to qualify and quantify risk elements objectively and reduce them to acceptable levels. Merritt also suggests that there are a variety of different angles to mitigate risks, particularly reducing the exposed resource and reducing the probability of the threat occurring.

#### ***The Process of Risk Management***

The process of risk management can be clearly segregated into four levels shown in Figure 1.

1. ***Planning.*** At this stage, the main objective is to investigate and identify the various kinds of risks involved in the industry. Once the risks are identified, they are to be evaluated properly according to their impact on the organization. Accurate and timely measurement enables an organization to quantify the risk for controlling and monitoring risk levels.
2. ***Decision making.*** This step basically focuses on which measure is to be used to control the risk exposures. According to Dr. P. K. Chakraborty (Chief Financial Manager, Bharat Coking Coal Ltd.), different risk control techniques available in this respect are: (i) loss prevention/loss avoidance; (ii) loss



*Figure 1. The process of risk management.*

reduction; (iii) loss transfer or insurance; and (iv) loss absorption. Among the four techniques mentioned though, loss prevention or loss avoidance is the best technique to pursue, but sometimes, due to inherent business processes, it may not be possible. In such cases the next better option is loss reduction. How loss in the petrochemical industry can be reduced will be discussed by this study. Another controlling measure is to transfer risk or to insure certain events to other parties. However, even after taking all measures for risk avoidance and risk reduction, there will be some risks which the industry has to absorb. For that, a company should have a clear cut policy regarding the types and extent of losses a company is going to absorb.

3. **Organizing.** Once the strategy of risk management is formulated, efforts are to be taken to implement the risk management techniques efficiently and effectively.
4. **Controlling.** At this stage the process of risk management is to be reviewed to identify if there are any discrepancies between the estimated results and the actual results.

#### ***Foreign Exchange Exposure***

Studies by Eitman and Stonehill (1986) and Shapiro (1986) dealt with foreign exchange

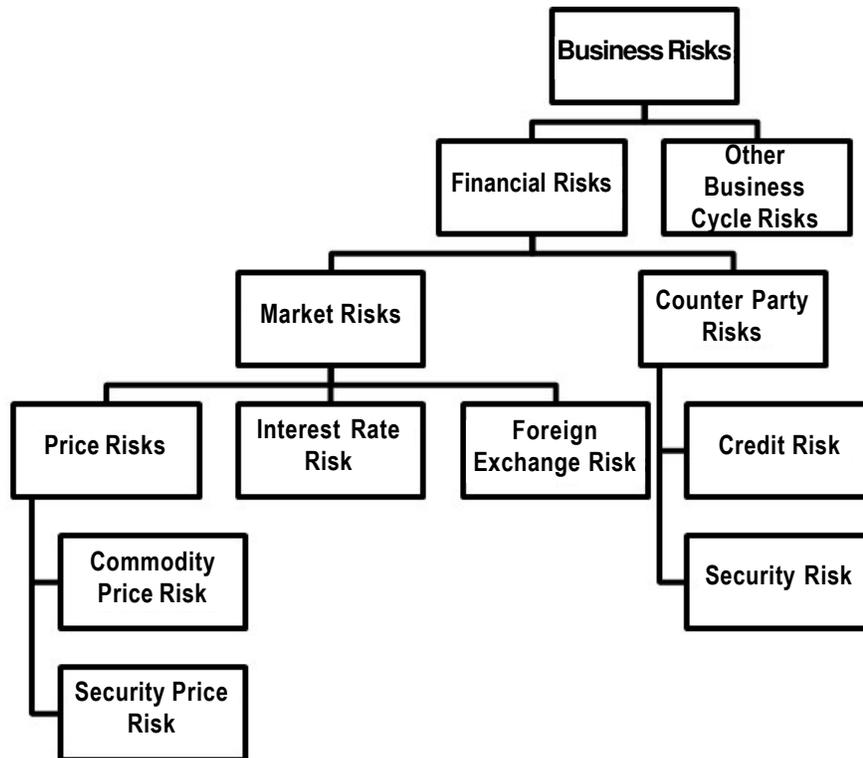
exposure. They defined the three types of foreign exchange exposure as transaction exposure, translation exposure, and economic exposure. Meanwhile, Rajwade (2000) covered a number of interesting aspects of foreign exchange management. He showed that with convertibility, corporate management of foreign exchange exposure has become increasingly important. In a highly volatile foreign exchange market, skill in handling foreign exchange is very vital. With the opening of India to international markets and the liberalization of the economy, foreign exchange operations in India should develop skills in the area of option futures and the like.

#### **RISK MANAGEMENT IN HALDIA PETROCHEMICALS LTD.**

Keeping these in mind, the exposure of Haldia Petrochemicals Ltd. to various risks is illustrated in Figure 2. Any of these risks can adversely affect the business and financial performance of any organization.

#### ***Financial Risks***

Financial risks can be defined as the uncertainty of an entity's performance due to uncertain future values of market or credit variables (i.e., price level, volatility, price differentials, credit rating, correlation, default rates, etc.). Financial risks arise during countless transactions of financial nature (like sales and purchases, and investments and



**Figure 2.** *Various Types of Risks in HPL*

loans) and various other business activities. It can arise as a result of legal transactions, venture of new projects, mergers and acquisitions, debt financing, the energy component of costs, or through the activities of management, stakeholders, competitors, or foreign governments.

**Market risks.** Market risks arise on the account of movement in market factors. They are associated with the ups and downs of the market mostly driven by external events and sentiments and are very difficult to predict beforehand. Due to liberalization and globalization, the level of market risks has increased. The two most important market risks HPL is exposed to are basis risk and price risk.

Basis risk refers to the lack of a perfect correlation between the hedge instrument and the underlying exposure. It is enhanced where a different currency or benchmark is used to hedge the risk of adverse movement in the currency or benchmark of the underlying exposure. Basis risk

is also known as correlation risk. It arises when the future price and the cash price of the commodity do not change in the same proportion over the period of the hedge. In the case of HPL, the company opts for cross-hedge in the Indian and international exchange using crude oil futures contracts to hedge the price of naphtha. In this context, it is to be noted that Brent crude oil and Naphtha are highly positively correlated (with a coefficient of approximately 0.84).

Price risk, on the other hand, basically signifies the commodity price risk which arises mainly from the business cycles and due to market fluctuations being different between raw material and finished goods. In the case of HPL, naphtha is the prime raw material. It constitutes about 90% of raw material purchases and about 70% of the total finished products' costs of the company. Hence, appropriate measures have to be taken to counter the risk associated with this vital commodity.

### **Business Cycle Risks**

Apart from these, the business cycle risks from procurement to finished products in HPL are further classified below:

**Freight risks.** This risk originates from uncertainties of the market in relation to freight costs and cargo size, and also from the availability of the right size of vessel. HPL is exposed to such freight/shipping risks, which need to be managed in such a manner that the company is able to book spot cargoes based on fixed rate premium in order to keep itself hedged if the market moves back to market-related rates or if there is an opportunity to save freight costs by taking some risks. The company can also book charter vessels and carry out floating ship and ship-to-ship lighter age operations to mitigate such risks.

**Benchmark MOPAG risks.** MOPAG is an assessment based on Platts price quoted at Mean of Platts Japan (MOPJ), and the freight movement between Japan and Singapore on one hand and Japan and the Arab Gulf on the other. The freight between these destinations finally determines Mean of Platts Singapore (MOPS) and Mean of Platts of Arab Gulf (MOPAG) respectively. MOPAG fluctuates on a daily basis based on geo-political events, crude prices, prevalent naphtha demand and supply conditions, freight market between Japan-Singapore-Arabian Gulf, refinery operations, and demand of other refined products affecting the refinery product mix.

The benchmark MOPAG fluctuates with the movement in crude oil prices, the supply and demand of various petroleum products, and the freight market in Asia. Also, it is particularly influenced by Japan. This means that naphtha prices or Platts-linked MOPAG fluctuate also due to movement in other refined products out of crude like LPG, kerosene, diesel, and so forth. The volatility of each product may vary, but it does have an impact on the naphtha prices. Hence, it is essential to correctly assess movement in MOPAG prices by demand and supply of naphtha along with other petroleum products.

However, the polymer market does not follow the same economics as the naphtha market. A rise in naphtha price may not result in a corresponding rise in end product prices. This may result in the use of high cost raw materials inventory but low realization from the end products market.

**Timing risk.** It has been observed that, in case of HPL, the total procurement time is approximately 90 days. From receipt of materials to finished products, there is a gap of another 40 to 45 days (see Figure 3) considering storage, production cycle, and realization from finished product sale. While more than 50% of HPL'S products are linked to the polyolefin market, the same, in turn, is linked to the economic scenario, not only in the home markets but also in the regional and global markets. Although, the domestic market accounts for more than 80% of polyolefin production, the prices are governed by movement in benchmark Platts, which in turn moves with supply and demand in the region and in developed economies, being the largest consumer of plastic processed goods.

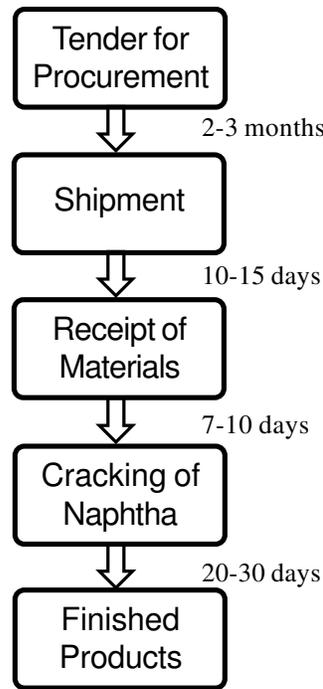
The risks associated with this time gap are shown in Figure 4

### **Other Risks**

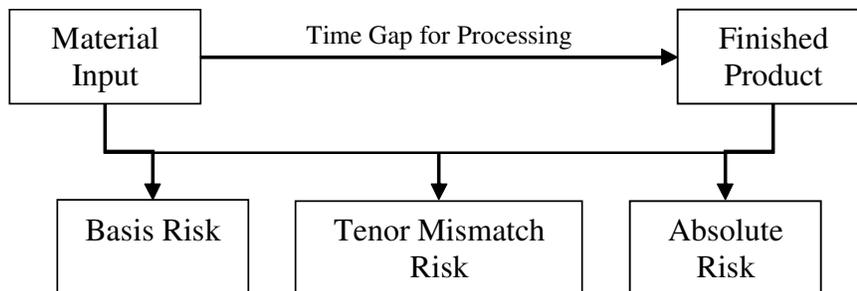
**Tenor mismatch risk.** The tenor of an exposure is the period from exposure recognition to exposure settlement. If the tenor of the underlying exposure does not match the tenor of the hedge, the hedge may need to be rolled-over or an early delivery may need to be effected to match the hedge with the underlying exposure. Alternatively, the hedge and exposure may be settled separately and each shall be exposed to currency fluctuation for the residual maturity (i.e., the mismatch period).

**Absolute risk.** Absolute risk arises from the fact that there does not exist a perfect correlation between the input and output prices. The difference in prices of the inputs and the finished products can be attributed to several factors.

**Currency risk.** Another important risk is currency risk. It can be defined in terms of volatile



**Figure 3.** Time Gap from Receipts of Material to Finished Products



**Figure 4.** Timing Risks in HPL

and sporadic product prices in global markets and fluctuating currency rates, which affects company cash flows. HPL’s currency risk profile is demonstrated in Table 1.

Table 1 shows that HPL procures maximum feedstock from the international market. These transactions expose the company to commodity risks (fluctuations in crude prices) as well as currency risks (fluctuations in exchange rates).

**Foreign Exchange Risk**

Foreign exchange risk may be defined as the risk of adverse movement in foreign currency vis-à-vis the Indian rupee (INR). Foreign exchange risk in HPL arises primarily as a result of: (1) the import of raw materials; (2) the import of capital equipment; (3) the export of polymers and chemicals; (4) availing of loans denominated in foreign currency, which may include external

**Table 1**  
*HPL's Currency Risk Profile*

	2003-04	%	2004-05	%	2005-06	%
<b>Raw materials</b>						
Import	14,017	64	23,612	73	29,780	74
Indigenous	7,966	36	8,878	27	10,345	26
<b>Total</b>	<b>21,983</b>	<b>100</b>	<b>32,490</b>	<b>100</b>	<b>40,125</b>	<b>100</b>
<b>Chemicals and Catalysts</b>						
Import	1,116	57	1,252	59	952	50
Indigenous	847	43	857	41	965	50
<b>Total</b>	<b>1,963</b>	<b>100</b>	<b>2,109</b>	<b>100</b>	<b>1,917</b>	<b>100</b>

commercial borrowings (ECBs), foreign currency term loans, packing credit in foreign currency (PCFC), foreign currency nonresident (FCNR (B)) borrowings, pre-shipment credit, supplier's line of credit, and buyer's line of credit; and (5) other miscellaneous inflow or outflow in foreign currency.

In HPL, procurement of naphtha from domestic refiners is based on import parity price, which is based on the average of the RBI reference rate for the last 15 days. Accordingly, the domestic purchases of naphtha would also expose the company to foreign exchange risk. However, as the invoicing of such exposures is in INR terms, such exposures do not qualify for hedging.

**Foreign exchange exposure recognition.** In HPL, the process of foreign exchange exposure recognition starts with budgeting of exposure; in this case:

1. Foreign exchange exposures on account of imports, exports, and foreign currency loans are required to be recognized at the time of preparing the annual budgets. Such exposures may be termed as tentative exposures.
2. Tentative exposures may be revised when budgets are reviewed and revised.
3. The exposure horizon (the period for which exposures are estimated) for tentative exposure has to be one year. Hedge horizon (the time from inception of a hedge til its maturity) should be less than or equal to exposure horizon. Hedges having a horizon of more than one year can be taken only after taking the approval of Foreign Exchange Risk Management Committee (FRMC).

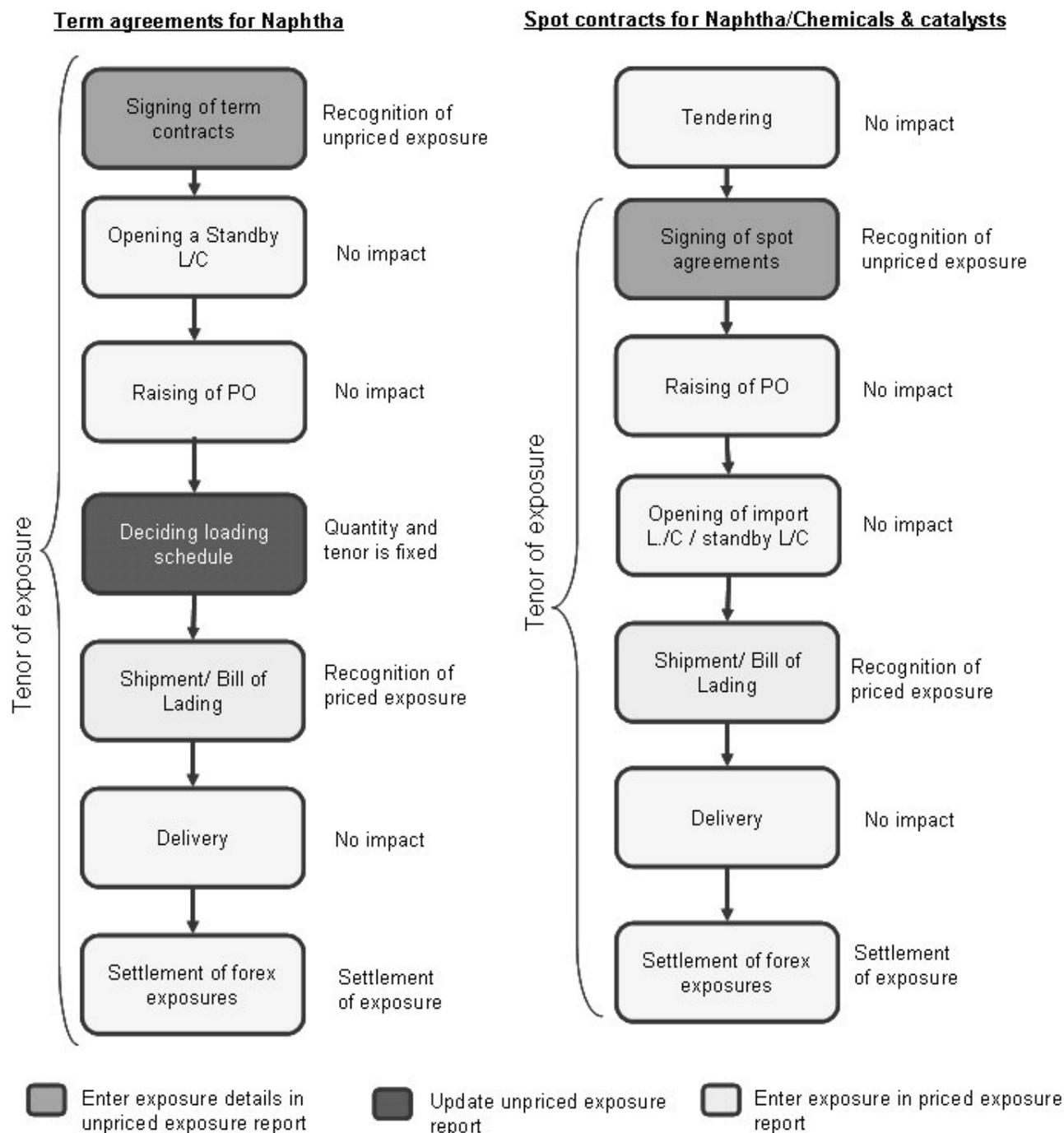
**Exposure recognition for imports.** In the case of HPL, the process of exposure recognition for imports (also illustrated in Figure 5) is as follows:

1. **Tendering.** The company invites bids for supply of naphtha. This is applicable only in case of spot contracts. An exposure should not be recognized at the time of inviting bids.
2. **Signing of term contracts/spot agreements.** An unpriced exposure may be recognized at the time of entering into such agreements. However, the value and tenor of exposures can only be estimated at this stage as the price and loading schedule are not fixed at this stage.
3. **Raising purchase order (PO).** In case of purchase of chemicals and catalysts, exposure is required to be recognized at the time of raising PO. Such an exposure may be termed as a priced exposure. Raising POs for naphtha procurement does not have an impact on exposure recognition.
4. **Opening of import L/C.** Opening of import L/C or standby letter of credit does not have any impact on exposure recognition.
5. **Deciding the loading schedule.** In case of procurement of naphtha, the parcel size (quantity) and tenor of exposures are fixed at the time of deciding the loading schedule. However, the pricing may not be finalized.
6. **Shipment date/Date of Bill of Lading (B/L).** In case of procurement of naphtha, pricing is finalized on the shipment date or within seven days from the shipment date. Accordingly, a priced exposure may be recognized on such date. Usance period would also commence from the shipment date.
7. **Delivery.** The date of taking physical delivery would not have any impact on exposure recognition.
8. **Settlement of foreign exchange exposure.** Foreign exchange exposure would be considered as settled when the actual payment is made in foreign currency. In case where an L/C has been opened against the specific shipment (this excludes standby L/C arrangements), the exposure is said to be settled when, in addition to making the actual payment, the L/C is retired.
 

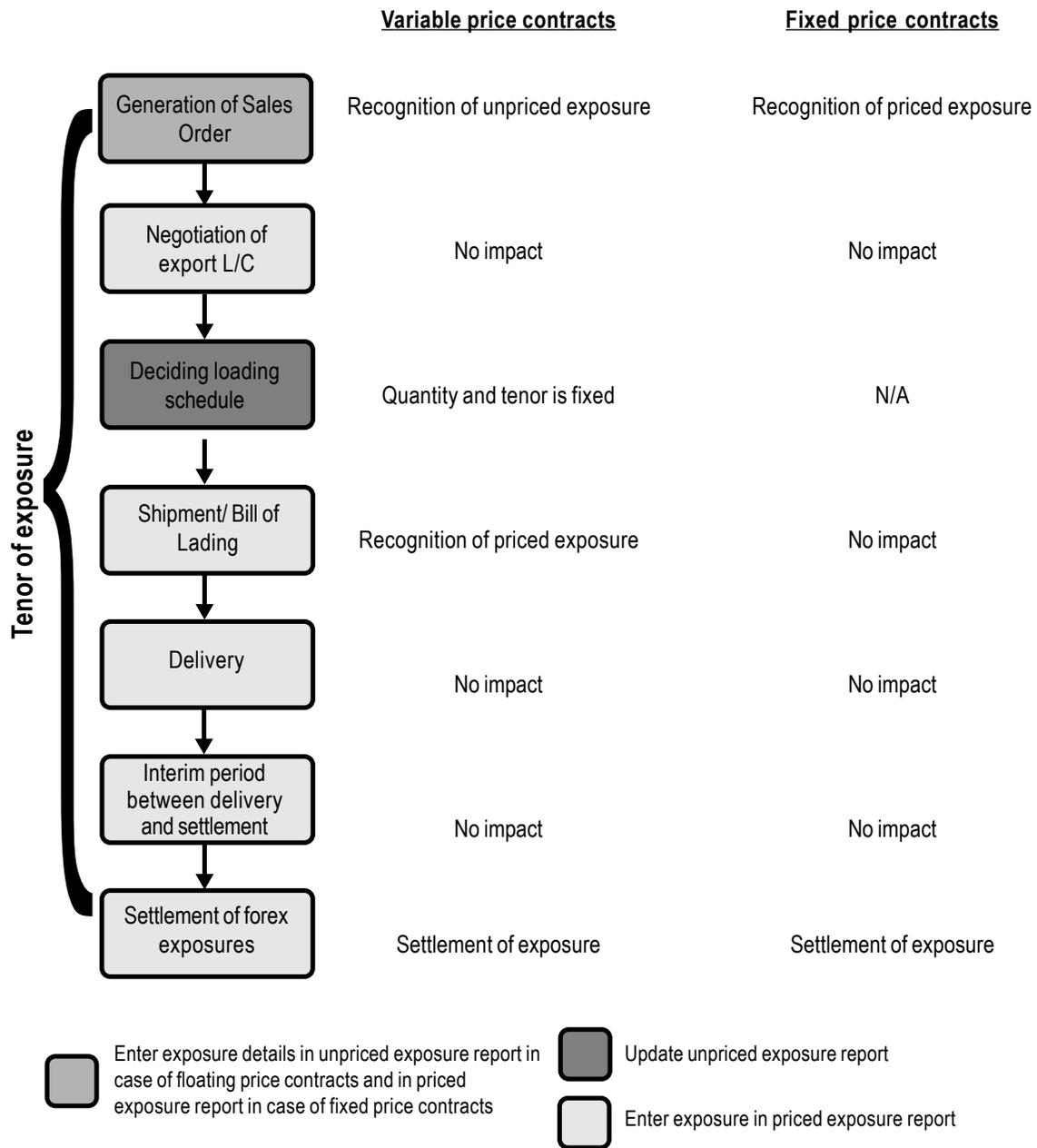
At the time of recognition of an unpriced exposure, details will be entered into the unpriced exposure report by the back office (BO) for the use of the front office (FO). When the loading schedule is fixed for term contracts, the Procurement Department will communicate the details to the BO, which will update the unpriced exposure report. The BO will prepare a priced exposure report and send it to the FO at the time of pricing.

**Exposure recognition for exports.** On the other hand, the process of exposure recognition for exports (also illustrated in Figure 6) is as follows:

  1. **Generation of sales order.** This is the exposure recognition stage for the export of polymers and chemicals. At this stage, the priced exposure is recognized in case of fixed price contracts, and unpriced exposure is recognized in case of variable price contracts.
  2. **Negotiation of export L/C.** Negotiation of export L/C does not have any impact on exposure recognition.
  3. **Deciding the loading schedule.** In case of variable price contracts, the parcel size (quantity) and tenor of exposures are fixed at the time of receiving shipping instruction. However, the pricing may not be finalized.



**Figure 5. Process of Recognition of Import Exposures**



Adopted from the foreign policy followed by HPL with their permission.

**Figure 6. Process of Recognition of Export Exposures**

4. **Shipment date/Date of Bill of Lading (B/L).** In case of variable price contracts, pricing is finalized on the shipment date or within seven days from the shipment date. Accordingly, a priced exposure may be recognized on such date. Usance period would also commence from the shipment date.
5. **Delivery.** The date of transferring the output to the buyer would not have any impact on exposure recognition.
6. **Settlement of foreign exchange exposure.** foreign exchange exposure would be considered as crystallized or settled when funds are credited in the designated bank account.

Figure 7, meanwhile, shows the process of recognizing new transactions.

**Analysis of foreign exchange exposure.** It is also necessary to analyze the foreign exposure. HPL follows three steps:

1. **Quantification of foreign exchange exposures.** All foreign exchange exposures are recognized in foreign currency terms as well as in INR terms. The exchange rate to be applied while determining the INR value of the exposure is the rate prevailing at the time of exposure recognition.
2. **Bucketing.** Once the exposures are recognized they are required to be bucketed in the 1<sup>st</sup> to the 15<sup>th</sup> of the month and in the 16<sup>th</sup> and the 31<sup>st</sup> of the month. (This bucketing procedure is being followed by HPL. It is not a standardized procedure. Other organization may have their separate time frame for bucketing.) The receivable and payable exposures in the time buckets may be aggregated to arrive at the net receivable and payable position.

3. **Netting.** After bucketing, the exposures in the time buckets are to be netted to arrive at the net foreign exchange exposure position in each time bucket. Net exposures will serve as a decision support tool for undertaking hedging activities. It may be clarified that hedging may be undertaken to hedge gross exposures or net exposures.

### **Exposure Management**

After the identification and analysis of the exposures, it is important to manage these foreign exposures. For proper exposure management, it is necessary to consider the exposures for hedging by the FED as soon as they have been reported, using the authorized instruments/strategies. In the case of HPL, the FED will be responsible for understanding all major foreign exchange risks faced by HPL and will keep the Procurement and Marketing Department advised on the implications of their purchasing and selling policies. (These information were collected from HPL's foreign exchange risk management policy.) At the same time, the FED will manage only those committed and tentative foreign exchange exposures the Procurement and Marketing Department or persons in the Finance Department have informed them of (actual or likely quantum of receivables or payables, tenor, liquidity position, embedded investment options, and other important details). Total exposures including hedges shall not exceed the business plan. In case of any excesses, the same shall be reported to FRMC at its next meeting.

Exposure management is an essential part of business and should be viewed with objectivity. It is neither a license to print money nor is it a cause for getting trapped in a fear psychosis, and should be viewed with the same clarity of vision as, say, production or marketing is viewed.

Cash flows (e.g., contracted foreign currency cash flows, foreign interest rates whether floating or fixed, cash flows from hedge transactions, and projected/contingent cash flows) and transactions, both capital and revenue in nature (like interest payments and receipts and open hedge transactions), could be considered for the purpose

of exposure management. In the cash flows mentioned, the prescribed limit in value will be brought to the notice of the Exposure Manager, as soon as they are projected. It is the responsibility of the Exposure Manager to ensure that he receives the requisite information on exposures from various sections of the company in time.

### ***Risk Measurement***

The company will undertake hedging activities to control foreign exchange risk. It is necessary to monitor the performance and measure the effectiveness of its hedging strategies. There are various techniques that can be used to measure the risk that HPL faces on its hedged and unhedged positions on a continuous basis.

Mark-to-market denotes the task of undertaking valuation of risk exposures, both unhedged and hedged, based on current prices for quantification of gain/loss positions as compared to the accepted benchmark rate. Mark-to-market of exposures is conducted only for unhedged exposures. HPL may decide to keep certain exposures open or not hedge them. It may be noted that exposures that are earmarked for netting are also unhedged exposures. Exposures that are earmarked for netting should be marked-to-market separately from exposures that are kept unhedged. This will enable measurement of risk within the defined netting time bucket. (These are adopted from the foreign exchange risk management policy of HPL with their permission.)

***Mark-to-market of exposures earmarked for netting.*** Receivable and payable exposures that are earmarked for netting should be treated separately for the purpose of mark-to-market. The exposures should be marked to market based on the prevailing forward rate for the specific date of maturity of the exposure.

In cases where the exact date is not available, mark-to-market should be conducted based on the estimated date. In any case, such a date should be specific and not a range of dates. It may be noted that mark to market should be conducted for two benchmarks, namely the booking rate and the

prevailing forward rate at the time of exposure recognition.

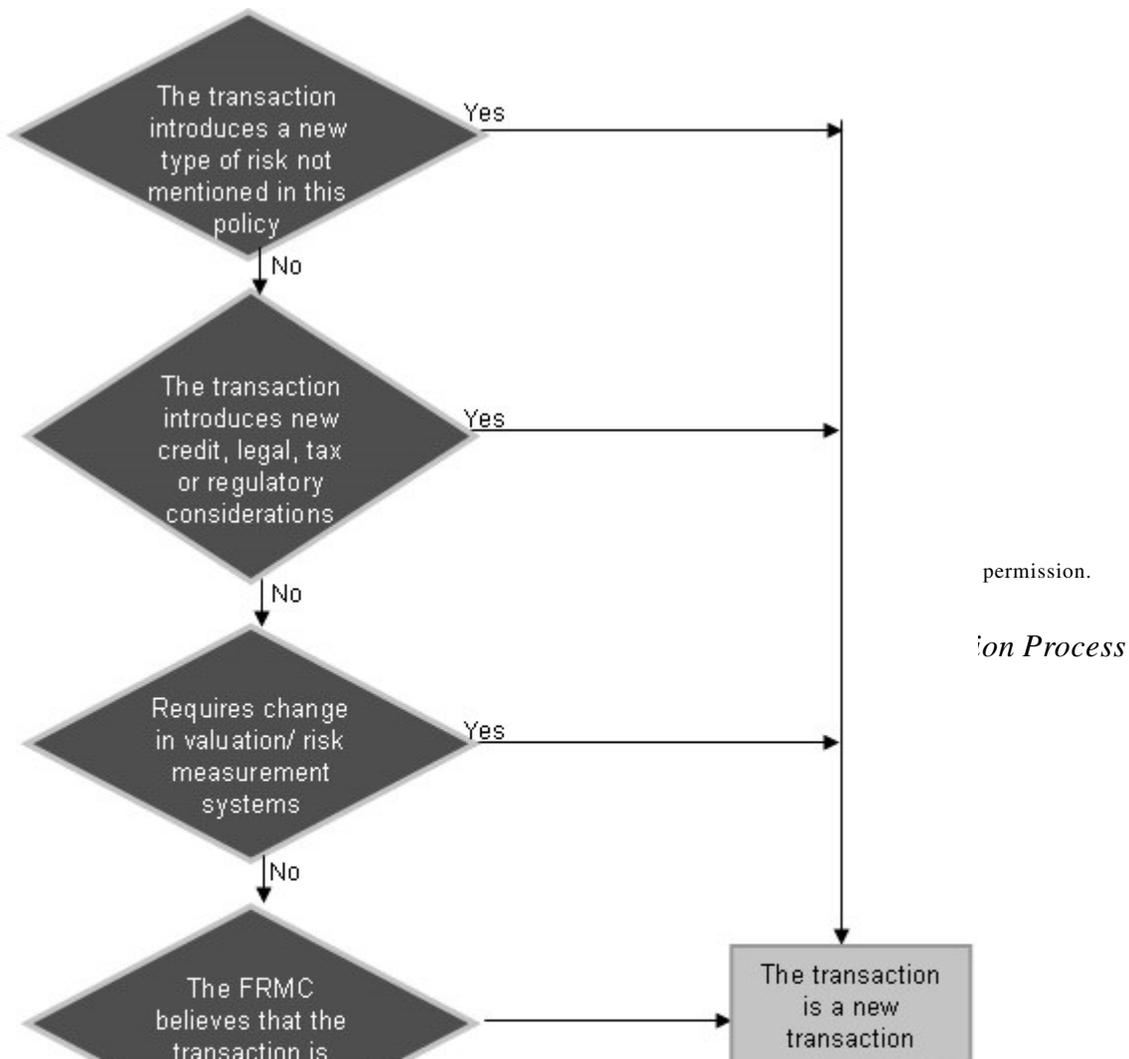
Accordingly, two separate mark-to-market figures will be arrived at. The first value of mark-to-market is the difference between the rate of booking the exposure and the forward rate for the residual maturity of the exposure at the time of conducting such mark-to-market. The second value of mark-to-market is the difference between the forward rate prevailing at the time of exposure recognition and the forward rate for the residual maturity at the time of conducting such mark-to-market.

In cases where the forward rate is not available for the specific date, the forward rate should be arrived at by interpolation of the rates for the nearest two available dates on either side of the date of maturity of the exposure. Such interpolation may be conducted in the following manner. For example: The date of maturity of the exposure is March 10, 2005. Forward rates are available for March 7, 2005 and March 12, 2005 and are 44.50 and 44.54 respectively. The forward rate for the purpose of mark-to-market is calculated as follows:

$$\frac{(2 * 44.50) + (3 * 44.54)}{5} = 44.524$$

where “3” represents the number of days between March 7 and March 10 and “2” represents the number of days between March 10 and March 12. “5” is the sum of the difference of the days (i.e., 2 + 3). Market information systems should be referred to for obtaining quotes.

***Mark-to-market of exposures other than those earmarked for netting.*** Mark-to-market of exposures other than those earmarked for mark-to-market should also be conducted in the same manner as those earmarked for the netting. However, it is important to mark-to-market these exposures separately to understand the risk of netting separately from the risk of leaving exposures unhedged. Exposures that are hedged should be marked-to-market separately from exposures that



are unhedged. This is important to ascertain the extent of risk after hedging. Like mark-to-market of exposures, mark-to-market of hedges and exposures should also be conducted against separate benchmarks namely the booking rate and the prevailing forward rate at the time of recognizing the exposure.

The first step in the mark-to-market of exposures is to mark-to-market exposures in the same manner as specified above. The second step is the mark-to-market hedges. Hedges should be marked-to-market based on the worst cancellation rate provided by at least three authorized dealers. In case the market information system displays a worse rate than the one provided by authorized dealers, the rate provided by the market information systems should be used.

The profit/loss from mark-to-market on each hedge should be aggregated with the profit/loss from mark-to-market of each exposure to arrive at the net profit/loss from mark-to-market. It is important to mark-to-market hedges and exposures separately and then aggregate them as hedges and underlying exposures may have a maturity mismatch.

### ***Risk Controlling Measures***

It has been observed that the volatility in naphtha prices may lead to erosion of operating margins. Hence the risk management program of HPL would aim to hedge the risk of naphtha price fluctuation in order to stabilize cash flows and prevent margin erosion. This would result in better planning and cash management and in reduction of differences between budgeted and actual performance.

Hedging can be of two types: long hedge and short hedge. A long futures hedge is appropriate when you know you will purchase an asset in the future and want to lock in the price. A short futures hedge is appropriate when you know you will sell an asset in the future and want to lock in the price. HPL will use all hedging techniques available to it, as per need and requirement. In this regard, it will pass a board resolution authorizing the use of the following: (1) rupee-foreign currency forward contracts; (2) cross-currency forward contracts;

(3) currency swaps; (4) interest rate swaps; (5) currency options; (6) interest rate options; and (7) others as may be required.

Hedging activities may be undertaken only against approved strategies. Thus, every hedging transaction should be identifiable to an approved strategy. Hedges will be permitted against actual exposures for the current year. The maturity of the hedge should not exceed the maturity of the actual underlying exposure. HPL may book forward contracts on the basis of a declaration of an exposure and based on past performance up to the average of the previous three financial years' (April to March) actual import/export turnover or the previous year's actual import/export turnover.

Contracts booked in excess of 25% of the eligible limit in case when the contracts are booked on the basis of past year's performance shall be earmarked for delivery and cannot be cancelled. For all contracts booked in excess of 50% of the eligible limit when contracts are booked on the basis of past performance, a certificate of Chartered Accountant shall be included in the specified format. When contracts are booked on the basis of past performance, the amount of overdue bills should not be in excess of 10%.

***Underlying principle of hedging.*** It is to be kept in mind that if management fails to reduce total risk by hedging, shareholder value may be eroded. On the other hand, a successful hedging program may increase shareholder value by reducing costs related to different market imperfections. As such, (1) every hedge should be backed by a deal note; (2) the deal rationale should be documented as part of the deal notes; (3) the hedging rationale should be in line with the risk vision and the objectives mentioned in the company's foreign exchange risk management policy; (4) the FRMC may review the hedging rationale for all or for specific transactions; and (5) the hedging transaction should not, in any manner, enhance the risk profile of HPL.

***Hedging ratio.*** The hedge ratio is a measure of the extent to which HPL will undertake hedging

activities. It may be defined as the total hedge positions to be undertaken as a percentage of the total outstanding exposures. Hedge ratios may be computed separately for tentative, unpriced, and priced exposures.

The hedge ratio may be segregated into core covers and non-core covers. Core covers can be understood as the minimum percentage to which the company must hedge. It refers to the minimum hedge ratio. Core covers will be applicable only for priced exposures. Core covers should be decided by the FRMC and reviewed on a quarterly basis as part of the quarterly review meetings. Non-core covers, on the other hand, refer to hedges over and above the core covers.

Apart from these controlling measures, the Treasury Department of HPL can also use the following authorized instruments to control their risks: (1) spot, cash spot, and tom; (2) forwards; (3) plain vanilla currency option; (4) zero cost options and collars; and (5) currency swaps. Appendix A discusses the characteristics, costs, objective, and risks involved for each of the instruments.

## CONCLUSION AND RECOMMENDATION

The following insights can be observed from this study, taking Haldia Petrochemical Ltd. as a model for the petrochemicals sector:

1. Organizations that have businesses that trade or have operations overseas are likely to be exposed to foreign exchange risk arising from volatility in the currency markets. Following which, it can be safely deciphered that for many businesses, the impact of exchange rate volatility can be significant.
2. It can be seen that the commodity markets worldwide have exhibited high volatility in the recent past exposing corporations in almost all segments to high price risk. However, in India, only a few large corporations have well-defined risk mitigation strategies with respect to their various commodity and foreign exchange exposures, executed by their respective treasury.
3. It is observed that Haldia Petrochemical Ltd. is exposed to three types of currency risks: translation, transaction, and economic exposures. It is to be noted that translation and transaction exposures are basically accounting concepts whereas economic exposure is a managerial concept. HPL is currently recognizing only translation and transaction exposures for risk management purposes, but the nature of business HPL is into demands it to recognize economic exposures as well.

There is a risk management policy in Haldia Petrochemicals Ltd., and if it is studied, a lot of sense in the theories can be observed. The only thing is to put the theory into practice in a more effective way. As observed, the following points may be considered by the organization in the process of their risk management.

1. **Enterprise-wide risk management system.** Implementing an enterprise-wide risk management system will be a progressive step for Haldia Petrochemicals Ltd. Under this process, there will be a risk management committee, headed by the Chief Financial Officer (CFO), on which all the relevant business heads will act as a think tank, investigating the notion of strategic risks.
2. **Set up a centralized risk management division.** The next step is to set up a centralized risk management division with the power to control risk at the group level, and whose main function will be to recognize strategic risk management and hedging opportunities at the group level. Broadly speaking, it will focus on its commodity and financial risk exposures. In commodities, Haldia Petrochemicals Ltd. should be concerned about price risk

correlations between all its principal products (naphtha, butane, propane, propylene, ethylene, polyethylene, polypropylene, methanol, and dry gas). In the financial markets, the firm has exposures to a range of currencies (including the Deutschmark, the Swedish krona, the Danish krone, the British sterling, and the U.S. dollar) as well as interest rate risk exposure on debt denominated in U.S. Dollar Libor and Deutschmark Libor.

3. ***Developing a risk model.*** Haldia Petrochemical Ltd. may start developing a risk model by aggregating historical monthly prices for all of its commodities, interest, and exchange rate exposures over the previous 15 years. Having gathered the information, correlations will soon emerge and form the foundation for a risk model.
4. ***Constant currency approach.*** The corporation needs to limit its exposures to a few currencies. The currencies that are showing less volatility may be selected. Though, practically, this option may not be a feasible one.
5. ***Derivative trading.*** The management of Haldia Petrochemicals Ltd. should only focus on forward contracts and swaps rather than going for other exotic options or sophisticated derivative instruments due to the following reasons: (i) being a manufacturing firm, there is a major concern of delivery of receipts and payments with time lag, which is not taken care of by other derivative instruments except forward contracts, which is generally an over-the-counter deal and delivery is to some extent compulsory; and (ii) cost benefit in terms of forward contracts as no premium or margin account is being paid or kept.
6. ***Loan Structure.*** The loan structure of the organization should be in such a way that

the exporting firm can reap benefits out of medium-term foreign exchange loans like external commercial borrowings in all capital structure rather than facing risks associated with long-term and short-term capital structure.

7. ***Customization of standards.*** As Haldia Petrochemicals Ltd. does benchmarking, it has been observed that there is a trend of results not matching these benchmarks. Moreover the difference is not negligible, rather really significant. This difference arises because of the lack of a scientific approach as well as realistic information. So benchmarks should be realistic with more scientific methods and need to be customized for every type of transaction.

Actual execution will be a simplified process once a centralized risk management function is in place, identifying Haldia Petrochemicals Ltd.'s economic targets for the year and focusing on the most efficient hedging strategies based on their new risk model.

During our interaction with Haldia Petrochemicals Ltd., it was observed that the basic philosophy of the company focuses on the strategic risk management down the value chain. The organization should not be interested in speculative trading at the group level, but rather, they should only try to position themselves so that they can predict and manage their market risk exposures towards a long-term goal.

However, hedging out large exposures on an infrequent basis can present liquidity problems. Nevertheless, market liquidity still varies dramatically from commodity to commodity. For example, while the crude oil market is quite liquid and options are easily available, the opposite is true for petrochemical products. This influences strategic risk management trading decisions significantly. Investigating the price correlation between different types of petrochemical products is necessary and if the organization is unable to hedge out an illiquid petrochemical price risk exposure, they may be able to proxy hedge using

a derivative on a more liquid asset, such as crude oil. This is where I think the organization should concentrate their risk management efforts going forward.

To conclude, it must be said, that petrochemical products can be an important trendsetter for energy products as a whole. It is important to clarify, though, that the most common strategies used in crude oil hedging can also be applied to other energy products as the specifics of various derivative instruments are often similar or even identical. This is the reason why companies worldwide are applying the same strategies to the hedging of price risks of gasoline, diesel, crude oil, heating oil, jet fuel, and other similar products.

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## Appendix A

### Characteristics, Objective, Cost, and Risks involved Risk Controlling Instruments

Instrument	Characteristics	Objective	Cost	Risks
<b>Forward rate agreements</b>	An over-the-counter contract that determines the rate of interest or currency exchange rate to be paid or received on an obligation beginning at some future start date. The rate at which the contract is undertaken is based on the future market view	It acts as a hedge against adverse movement in interest or currency rate. It brings certainty into the amount of future cash flows	There is no real cost of a forward agreement apart from booking of notional profit or loss on the position being marked to market on a periodic basis	Future exchange rate or interest rate may turn out to be contrary to expectations resulting in sub-optimal cash flows. The buyer has an obligation to settle the contract at pre-determined rate even though the market rates might be more favorable
<b>Plain vanilla currency options</b>	The buyer of the option gets a right to exercise the contract if the future market rate is less favorable on the specified future date (in case of European options) or during the tenure of the option (in case of American option)	It acts as a hedge to protect the buyer's downside risk in case of an adverse market move while at the same time, retaining the upside potential in case the rates are favorable	Option premium has to be paid by the buyer of the option to the seller of the option. The quantum of premium varies as per time to maturity and current rates	There is a risk that the option might be out of the money and not be exercised at all resulting in a loss of premium which is paid upfront
<b>Interest rate &amp; exchange rate caps</b>	A cap is an upper limit beyond which rates may not rise.	The buyer of a cap protects himself from any adverse movement in rates over and above the cap rate	The Buyer pays an upfront premium to the option writer based on the level of the cap compared to current market rates, height of the ceiling and the option tenure	There is a risk that the rates may not rise above the cap level leading to the option staying out of money and not being exercised at all
<b>Zero Cost Options/ Collars</b>	A zero cost collar entails purchasing a cap and selling a floor. In case of options, it can be buying a put and selling a call (or vice-versa). It limits the downside risk in turn for sacrificing the upside potential. Thus, the returns are limited to a certain band	It reduces the premium cost to zero.		A collar is beneficial only if the rates move within a certain anticipated band. In case of wide rate swings, there can be substantial losses
<b>Currency swaps</b>	A swap that involves the exchange of principal and interest in one currency for the same in another currency	To gain from exchange rate depreciation or lower interest rate cost of the currency into which the loan has been swapped		If the currency into which the loan was swapped appreciates significantly and/or interest rates harden, the corporate would stand to lose significantly
<b>Interest rate swaps</b>	An agreement between two parties where one stream of future interest payments is exchanged for another based on a specified principal amount. Interest rate swaps often exchange a fixed payment for a floating payment that is linked to an interest rate (most often the LIBOR)	Manage and limit interest rate exposure and benefit from interest rate movements based on a view taken on the market		There is a risk that interest rates move contrary to expectations leading to excess outflows