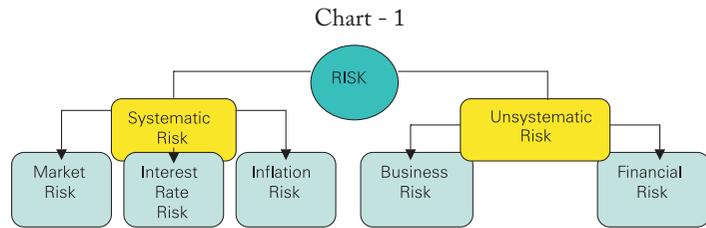


Risk Engineering

Risk Engineering refers to unanticipated changes attributed to company's assets, liabilities and operating income. Any business decision has got two fundamental parameters – 'Risk' and Return. Risk Engineering deals with establishing a trade off between these two parameters so as to maximise shareholders' wealth.



now no longer be merely a management concept, which the management applies inter

The SOX goes much deeper than just the accuracy of financial projections; it touches on many areas that affect project management. It is not too late to have the waves of Sarbanes-Oxley Act being multiplied in Indian Business World.

“Risk Engineering is like ‘Going Back To The Future’. It’s not about conquering the future but managing the future by taking suitable actions in present.

Change is something, which is permanent; in this change uncertainty is something, which is certain; in this uncertainty Risk Engineering is a measure for survival, prevention, growth, expansion and value addition”.

The rationale is – Survival of the Fittest.

Business Risk

There are many and diversified operational risks inherent in every business. Few Risk Hedging Tools available have been discerned as under.

Standard Deviation (d) and Coefficient of Variation:

These are statistical measures used to quantify risk. It measures the variance from estimations and budgets in respect of production, cost and expenses. Standard Deviation is an absolute measure while Coefficient of Variation is a relative model. It is expressed in the same units as the range

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The only thing certain in these changing times is ‘uncertainty’ and a ‘Risk’ is basically linked to such uncertainties. Although the future and risk cannot be predicted 100 per cent, still ‘precaution is always better than cure’. And the way we manage and mitigate such risks is broadly called ‘Risk Engineering’. Risk Engineering is an ‘Art’ and not ‘Science’. There is no specific, defined, well-delineated or scientific way by which risk can be engineered. It can be said that Risk Engineering is ‘Scientific Art’ or ‘Artistic Science’. Read on to take a peek into the depths of the concept.

Today, every business is exposed to some or the other risk, which affects its profitability and cash-flows. Any business cannot be fully safeguarded against the uncertainties of future, but it can certainly take steps to reasonably hedge itself from future risks.

Risk refers to degree of variability of actual returns from expected returns associated with given assets/investments. The future is uncertain but still scientific projections are made to prepare for the same. One thing that is sure is that risk can seldom be eliminated. With lucrative measures being taken it can only be managed and engineered so as to mitigate its effects on the business.

Risk can broadly be categorised in as Chart - 1.

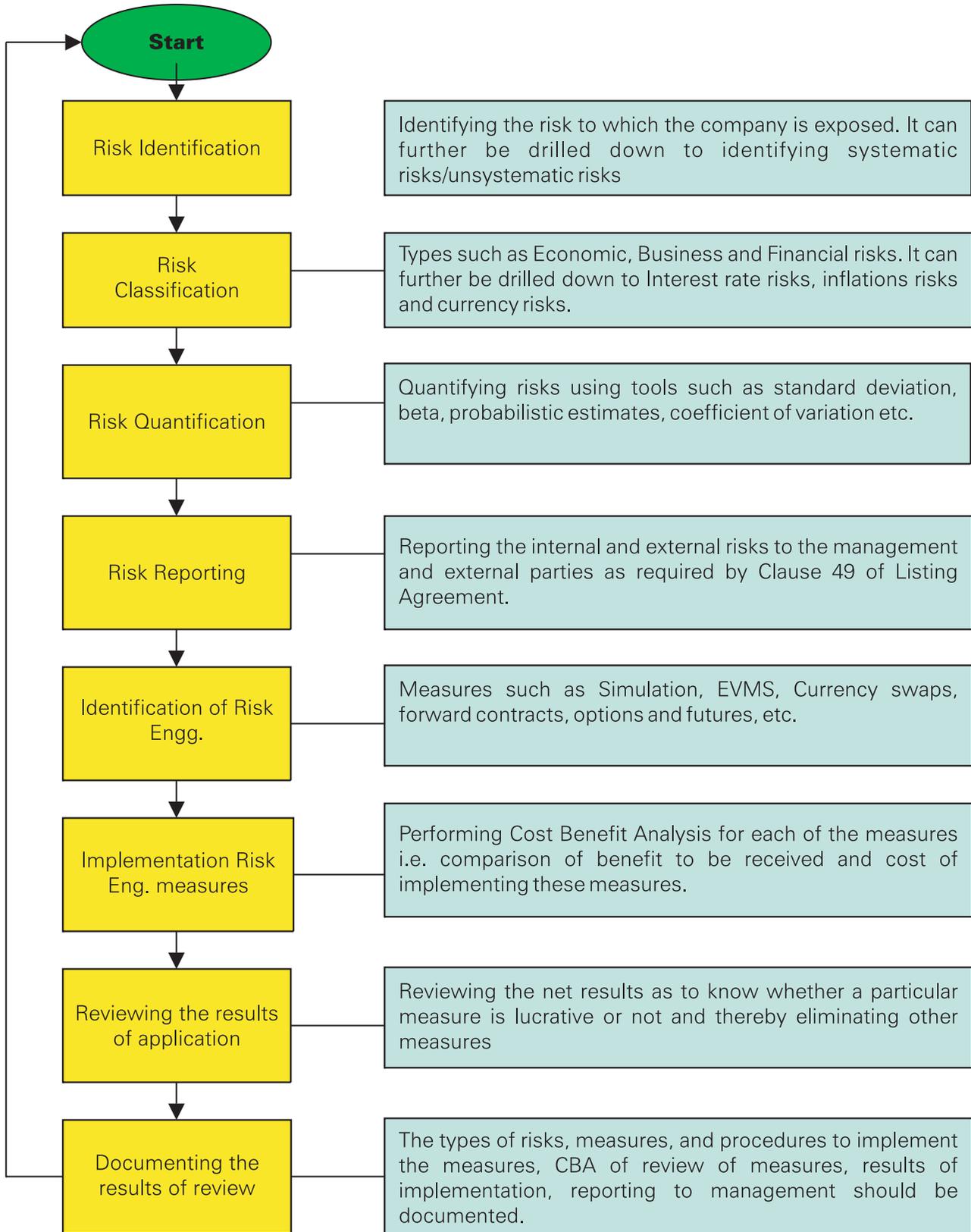
Giving Statutory Colours to Risk Engineering

Risk Engineering will

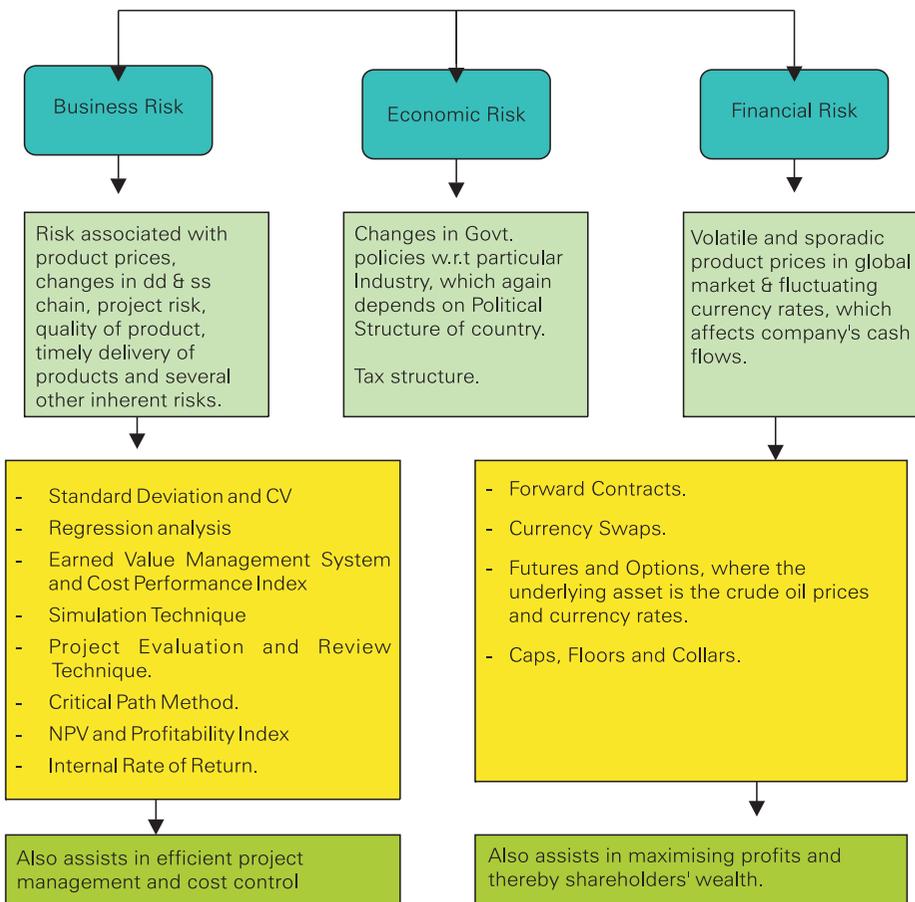
nally for purpose of mitigating its exposure to Risk. For Instance Clause 49 of the Listing Agreement has been amended wherein the corporates are now required to provide in the report on Corporate Governance, the Risk Management and Risk Mitigation Policies adopted by the management.

The new buzz in US economy is that – Is Poor Project Management a Crime? The answer could be ‘yes’ since now the Sarbanes-Oxley Act makes senior executives criminally liable for not making reasonable and sufficient endeavours to identify risks their business is exposed and taking measures to mitigate such risks. In the wake of several accounting scandals the US Congress passed a law, referred to as the Sarbanes-Oxley Act of 2002 (SOX), which holds CEOs and CFOs criminally liable for relating fraud to shareholders.

RISK ENGINEERING WEB



RISK PROFILE



of probable outcomes is expressed i.e. if you are applying the to evaluate per cent returns in a project, is expressed in per centage terms. It doesn't directly hedge business risks but provides value added information to the decision makers enabling them to make sound decisions and thereby preclude the adversity of any risks.

Regression Analysis: This is also a statistical tool, which provides a Decision Making Model thereby enabling the decision maker to take sound decisions. It is based on analysis of past trend and data. This decision-making model assists in making accurate future projections and predictions.

For Instance - Based on past trend in the net profit of the company, a statistical model can be developed

wherein just by feeding few figures a rough estimate can be made of net profit for any future period(s).

The use of Regression Analysis is exemplified as under: -

$$\sum x=0, \sum xy=87, \sum x^2=70, \sum y=9, n=6.$$

Rs. In Crores.				
Year	Profit	Weights		
	y	x	xy	x ²
1999-00	(5)	(5)	25	25
2000-01	(3)	(3)	9	9
2001-02	1	(1)	(1)	1
2002-03	4	1	4	1
2003-04	5	3	15	9
2004-05	7	5	35	25
Σ	9	-	87	70

Substituting the above values in following equations.

$$Y = mx + c.$$

$$\sum y = m \cdot \sum x + n \cdot c$$

$\sum xy = n \cdot \sum x^2 + c \cdot \sum x$, we get

$$y = 1.243x + 0.666.$$

Thus, profit for year 2005-06 with weight (x) of 7 should be 9.37 crore and profit for year 2006-07 with weight (x) of 9 should be 11.85.

This tool can be extremely useful in projections of future parameters and then comparing the actual results with the projections. However, the basic requirement for this tool is that the variable (profit in this case) should follow an increasing or decreasing trend.

Earned Value Management & Cost Performance Index: This is statistical technique used mainly to gauge performance of the company on the basis of budgeted performance. The significance of this technique in project management and risk hedging is exemplified using following example.

For Instance - The budgeted & actual data are as under: -

Prima Facie the above catalogued figures manifests that the expenditure is within the limits and the company has performed according to planned estimates. But the

Particulars	Budgeted Amount	Actual Amount
Exploration	100 crore	85 crore
Development	120 crore	95 crore
Total	220 crore	180 crore

budgeted amount is for the entire project i.e. 100 per cent completion whereas the actual completion is say, only 75 per cent. Hence, the actual comparison should be as under.

Particulars	Budgeted Amount (75 per cent)	Actual Amount
Exploration	75 crore	85 crore
Development	90 crore	95 crore
Total	165 crore	180 crore

The realistic figures as juxtaposed above show that the expenditure has in fact exceeded the budgeted figures and the company has not performed as per planned estimates. Thus, the calculations of the management can go wrong if the decisions are taken based on the first table.

In the above table, Rs. 165 crore is called Earned Value out of Rs. 220 crore of the budgeted figures.

Cumulative Earned Value/Cumulative Budgeted Amount i.e. $165/220 = 0.75$ is called Cost Performance Index. CPI below one is an indicator of unfavourable performance. It means that for every rupee spent by the company the company achieves value worth Rs. 0.75. CPI above one is desirable.

Balance budgeted amount i.e. Rs. 55 (220-165) divided by CPI i.e. 0.75 gives the balance expenditure which should be incurred if the current performance is assumed to continue in future as well. Thus, the further expenditure should be within overall limits of Rs. 73.333

(55/0.75).

Schedule Performance Index is akin to CPI except that in SPI the formula is *Earned Value for a Schedule Period/Budgeted amount for a Schedule Period*.

It measures performance of project for particular period rather than on cumulative basis.

Cost of Performance Index and Schedule Performance Index are based on the concept of 'Management By Exception'. Management

has to focus on only those areas, which do not perform according to planned estimates. For this purpose, CPI & SPI needs to be calculated for each line of cost and also on overall basis.

Simulation Technique: Simulation is a quantitative technique wherein organised series of trial and error experiments are conducted to predict the future behaviour.

For Instance if probabilistic estimates of Turnover, Net Profit or any other financial parameter are made available, a series of trial and error experiments can be conducted on these estimates and reasonable accuracy can be achieved in making prediction about turnover or net profit or any other financial parameter for the future period(s).

Critical Path Analysis: It is a quantitative technique that allows a comprehensive view of the project. A project usually involves a set of activities or jobs that are performed in certain sequence determined logically or technologically and it has to be completed

within (i) specific time frame (ii) at specified cost and (iii) meeting the performance standards. Critical Path Analysis is one of the most lucrative tool for successful project execution. Its major advantages *interalia* includes

- Comprehensive view of entire project.
- Effective time scheduling.
- Identification of critical activities of any project and continuous focus on it.
- Breaking down of project into different components for better control and vigilance.
- Control based on Principle of Elimination.
- Optimum Resource Allocation.



Project Evaluation & Review Technique [PERT]

Critical Path Analysis is incapable of handling uncertainty in timing, which is an impediment in turnkey projects such as oil exploration. PERT takes care of this uncertainty involved in any project. However, for this, management needs to provide three kinds of probabilistic estimates namely – Optimistic, Pessimistic and Most Likely. In short, PERT is a combination of Probability Distribution and Critical Path Analysis.

Net Present Value & Profitability Index: These are Financial Tools usually used for making appraisal of Capital Budgeting proposals. They help in justifying financial viability of any capital investment based on the cash flows provided over the life of that investment.

Estimation of Future Cash Flows would also aid in compliance with AS-28 ‘Impairment of Assets’ issued by ICAI.

Internal Rate of Return: Internal Rate of Return is again a financial tool used to measure the financial viability of any investment based on the return likely to be generated by it. It is the rate at which present value of future cash outflows is equal to present value of cash outflows. In a way, it is bottom-line rate of return, which every investment should yield in order to be in better off situation.

Financial Risks

This can be again classified into two groups –

- Risk associated with sporadic international product prices.
- Risk associated with

volatile foreign exchange markets.

The measures available to hedge against these risks are common.

Forward Contracts: Forward contracts are contracts to buy or sell foreign currency or crude oil at a specified rate on a specified date. It involves cost in the form of forward premium. This is the most common technique used today across various industries to hedge against financial risks.

This has been exemplified using the following instance.

Say, Company A is to make payment of USD 1 million on 31.03.05. On 01.01.05 it enters into forward contract when the spot rate is 1 USD = Rs. 44.34. The forward rate is 44.50. Thus the contract is at forward premium of 1.44 per cent $[(44.50-44.34)/44.50 \times 100]$.

Company A will have to pay the premium amount of Rs. 14,400 on 01.01.05.

On 31.03.05 A would have to make payment @ 1 USD = Rs. 44.50. Say the spot rate on that date was 1 USD = Rs. 44.55. Thus the net savings of the company would be as under.

Savings [Rs. 44.55 – Rs. 44.50] x 1 million.	Rs. 50,000.
Less: forward premium	Rs. 14,400.
Net Savings	Rs. 35,600.

Currency Swaps: This involves exchange of company’s receivables or payables denominated in foreign currency with any other company’s assets or liabilities denominated in a different foreign currency. It basically involves arbitrating and taking the ad-

vantage of forces of demand and supply in currency market. Currency rates between two countries, which are not theoretically determined but are based on the forces of demand and supply in the international market.

This technique can be more useful in case where a company has its holding or subsidiary in another country with different reporting currency. In that case, both the company can work out on suitable policy w.r.t currency swaps whereby both the companies are benefited and their respective risks are hedged.

The benefit of this engineering tool is exemplified as under: -

Suppose Company A (subsidiary or affiliate) incorporated in India has availed loan of Rs. 44,00,00,000 from State Bank of India and Company B incorporated in Britain (parent) has availed a loan of USD 1,00,00,000 from Bank of America. Both the companies decide to enter in Currency swaps with each other whereby they decide to exchange their respective debts.

Let’s see how currency swap can benefit both of them.

Consider the following rates –

1. 1 USD = Rs. 43.91.
 2. 1 GBP = Rs. 82.88.
 3. 1 GBP = USD 1.88.
- If A had not entered in currency swap, it would have to pay Rs. 44,00,00,000 to SBI.
 - If B had not entered in currency swap, it would have to pay GBP

- 53,19,149 [1,00,00,000 USD / 1.88].
- After entering into currency swap agreement, A would have to pay loan of B of USD 1,00,00,000. As a result, cash outflow for A would amount to Rs. 43,91,00,000. [1,00,00,000 USD x Rs. 43.91]
- Similarly, after entering into currency swap agreement, B would have to pay GBP 53,08,880 [Rs. 44,00,00,000/82.88].

A fixed interest payment may be swapped (converted) into a floating interest rate payment and vice versa. Thus, floating rate borrowers can swap their commitments for fixed rate and vice versa.

A floating to fixed swap will be taken if the rates are expected to increase and fixed to floating rate swap will be taken if the rate are perceived to fall.

Let's understand with the help of suitable example.

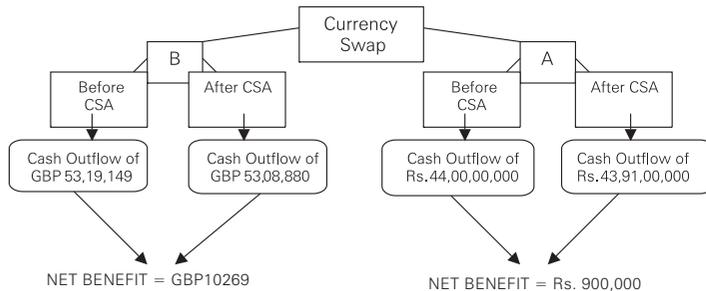
- compared to ABC Ltd.
 - Both the companies have outstanding loan of Rs. 50 Crore.
 - XYZ has gone for fixed interest rate while ABC has gone for floating interest rate.
 - XYZ expects the interest rate to fall and is therefore willing to shift to Floating Interest Rate.
 - ABC expects the interest rate to rise and is therefore willing to shift to Fixed Interest Rate.
 - Thus, the desired interest rate for XYZ is MIBOR + 0.40 per cent and desired interest rate for ABC is 11 per cent.
- How the Gain is Computed?

	XYZ LTD (ICICI)	ABC LTD (Citibank)
Fixed Interest Rate	10 per cent	11 per cent
Floating Interest Rate	MIBOR + 0.40 per cent	MIBOR + 0.80 per cent

Thus the net gain due to Currency Swap Agreement to both the companies would be

Background

- XYZ Ltd enjoys higher creditworthiness as



Desired Interest Rates if they had not entered in IRS Agreement.	MIBOR + 0.40 per cent + 11 per cent
Interest Rates if they enter into IRS Agreement.	10 per cent + MIBOR + 0.80 per cent
Gain if they enter into IRS Agreement.	0.60 per cent

Both the companies may mutually agree that the gain of 0.60 per cent shall be divided between XYZ and

Interest Rate Swap Agreements:

Interest Rate Swap (IRS) is an agreement between two parties who exchange interest payments based on a notional principal amount over an agreed period of time. The following can be the objectives of interest rate swaps.

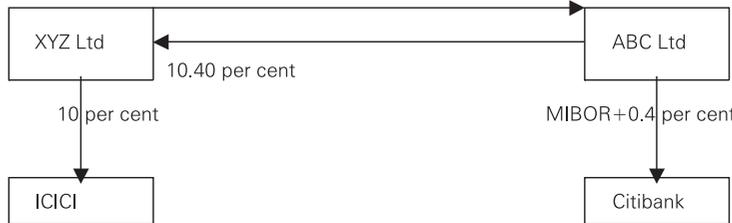
- To protect or alter the interest rate on borrowings.
- To alter the frequency and size of the cash flow profile.



ABC say, in the ratio of 2:1, taking into consideration the creditworthiness enjoyed by them. Accordingly, XYZ will be benefited by 0.40 per cent and ABC will be benefited by 0.20 per cent.

Mechanism

MIBOR + 0.40 per cent



Swap Pay-off Table

	Pay to bank	Pay to other party	Receipt from other party	Net pay out cost	Desired rate	Benefit
XYZ	10 per cent	MIBOR+0.4 per cent	10.40 per cent	MIBOR	MIBOR+0.4 per cent	0.4 per cent
ABC	MIBOR+0.8 per cent	10.40 per cent	MIBOR+0.4 per cent	10.80 per cent	11 per cent	0.2 per cent

Futures & Options: With avalanche of trading in derivatives market, these tools have become favorites of many companies for Risk Engineering.

The company can enter into agreement for hedging

risk where the underlying asset can either be foreign currency or international product prices, both of which are subject to volatile movements.

Options:

Options are agreements wherein the option holder (Buyer) has a right to buy or

risk is limited to the amount of premium to be paid at the time of buying an option.

On the other hand, for the option writer (Seller), the benefits are limited to option premium received while cost or risk is unlimited.

Actual delivery of the underlying assets does not take place and the transaction is settled by making payment of the differential amount.

In case of options the underlying asset can be currency, product prices, interest rates or share prices. The options derive their value from the value of their underlying assets.

Futures:

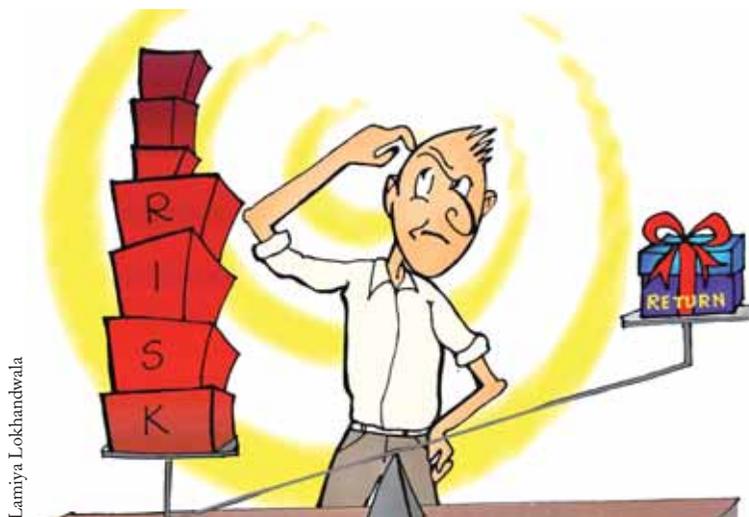
Futures are akin to options but unlike options, the buyer in futures does have an obligation to buy or

sell specific quantity of an underlying asset at a specified price on or before a specified date. It is to be noted that the buyer has a right but does not have an obligation to do so. In a way, the benefits for the buyer are unlimited while the cost or

sell specified quantity of underlying asset at a specified date on or before a specified date. The buyer cannot elude himself from his obligations in case of futures. In a way, the risk in case of futures is equal both for the buyer and the seller.

These derivatives can prove to be one of the most lucrative tools for hedging company's financial risk, as far as product prices in the international market and foreign currency rates are concerned.

Many companies have reported huge profits in the form of paper gains through efficient Treasury Operations & Risk Management and at the same time hedging its financial risks. □



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