UNIT 16 FINANCIAL ENGINEERING

Objectives

The objectives of this unit are to:

- provide an overview of financial engineering and the process involved therein
- focus on newly emerging fixed income products
- focus on newly emerging equity products
- explain derivative products developed by financial engineering

Structure

16.1 INTRODUCTION

In general, engineering is the process through which some value is added to the raw material or semi-finished product so as to make it useful to the users or consumers. Applying this general meaning of engineering, we can say financial engineering is the process through which finance managers or intermediary institutions in financial markets add value to existing plain vanilla products that satisfy the users need. John Finnerty (1988) offers a comprehensive and lucid definition of financial engineering as follows: "Financial engineering involves the design, the development, and the implementation of innovative financial instruments and processes, and the formulation of creative solutions to problems in finance". The users of financially engineered products include investors including institutional investors like pension funds, banks and financial institutions, corporates, suppliers, consumers, employees and government.

We provide you a quick and intuitive understanding of financial engineering concept. The meaning and characteristics of debt and equity instruments are well known. If you place these two instruments along risk-reward line, they can be placed at two extreme points. Debt carries low risk and hence low return. Equity carries high risk and hence high expected return. These two are plain vanilla products. Many financially engineered products are in between these two products or decomposing the risk and return or changing them to the level users want. We can say preference shares is one of the earliest financially engineered product since it has higher risk compared to debt but also carries higher return. Compared to equity, it carries lower risk but also lower return. So, an investor, who need moderate risk and return can choose 'preference shares'. Is there any alternative to this financially engineered product? Yes, it is possible that one can buy both equity and debt (or debenture) of the same firm and synthetically create a product somewhat equal to preference shares. But it is something like mixing individual chemicals in

your home to prepare cough syrup instead of buying formulated product. In other words, preference share is equal to formulated product and ready for use whereas buying both equity and debt in certain proportion to get the same effect is something similar to mixing chemicals by yourself to get the same formulation.

Convertible debenture is another financially engineered product that is in existence for a long time. Convertible debentures, which are optionally convertible, provide an opportunity to share the reward if the equity price goes up without risking your capital when the company is not doing well. In other words, here is a product, which decomposes the risk and return of the equity and passes on the return only to the investor. Of course, the convertible debenture holder can't expect such product without incurring any cost and interest rate for convertible debt will be lower than non-convertible debt. While convertible debentures or bonds are financially engineered product by the company, the market has created similar product called option (call and put option). It again decomposes risk and return and hand over return to one set of investors and risk to another set of investors. The investors, who get return, agree to compensate the investors who take risk by paying premium. Options are again financially engineered product.

We can extend the concept to an extreme situation such that corporate form of business with limited liability itself is a financial engineered product in which equity holders hold a call option on the value of the assets of the company. The plain vanilla product is sole proprietorship or partnership with unlimited liability. Since the plain vanilla structure put a limitation on the growth of the company, we need a structure in which many investors can participate but management is vested only with few. Since there is no guarantee that managers will manage the business well, there is a need to restrict the liability of investors. Equity with a limited liability is financially engineered product. Though Finnerty definition requires 'innovation' as an essential characteristic of financial engineering, not all engineered products are innovative. They are to be different and add value to users. A financially engineered product may be innovative today but it may eventually become a common product in the future.

16.2 FACTORS CONTRIBUTING TO FINANCIAL ENGINEERING

As stated above financial, engineering produces products or in some cases solutions that add value to the users. Why users of financial products or solutions want some value-added products? An understanding of such needs will be useful to appreciate the role of financial engineering and the products and solutions that come out of financial engineering. John Finnerty (1988) identified eleven factors that are primarily responsible for financial innovation. These factors are briefly discussed below:

(1) **Tax Advantage:** If there is a way to save tax or defer tax, every one will exploit the opportunity. Often financial engineering helps to develop such products. For instance, if you buy a zero coupon bond in the secondary market, the difference between the redemption value and the purchase price is treated as capital gains whereas interest received from interest paying bonds are treated as regular income. Since the tax rate for capital gains is substantially lower (it is 10% now for long-term capital gains) than marginal tax rate of high net worth investors (it is 30% for individuals and 35% for corporate entities), it make sense for companies to issue zero-coupon bonds. Small investors wanting to show the income as regular income will buy the same in primary market whereas high net

worth investors will buy from secondary market. Mutual funds is also tax-efficient medium through which you can change the character of the income from one to another. For instance, if you invest in bond market fund, which in turn invest the money in bonds and receive interest income, you can still show the income as capital gain by choosing certain schemes. You can convert capital gains into dividend and vice versa. Thus, mutual fund is a financially engineered structure to get tax advantage and of course, it is also a vehicle through which investors can achieve diversification at low investment. There are several other examples. While operating leasing is a plain vanilla product, financial leasing is an engineered product, which often used to gain certain tax advantage. Some years back, many companies have done 'sale and lease back' transactions to exploit loopholes in tax laws, which was plugged subsequently. Similarly, a non-tax paying company and tax paying investors can save tax by investing in preference shares. It is possible for a company to issue 'convertible preference shares' such that the preference shares can be converted into non-convertible debenture on default of dividend. Of course, many of the financially engineered product to exploit tax law loopholes are effectively killed by the government by amending the tax laws and sometime with retrospective effect. The life of such products or solutions is generally short but opportunities come regularly.

(2) **Reduced Transaction Cost:** Financial products and solutions come with high transaction cost. For instance, if a firm issues debenture for 7-year period, it has to repay at the end of seventh year but invariably it has to approach the market again with another bond issue in the near future since growth demands fresh funds. An alternative is issue of fairly a long-term bond, say 99-years with call and put options and in that process tremendous transaction cost is reduced. Add more features to take care of various concern like changes in credit rating, etc. and you will get truly financially engineered product to handle transaction cost. Mutual funds and several products of derivative markets are aimed to reduce either transaction cost or at least recurring transaction cost to a large extent.

(3) **Reduced Agency Cost:** Agency relationship between promoter/managers and other shareholders/stakeholders creates certain cost, which latter bear. Employee Stock Option (ESOP) is a financial innovative product, which swaps part of salary for equity such that the value of equity increases only if mangers perform well. Leveraged Buyout (LBO) through issue of junk bonds is a financial process through which inefficient management is replaced with efficient one and productivity of the assets is improved. Compare this with a situation where banks and financial institutions were not able to take action against defaulting companies except initiating time consuming court action and in meanwhile productivity of assets are deteriorate further.

(4) **Risk Reallocation:** Financial engineering plays a major role in this respect too. We briefly discussed this point in introduction. Through financial engineering, it is possible to reallocate the risk to different parties and of course such reallocation comes with a price. For instance, fixed interest rate bond is plain instrument in which both investors and issuer are exposed to interest rate risk. A floating rate bond takes away the risk. However floating rate brings new problem and issuers are exposed to higher cost of borrowing. A swap transaction can shift such risk from company to counter party. Like this, you can create an environment in which you can trade 'risk'!! We will see more examples in subsequent sections.

(5) **Increased Liquidity:** Liquidity reduces the cost and improves efficiency of pricing. Liquidity is affected due to rigidity and inability to assess the risk level. For instance, real assets in general are less liquid compared to financial assets. Land is not as liquid as bonds issued by a company dealing in buying and selling of land. Equity and bonds of leasing companies are more liquid than assets funded by leasing companies. Loan portfolio is less liquid if some banks want to sell the loan portfolio compared to stocks and bonds of the bank. Through securitization, financial engineering can improve the liquidity. Another example, is open-end mutual funds, which give option to enter and exit at anytime and of course with certain cost (entry and exit load).

(6) **Regulatory or Legislative Factors:** Regulation or deregulation, both make life complex. A regular public issue in the US market is highly costly for an Indian company since the regulations are very high and the cost of compliance of such regulations is high. ADR and GDR are financially engineered products, which allow companies to issue shares in US and other markets without attracting such high level of regulations. Depository and electronic-trading are positive side of regulations, which reduces level of risk and also transaction cost. Mutual funds are introducing several new products within regulation to attract investors and tap new sources of funds. Insurance is another highly regulated industry but you can witness so many products offered by them. If regulation puts certain restrictions, you have to be more innovative to keep the interests of investors. If regulation removes certain restrictions and allows competition, you have to be equally innovative to compete and retain your investors. For instance, RBI puts lot of restrictions on companies raising deposits from public.

(7) **Level and Volatility of Interest Rates:** Interest rate influences the price of almost all products of the economy and of course interest rate in turn is influenced by several factors. Volatility in interest rate creates problem for several players in the market but there are people who like volatility of interest rates and hence want to assume additional risk. Financial engineering can help these two parties to swap their risk appetite on interest rate volatility. All interest rate derivatives are outcome of such volatile behaviour of interest rates.

(8) **Level and Volatility of Prices:** Producers and users of products (real as well as financial) and services are exposed to high level of price risk. Bonds linked to commodity prices shift such price risk from those risk-averse players to those who are willing to take up such risk.

(9) **Academic Work:** Sometime new and value added products are developed as a matter of academic exercise and subsequently someone finds it useful.

(10) **Accounting Benefits:** Accounting regulation requires certain items to be treated in a particular way. Earlier when there were no regulation on treatment of stock option, many companies have reduced salary by converting a part of salary into stock option (ESOP) but not recognized as expense. In that process, profit and profitability increase. Zero-coupon convertible bonds are beneficial if there is no regulation on how to treat the discount in stock price that is going to be offered in the future;

(11) **Technological Developments and other Factors:** A complex exotic derivative structure was neither in demand nor life was as complicated as today requiring such products. Technological development in computational finance today makes it possible to develop such products and allow users to trade risk and return.

Activity 1

Visit the web site of few large Indian and US companies and see their annual report. Examine whether they have issued any security other than plain equity and bonds.

.....

.....

.....

.....

16.3 FINANCIAL ENGINEERING PROCESS

Financial engineering process is no different from the process that any firm follows in developing new value added products or services. The process starts with identification or realization of some needs. Sometime such needs are known but many times, you have to identify the needs of the market and bring out products or services or solution to the users without expecting them to formally communicate such needs. Like car manufacturers, mutual funds managers have to constantly look for ways to innovate new products that are appealing to investors and at the same time achieves certain additional objectives. It is quiet possible that you may add one more feature to the existing products, which increase its value to users. For example, an open-end fund gives liquidity compared to close-end funds but still investors have to fulfil so many formalities to get the money. Cheque book facility to mutual funds holder takes away so many formalities relating to redemption and provide instance liquidity. Corporate finance managers have to look for ways to reduce cost of capital or reduce the risk arising out of operating activities. Treasury managers of banks while talking to clients can get ideas for new product or solutions. Once the need is identified, an initial sketch of the product is developed. At this stage, depending on the product requirement, complex model building exercise is used. For instance, a structured derivative product requires high level of mathematical modeling. The next stage is testing of the product so check whether the desired result is achieved. Sometime it involves simple verification with the users or some senior managers' assessment. Sometime, you may have to run some simulation exercise to verify how the product will produce results under various simulated future scenario. Once the product is perfected, the next stage is pricing of the product. At the stage of pricing, it is quiet possible that the price paid by the customer may be more than the benefit derived out of the product. So, the product may be restructured again so as to make it attractive to the users. Finally, the product is launched or solutions are provided either directly or after some test marketing.

Activity 2

Suppose you are in a large bank specialising consumer loans. You are asked to develop a new product to achieve 20% growth in consumer loans. Examine the existing products available and then develop a new product. List down the process you have applied in developing new product.

.....

.....

.....

.....

.....

.....

16.4 FINANCIAL ENGINEERING IN FIXED INCOME SECURITIES

Fixed income securities have seen large-scale innovation and new products. As was mentioned in the introduction of the Unit, zero-coupon bond and convertible bonds are some of the early part of new products. A zero-coupon bond enables the borrowers to defer interest payment whereas it gives an option for the investors to show the appreciation either income or capital gain depending on tax preference. An optionally convertible bond reduces interest cost to borrowers whereas investors get an option for converting the same into equity depending on the performance of the company, which may not be assessable at the time of investment. Another major innovation in bonds was floating rate bond, which takes away the interest rate risk. A number of subsequent innovations on floating rate bond aim to deal with different types of risk. A typical floating rate bond contains a float part and fixed part. For example, it can be bank rate or LIBOR + fixed premium say 4% or 2%. When the interest rate moves upward in the market, the bank rate or LIBOR also moves up and hence investors get higher interest rate. When the rate declines, borrowers are not stuck with higher interest liability. Thus, float part effectively handles the interest rate risk. Here interest rate risk means additional interest liability on account of fixed interest commitment that the borrower has to bear when the interest rates are moving down in the market. Similarly, when the interest rate moving upward, the investors of fixed interest rate bonds loose money as the prices of bonds decline. In other words, the market prices of bonds move up and down based on changes in the market interest rates.

Instead of fixing the float to Bank Rate or LIBOR, if the issuer and investor fix the float to some other value, they can tackle different types of risk. For instance, a commodity producer or oil company is exposed to considerable amount of commodity or oil price risk. Prices of commodities, oil, metal, etc., are highly volatile and producers of these products are exposed to high level of risk. In other words, in a balance sheet context, the asset side risk (also called business or operating risk) is very high. Naturally, for these companies, a pure fixed interest paying debt will add more problems. For some reasons, if the prices of the products crash, it may hurt the business considerably. While debt creates such adverse effect in a falling prices, it creates value when price moves upward. The issue before the finance managers of these companies is how to resolve the negative effect of the debt in a falling market price while retaining profit opportunity when the prices move up. It is resolved by linking floating rate with the commodity price index. That is, the investors will get higher interest rate when the market price of the commodity moves up and gets lower return when the prices fall. For instance, if the interest rate of such floating bond is 4%+changes in oil price or price index, the bond holders will get a return of 4% only if the price remains same. If the price increases by 3%, then bond holders will get 7%. Normally, there will be a floor rate and cap rate for such issues. In the above case if the floor is 4% and cap is 10%, the interest rate will be minimum of 4% (even in cases when the oil price declines by 10%) and maximum of 10% (even when the oil price increases by 20%). So, the instrument, by and large, retains, the characteristics of debt but it brings some equity flavour into the instrument.

What about the users of such commodities, metals and oils? They are also exposed to price risk. When the prices of input moves up, it may not be always possible for the company to adjust the end product price. This will hurt the profitability of the company particularly cause distress if the company also has fixed interest rate debt. Inverse floating rate bonds, where interest is linked to commodity price changes but in a inverse direction. That is, interest liability will be lower when the price of input moves upward. Similarly, when the price

of input moves downward, then interest liability will be more. The borrower would be happy to share part of the profit caused by lower input price with the lender provided the lender agrees to share the loss when the input price increases. You may be wondering why no one bothers to develop such instruments for consumers, who are ultimately affected by the prices. They can invest in the bonds and shares of those companies until financial engineers come out with a product.

As was discussed earlier, financial engineering developed several innovative products in debt instrument. We mentioned earlier that zero-coupon bond is one of the earliest innovations. But the problem is, investors who are looking for regular investments that will avoid such instrument. To overcome this and also to create some additional liquidity, issuers of such zero-coupon bonds have started issuing baby bonds, which are also zero-coupon bonds. Those who are looking for regular income can sell the baby bonds while retaining the mother bond. Of course, tax treatment for such baby bonds was also one of the reasons for such innovations.

Can you create Zero-coupon bond (ZCB) from an interest-paying bond? There is nothing impossible before financial engineer. It works like this. If you carefully look into interest-paying bond, it is a structure in which you invest today some amount and borrower will pay you regularly interest at the end of every period (say six months) and principal on maturity (say 10 years). Thus you will be getting 20 cash inflows. Investment bankers issued 20 different series securities backed by investments in such interest paying securities and the 20 such securities are zero coupon bonds with different maturity. That is, series 1 will mature at the end of 6 months and the face value of the same is equal to first interest payment. Series 2 will mature at the end of 12 months and the face value is equal to second interest payment. Such that series 20 will mature at the end of 10 years and the face value is equal to principal and last instalment interest. All these zero-coupon bonds are discounted and issued today such that investment banker collects the face value of the interest paying bond plus a small commission. Those investors, who have surplus for 6 months, will invest in series 1, those who have surplus for 12 months will invest in series 2, etc. Interestingly, all investors of ZCB get benefit more than what they would get otherwise for investing money for such term.

Innovation in debt instruments in general (a) aims to remove interest rate risk (b) bring a bit of equity flavour into the instrument and (c) improve tax efficiency of the product. Suppose a firm borrows money in dollar but does not want to take the risk of foreign exchange rate fluctuations. It is possible to issue a bond in one currency, pay interest in another currency and repay in a different currency. Alternatively, you can peg the interest rate to the changes in foreign exchange rate fluctuations. In essence, foreign exchange risk is transferred from the company to others. In other words, any risk can be handled, restructured and transferred from a person who is not willing to take such risk to a person who is willing to assume such risk.

Activity 3

Reliance Industries has successfully leveraged convertible debentures for expansion. Examine convertible debentures issues of Reliance and figure out how it helped them to achieve high growth without diluting their stake. Also, figure out why other companies like Essar Oil failed to replicate such innovation.

.....

.....

.....

.....

16.5 FINANCIAL ENGINEERING IN EQUITY PRODUCTS

Equity product witnessed limited innovations since by definition, these products are designed to carry high risk. Nevertheless, a few attempts have been made to reduce the risk or share the risk and change some of the basic characteristics of the instruments. One of the basic characteristics of common stock is voting rights that it gets for the holders. Unlike co-operative form of organization in which each shareholder gets only one vote irrespective of share that the shareholder contributes, common stocks holders' votes equal to number of shares that the shareholder possess. For instance if you have 1000 shares and your friend has 100 shares, you get 1000 votes and your friend gets 100 shares. Voting rights give the shareholders to participate in key decisions to the extent of their stake in the company. Such voting right has a value. This basic characteristic of the equity has been changed and voting rights value is swapped for additional dividend by issuing different classes of shares. For instance, under Indian law, it is now possible for the public limited company in India to issue non-voting shares. Subscribers of such shares have no voting rights and in this process it is almost like preference shares but without any right on even dividend. However, when companies issue such non-voting shares, a suitable compensation either in the form of discount in offer price or additional dividend is offered to the subscribers. Though so far no company has issued such shares, some companies may issue such shares in the future. The benefits that non-voting shares offer are (a) it enables key promoters to retain their voting rights while issuing additional shares and (b) many small investors and mutual funds are not interested in voting rights of good companies and they are happy with additional dividend to exchange the voting rights. Empirical studies have shown that there is no significant difference in market price between the shares of different classes except in period of takeover contest where voting rights assume importance.

A more common form of this kind of shares is 'differential voting rights' shares in which all classes of shares have voting rights but in a disproportionate form. For instance, Class A shares will have voting right of one vote for one share whereas Class B shares will have a voting right of 100 votes for one share. Sometime, the arrangement will be such that Class B shareholder will not get any dividend from the company or get only one-tenth of dividend of Class A shareholders. Typically, promoters would subscribe Class B shares whereas most small investors would prefer Class A shares. Initially, companies will issue Class A shares to all investors and subsequently will announce for exchanging Class A shares with Class B shares on certain terms (eg. For every 10 shares of Class A surrendered, the shareholder will get one Class B shares, which has 100 voting rights per share and no dividend). Naturally, those who are interested in control stake would go for exchange. Sometime, companies may issue non-voting or low-voting shares for ESOP. While the uses of such instruments could be many, it is generally considered that non-voting or low-voting shares increase the agency cost since promoters are trying to retain their control without investing an equal amount.

Some companies in the US and West have issued puttable common shares in which the holders of the equity shares have right to surrender the equity shares at a pre-determined price on a pre-determined date. If you closely observe the basic characteristics of the instruments, it is somewhat equal to buyback of shares or selling puts. In other words, the risk associated with equity shares is considerably reduced by issuing such shares. You might wonder that why Indian regulators have not insisted such instruments from companies since many Indian companies during the period of 1994-96 and recently in 2000-01 have been

promoted by fly-by-night operators. Good companies gain by charging more premium for such shares because of less risk associated with such shares. There is no loss to the company since the shareholders will not exercise their right if the company performs well. Companies like Intel have issued 'put option' instead of puttable common shares.

Yet another innovation from mutual funds and investment bankers is splitting the total return of equity into two components and trade them separately. For example, SBI Mutual fund could invest 100000 shares in Infosys and create 100000 Class A and 100000 Class B stripes against the investment in Infosys. SBI defines that those who purchase Class A shares will get only dividend (or dividend plus 20% capital appreciation) and Class B shares will get no dividend but entire capital appreciation (or 80% capital appreciation). The Class A is called PRIME and Class B is called SCORE. While small investors prefer Class A or PRIME, speculators will prefer Class B or SCORE component.

16.6 FINANCIAL ENGINEERING IN DERIVATIVES

The contribution of financial engineering on derivatives is substantial. In fact, every derivative instrument is the outcome of financial engineering. To appreciate the contribution of financial engineering on managing risk through derivatives, let us go back to the origin of such developments. Market is a place where goods, products or services are exchanged. Normally, such exchanges take place when the parties transact and such trades are called cash market trades. However, cash market transaction creates certain problems. For example, a food processing company may not be in a position to buy its entire one-year requirement of wheat and wheat producer may not be in a position to supply entire quantity of wheat. Both parties are exposed to price risk if they decide to transact periodically, say once in a month - that is, producer will supply one month wheat every month based on the price prevailing in the market. To manage the price risk, producers and consumers have started transacting in forward market. Forward is an agreement between the two parties entered today with all terms of contracts agreed today but settled at a future period. Forward is a plain vanilla instrument that gives birth to derivatives through financial engineering. Forward performs almost all requirements of both parties of transactions but there are certain limitations. For instance, if one of the parties wants to get out of the contract before the settlement date, both parties have to negotiate for the reversal of the contract, which often will be expensive. In other words, there is no easy way for getting in and getting out of the forward contract. However, futures (both commodity and financial futures), which are a derivative instrument, offer this facility. Future is a standardized forward contract entered between two parties and traded in the exchange. Because of standardization, it is possible to trade in organized exchanges and because it is traded in exchanges, it is easy to get in and get out of the contract. Today, futures are highly liquid and available on large number of financial products like stocks, bonds, currencies and commodities like coffee, cotton, plantation, etc. They are also available on metals and energy products.

While futures resolve basic problem of liquidity while allowing parties to 'lock-in' the price today so that there is no price risk, the parties forgo the opportunity to exploit the price advantage. For instance, the buyer will continue to pay higher price even the current market price is much lower. Of course, the producers gain in such situation. On the hand, if the prices move up, the producers continue to sell at lower price while buyers' gain in such a situation. Hence when the prices move up or down, one of the parties gain and other incur loss. Financial engineers designed options contract which allows buyer of

the options to retain the benefit of price movement while avoiding loss. Consumers buy call option, which gives them a right to buy at a predetermined price. They exercise the right only when the price is more than the predetermined price. Producers buy put option, which gives them a right to sell at a predetermined price and producers exercise their right when the price moves downward. Option contracts split the risk into positive and negative and allow parties to take whatever they like. Buyers of option, who take positive side of the risk, are expected to pay a price or premium to sellers of option, who take negative side of the risk.

Swaps are similar to futures but the difference is it is a series of futures. Swaps are normally entered into exchange fixed rate borrowing/lending with floating rate borrowing/lending or to exchange one currency borrowing/lending with another currency borrowing/lending. Suppose your company has borrowed money in the US but your exports are primarily to Europe. It is possible that you can swap dollar loan with Euro currency loan so that your foreign exchange risk is reduced. Swaption is another variation of swaps contract and it brings option element into swaps. Financial engineers have developed several such variations and you will have an opportunity to learn them in derivative courses.

Activity 4

Visit internet and find out the details of some exotic derivatives like weather derivative and write a brief report on the same.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

16.7 SUMMARY

Financial engineering like any other engineering has brought several new products and solutions to the market. It has completely changed the financial market today. Its main contribution is to split the risk and return into several components and allow investors of financial markets to decide the combination that is most suitable to them. Such innovations are seen in bonds, equity, derivatives, and also in other fields like merger, acquisition and corporate restructuring. It also provides mechanism to price such combinations by developing various pricing models for futures and options. Some of the models are cost-of-carry model, binominal model, Black-Scholes Option Pricing Model, etc. Today, it is possible to quantify risk and return of any new products and also price them with the help of these models. Financial engineering is an exciting field, which attracts some of the best human resources. The profession is also highly rewarding.

16.8 SELF-ASSESSMENT QUESTIONS

1. What is financial engineering? Do you feel financial engineers play an economic role in the society?
2. Briefly discuss the financial engineering process that you will follow while developing new products or solutions.
3. List down with examples any five variables that contribute new products development.
4. Explain how fixed income securities are used to manage product price risk.
5. Discuss innovation that took place in equity products and explain what they achieved.
6. What is non-voting share? How is it useful to the company and investors?
7. What is the use of derivatives? Is it an instrument designed for speculators or useful to others too?
8. Explain any two derivative products and show the value addition in them.

16.9 FURTHER READINGS

Finnerty, J. D., *Financial Engineering in Corporate Finance*: An Overview, Financial Management, Winter 1988, Pp. 14-33.

Marshall, John.F and Bansal, Vipul K, *Financial Engineering: A Complete Guide to Financial Innovoation*, Printice-Hall of India,New Delhi, 1996.

Mason, S P., Merton, R.C., Perold A. F., and Tufano P., *Cases in Financial Engineering:* Applied Studies of Financial Innovation, Prentice Hall, Englewood Cliffs, New Jersey, 1995.

Miller, M H. Finanical Innovation: The Last Twenty Years and the Next, *Journal of Financial and Quantitative Analysis*, December 1986, Pp. 459-71.