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Financial engineering: Factors leading to it's growth in Indian financial market

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Abstract
Corporate finance, bank finance and investments have changed in recent years. This change has given birth to a new discipline that has come to known as 'Financial Engineering'. It involves the design, development and implementation of innovative financial instruments/ processes and the formulation of creative solution to financial problems. By combining elements of forward, future options and swaps, firm can create a financial instrument that meets the needs of the corporate i.e trying to hedge it's risk exposure or one offers the institutional investors an investment opportunity with a unique payoff structure. Financial Engineering in simple words can be defined as the process of using the principles of financial economics to design and price financial instruments. To design innovative financial instruments, financial engineers requires specific skill too. The purpose of the present paper is to understand the concept of financial engineering, functions carried out by them, factors affecting financial engineering etc.

Keywords: financial engineering, quants, hedge funds, investment products

1. Introduction
Finance is one of the most important fundamentals of investment for any economy the world. The development of finance tools in order to the financial globalization requirements and the capital transfer among states has recently become the main concern of financial and banking experts, so financial engineering is the emergence of a new funding pattern differs from the traditional funding in vision of the risk levels in investments need funding. Financial institutions need the specialists with an understanding of problems financial strategies, with an expertise and practical know-how, at the same time need to focus on the significance of financial operations in the bigger picture. To meet such needs, financial engineering may be used by institution for managing it's finance. Financial engineering concept is as old as financial transactions, but it seems relatively recent in terms of terminology and specialization. Financial engineering is the use of financial such as forwards, futures, swaps, options and related products to restructure or rearrange cash flows in order to achieve particular financial goals particularly the management of financial risk. Financial engineering is not only limited to corporate and institutional applications, many of the most creative financial innovation have been directed at the consumer level (like adjustable rate mortgages, cash management accounts, and various new forms of life insurance). Financial engineering has thus become the life blood of these activities. According to Thone Finnerty financial engineering involves the design, the development, and the formation of creative tailor made solutions to problems in finance.

2. Concept of Financial Engineering
Financial engineering is the application of mathematical methods to the solution of problems in finance. Financial engineering uses tools and knowledge from the fields of computer science, statistics, economics and applied mathematics to address current financial issues as well as to devise new and innovative financial products. It is also known as Quantitative Analysis, Financial Mathematics, Mathematical Finance or Computational Finance. It is helpful in derivative pricing, financial regulation, execution, corporate finance, portfolio management, risk management, trading and structured products. Therefore financial engineering is used by Commercial Banks, Investment Banks, Insurance Agencies and Hedge Funds. Hedge funds are alternative investments using pooled funds that employ numerous different strategies to earn active return, or alpha, for their investors. Financial engineers are popularly known as "Quants".

3. Functions of Financial Engineers
1. The financial engineers are specialists making use of mathematical formulas, programming and engineering methods in financial theories, and analyses market trends to build data-backed financial models.
2. Companies often employ people with advanced degree in Financial Engineering and these specialists work as investment managers, bankers or traders using their financial engineering background to improve the quality of existing investment products. An investment product is a product (such as tocks, options, futures, bonds, mutual funds, certificates of deposit, money market investments, ETFs and annuities) purchased with the expectation of earning a favorable return.
3. This knowledge is used by engineers to develop simulations and predict market behavior. Of course, the predictions aren't always accurate, any unexpected issue may happen in the financial market but the risk potential reduces. Since a financial engineer knows about market trends and previous market performances, the knowledge is used to make future investment predictions.

4. Apart from knowledge in finance, the engineer needs to possess sufficient computer programming skills. Programming skills are needed to build simulating financial models to learn about market behavior. Through these simulations, the financial engineer is expected to generate results, as much as accurately possible.
5. Most of the financial engineers work in the field of financial risk management and as financial analyst. With the knowledge of computer simulations and market trends, the engineer helps to develop profitable investment plans for individuals and companies. Often, these investment plans have high risk factor, which might seem counter-productive to the goal of hiring financial engineers, but that's a strategy used by risk management firms to yield higher return than comparatively stable investments. Companies and high net-worth individuals often take help from financial engineers to design a portfolio which places the complete investment capital at risk.
6. As a financial analyst, the financial engineer creates real-time financial simulations to predict the future behavior of the market.

4. Financial Engineering Team

Financial engineers often work as a part of a longer team. The elements of the team will vary depending on the nature of engineering involved. Team members involve Accountants, Tax specialist, Underwriters, compliance Officers, Financial Analyst, Programmers and Information Service Personnel. Therefore to carry out functions mentioned above all the members of the team are carefully selected to work together efficiently and with the speed required to complete the task.

5. Factors contributing to the growth of Financial Engineering

Since the 1950s and 1960s, and particularly in the last decade, the global and financial environment has changed rapidly. In particular, the breakdown of the Bretton Woods agreement in 1972 which ultimately led to floating exchange rates, has led to major increases in volatility and competition Technology has improved dramatically in this period. Government debt has also increased in most countries. Marshall (1992:20) 24 has classified the causes of increasing risk into two: environmental and intra-firm.

a. Environmental factors

It may be regarded as the factors external to the firm and over which the firm has no direct control but which are nevertheless of great concern because such factors impacts the performance of the firms. Such factors include price volatility, tax asymmetries, technological advances, globalization etc. which are discussed below.

1. **Price Volatility:** Price is what one pays to acquire something of value or the use of some thing as value. For ex. Price of Commodities, Interest Rate, Exchange Rate, Equity Capitalization Rate etc. Price Volatility is interaction of demands by consumers and the supplies by producers ultimately decides market clearing price and quantities. If the demands and supplies for a thing change rapidly over short period of time then market clearing price can change dramatically. This is called Price Volatility. In nutshell, Price volatility/change exposes individuals, producing firms and government to significant risks.

Consequences of Price volatility: Equity holder is exposed to price risk because the price of corporate share fluctuates which makes capital gain highly uncertain. In today's world equity price volatility has increased because of rapid flow of information, a spate of takeover efforts and new form of spot future arbitrage

2. **Globalization of the markets:** In the 1960's wage rate disparities between US and other countries led firms to start overseas production of low technology product which can be easily transported. Development of Eurodollars in 1970's gave rise to Multinationals, who introduced new financial instruments, which were the product of revolutionary financial engineering. Increased competition due to globalization has forced MNC's to incorporate high degree of leverage in their capital structure making them vulnerable to Exchange rate and Interest rate risk.

3. **Tax Asymmetries:** Tax asymmetry exists if two firms are subject to different effective Tax Rate, which is cleverly exploited by Financial Engineers. This happens when some industries are granted special tax exemptions, different countries impose different tax burdens, past performance has left some firms with sizable tax credits and write-offs, Interest and Dividends are taxed differently at the level of recipient and paying corporations.

4. **Technological Advances:** Improvement in Computer Technology along with advances in Telecommunication led to high speed data transmission. Synergy of these technologies with software programming led to advent of spreadsheet programs. With the introduction of spreadsheet programs currency and interest rate swap blossomed.

5. **Advances in Financial Theory:** Extensive theoretical contributions from academicians to financial theories formed the backbone of new financial instruments and their usage. Development of financial theory is capable of explaining the valuation of stock Index futures contracts led to Order matching computer system on NYSE Known as Designated Order Turnaround (DOT) system. Elaborate research on mathematical relationship which exploit discrepancies in market price led to program trading or future- Cash arbitrage causing short run volatility.

6. **Development of new markets and market linkages:** There has been an explosive growth of futures and options exchanges worldwide. 24-hour trading has become possible on futures and options exchanges across the globe. The Chicago Exchange has developed a computer system on which trade can now be carried out at

any time, replacing human activity on the floor

7. **Regulatory Change and Increased Competition:** Increased competitive pressures, better risk management techniques, coupled with the1980's atmosphere of deregulation led to efforts to repeal much of regulation heaped on the industry. Massive failures in the thrift industry acted as catalyst for deregulation. Interstate banking broke down, commercial banks became increasingly involved in investment banking.

8. **Transaction and Information cost:** Enormous technological development decreased the cost of information, on which many transactions feed. Thus, the cost of transacting itself, declined significantly during the decade of 1980's. Unlike today under 1970's transaction cost, arbitrage opportunity does not exist.

b. Intra-firm Factors

1. **Liquidity Needs:** Liquidity has many facets like ease of conversion of cash, or put cash to work, Degree to which market can absorb sale and purchase without imposing excessive cost, Size of bid-ask spread. Financial innovations help corporation and individual to meet these needs. Example of liquidity needs are Money Market acct, Sweep Accts, Electronic fund transfer, CD market, Repo market were designed to provide access to cash or put unneeded cash to work. Instruments such as floating rate notes, adjustable rate preferred stock are long term securities whose values do not deviate to nearly the same degree as traditional fixed coupons.

2. **Risk Aversion by managers:** Although corporate managers have become increasingly aware of their risk exposures, These managers are also uncomfortable with the instruments of modern risk management. They often fail to understand the intricacies of these modern instruments. Hence Formal Training of Senior-Level Personnel has become a serious issue.

3. **Agency cost:** An agency cost is an economic concept that relates to the cost incurred by an entity (such as organizations) associated with problems such as divergent management-shareholder objectives and information asymmetry. The costs consist of two main sources:

The costs inherently associated with using an agent (e.g., the risk that agents will use organizational resource for their own benefit) and The costs of techniques used to mitigate the problems associated with using an agent (e.g., the costs of producing financial statements or the use of stock options to alin executive interests. For
Example in a M&A activity by assuming ownership, management eliminates the agency relationship and presumably, most of the costs associated with that relationship entails. This helps in increasing the share value, and justifying for the excess payment made.

4. **Quantitative Sophistication and management training:** In very few areas is quantitative sophistication more important than in investment arena. By deciphering complex situations through tedious mathematical could enhance returns by a respectable number of basis points. Hence firm expend huge sums on training of management in quantitative sophistication.

5. Conclusion

Financial engineering is one of the basic of our financial system, which is the life blood of efficient and responsive capital markets. The financial system in an economy plays a considerable role in stimulating economic development. It channels funds (like credit, loans etc) to the various economic agents that need them for productive uses. This function is very imperative for any economy that intends to be viable with respect to economic growth because it creates and makes contractual arrangements that link borrowers and lenders more efficiently than if they had to trade directly. Financial engineering is engineering discipline which deals with the creation of new and improved financial products through innovative design or repackaging of existing financial instruments. Financial engineers consider financial engineering as pervasive spanning across design of innovative financial instruments, financing merger and acquisition deals, corporate restructuring, derivative trading strategies etc. Financial engineering and its innovative products have played an important role in expanding sources of finance and meeting investors and Issuers requirements. It also helps managers abreast of their rivals, controlling volatility, risk management, reduces stock risk, bridging gap between buyers and sellers. Therefore it can be concluded that financial engineering not only helps in accelerating economic growth of country but also offers solution to intractable problems too.

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