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Analysis of Option Trading Strategies as an Effective Financial Engineering Tool

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---------- **ABSTRACT**----------
Financial engineering is the use of mathematical techniques to solve financial problems. It carries different meanings with respect to different sectors. It 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 sometimes referred to as quantitative analysis and is used by regular commercial banks, investment banks, insurance agencies and hedge funds. Financial engineering has led to the explosion of derivative trading that we see today. Since the Chicago Board Options Exchange was formed in 1973 and two of the first financial engineers, Fischer Black and Myron Scholes, published their option pricing model, trading in options and other derivatives has grown dramatically. This paper analyses the use of different option trading strategies as an effective tool in Financial Engineering which are used as an effective tool for managing risk in both bullish and bearish markets.

KEYWORDS: Bearish markets, Bullish markets, Call Options, Financial Engineering, Option trading Strategies, Put Options.

I. INTRODUCTION

Finance is one of the most important fundamentals of investment for any economy in the world. The development of finance trading tools in order to match 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 which differs from the traditional funding in vision of the risk levels in investments need funding. That type of funding becomes important when the accumulative capital decreases.The different mechanisms used to provide tools for new investment, development in traditional securities, updated methods of financial restructuring of banks, tools in financial operations, which contribute to improved performance, increased profitability, check the speed and efficiency with cost savings. Any economy needs new finance tools which can improve growth and productivity. It meets the needs of corporations at the different funding stages. The activity of venture capital has begun in the United States of America and these institutions spread later in other countries with the aim of meeting the needs of investment funding and overcoming the inadequacy of supplied capital with suitable conditions of the existing financial institutions and providing funding for new or high risk projects which do not have growth potentials or high rate. On the other hand options are important derivative securities trading all over the world for the last three decades. They are speculative financial instruments. It has peculiar quality under which the holder of the option has been given right to buy or sell an underlying asset at a specified period for a fixed premium. Option trading strategies are used by speculators, hedgers and arbitrageurs. Options can be used to create portfolio with unique features, capable of achieving investment objectives.This paper focus on the different mechanisms used for the design, development and implementation of innovative financial instruments with special reference to option trading strategies as an effective Financial engineering tool in risk management. This paper also discusses the formulation of creative solution to problems in finance.

The outline of the paper is organized as follow: -
Section 1: Introduction, aim of this research, question of research and literature review.
Section 2: The overview about types of trades, option trading strategies, financial engineering, advantage and factors contributing to the growth of financial engineering.
Section 3: Empirical studies of financial engineering and conclusion.

II. OBJECTIVES OF THIS RESEARCH

The objective of this paper is to discuss the concept, forms, importance and objectives of financial engineering with an indication of the advantages of option trading strategies. This new investment type in light of the review of some experiences applied the most important rules and policies necessary to support the success of this type of strategies in the developing countries especially in India. Provide insights about basic differences in the form of market failure in measuring price risks. Provide insights about different financial engineering instruments. Provide insights about benefits of using financial engineering instruments as tools of public policy to promote regional development. Aid the government at increasing the role of the private sector in financial services provision, with strengthening role of risk management in financial institutions.

III. QUESTIONS OF RESEARCH

[1] What are different strategies for managing risk in Options?
[2] What are the different types of option trading strategies available to investors?
[3] What are the reasons to include option trading strategies under Financial Engineering?
[4] Is there any impact of financial engineering on financial system?
[5] What are evidence exist on the benefits of using financial engineering instruments as tools of public policy to promote regional development?

IV. HYPOTHESES

Financial engineering have widespread impact on financial policy, and develops investment, product and reduces the chances of unintended negative outcomes. The following hypotheses are proposed for the present study:

H_0: There are negative relationship between dependent variable, (alternative mechanisms) or (financial engineering) and independent variables changes in activities, option trading strategies, pricing methods to measure the economic – timing skills - transactions costs - option replication.

H_1: There is positive impact of financial engineering on instruments as tools of public policy to promote regional development.

V. LITERATURE REVIEW

There are descriptive literature which discusses recent financial engineering and that advances various hypotheses about them has arisen (Van Horne 1985; Miller 1986, 1992; Mayer 1986; Cooper 1986; Faulhaber and Baumol 1988; Campbell 1988, ch.16; Siegel 1990; Finnerty 1992; Merton 1992; Kopcke 1995; Lea 1996)6. Sharpe (1987) Arnott and Fabozzi (1992), and Bodie, Kane and Markus (1999) focus on asset allocation vast and addresses a board set of issues. Most Studies that consider derivatives in the context of asset allocation use option – pricing methods to gauge the economic value of the market – timing skills, Merton (1981), Henriksson and Merton (1981), and Evnine and Henriksson (1987). Carr, Jin and Maden (2000) solve the assets allocation problem in an economy where derivatives are required to complete the market. Carr and Maden (2000) consider a single – period model where agents are permitted to trade the stock, bond and European options with a continuum of strikes. Because of the inability to trade dynamically, options constitute a new asset class and impact of beliefs and preferences on the agent's positions in the three asset classes is studied. In a general equilibrium framework, they derive conditions for mutual – fund separation where some of the separating funds are composed of derivative securities. None of these papers explores the possibility of substituting a simple buy – and – hold portfolio for a dynamic investment policy.

The other literature are relevant to our paper: :-Merton's (1995) functional approach to understanding the dynamic of financial innovation Bodie and Merton (1995) and Merton (1997) , the literature on dynamic portfolio choice with transactions costs, and the literature on option replication. There are many examples contained in Merton (1995) illustrating the importance of function in determining institutional structure is the example of the German government's issuance in 1990 of ten – year Schuldschein bonds with put – option provision . Merton (1995) observes that the put provisions have the same effect as an interest – rate stabilization policy in which the government repurchases bonds when bond prices fall and sells bonds when bond prices rise. More importantly, Merton (1995) writes that '' the put bonds function as the equivalent of a dynamic, open market, trading operation without any need for actual transactions".Magill and Constantinides (1976) were among the first to point out that in the presence of transactions costs, trading occurs only at discrete points in time. More recent studies by Davis and Norman (1990), Aiyagari and Gertler (1991), Heaton and Lucas (1992, 1969), and He and Modest (1995) have contributed to the growing consensus that trading coasts have a significant impact on investment performance and, therefore investor behavior. Despite the recent popularity of internet- based day-trading, it is now widely accepted that buy-and – hold strategies such as indexation are

difficult to beat-transactions costs and management fees can quickly dissipate the value-added of many dynamic asset- allocation strategies.There are more several studies have considered the option-replication problem directly, in some case using mean-squared error as the objective function to be minimized such as Duffie and Jackson (1990), Schweizer (1992, 1995, 1996), Schal (1994), Delbaen and Schacher Meyer (1996), and Bertsimas, Kogan, and Lo (2000a), and in other case with transaction costs such as Leland (1985),

Hodges and Neuberger (1989), Bensiadm ,et al.(1992), Boyle and Vorst (1992), Davis, Panas, and Zariphopoulou (1993), Edirisinghe, Naik, and Uppal (1993), Henrotte (1993),Avellaneda and Paras (1994), Whalley and Wilmott (1994), Grannan and Swindle (1996), ,and Toft (1996). Merton's (1995) illustrates automatic stabilization policy the possibility of substituting a static buy-and-hold portfolio for specific dynamic trading strategy, an interested–rate stabilization policy. The modern technology for replacing options is clearly well established, and natural generation of that technology is to construct portfolios of options that replicate more general dynamic trading strategy.

VI. OPTION TRADING STRATEGIES

Users of Option trading strategies are speculators, hedgers, and arbitrageurs. Options can be used to create portfolios with unique features, capable of achieving investment objectives not attainable with futures. Here are trading strategies for the various participants:

1. Arbitrage

The purchase and sale of the same security in different market to take advantage of a price disparity between two markets is termed as arbitrage. 'This strategy involves risk-less profit from market mispricing. Before March 2001, a major part of the volume on the stock exchange was accounted for by arbitrage of shares between the NSE and the BSE as they followed settlement periods and different carry-forward mechanisms. Profits in this activity were not substantial but it involves practically no risk, so most of the jobbers, sub-brokers and large investors safely traded in shares.

2. Hedging

Hedging represents a strategy by which an attempt is to be made to limit the losses in one position by simultaneously taking a second offsetting position. The offsetting position may be in same or different security. In most cases hedgers are not perfect because they cannot eliminate all losses. Typically, a hedge strategy strives to prevent large losses without significantly reducing the gains.

3. Speculation

A Speculator has a definite outlook about future prices and therefore buys put or call option depending upon this perception. If a he has a bullish outlook, he will buy calls or sell puts. As a bearish perception the speculator will buy put and write calls. 'He will earn a profit if his view is in right direction. If he is not, he will lose the money. A speculator buys call or put options if his price outlook in a particular direction is very strong. But if he is either neutral or not so strong, he would prefer to write a call or a put option to earn premium.

4. Option Spreads

This is a strategy to take advantage of relative price changes. This involves buying and selling different options simultaneously, creating a price spread that widens or narrows depending on what happens to the prices of the underlying assets. Options spreads in which two legs of the spreads have different strike prices but the same expiry date are called vertical spreads. However, an option spread that has two expiration dates but the same strike price is called a horizontal spread. This is also a speculative strategy but with limited risk and return compared to naked speculation.

Some important option spreads are as follows:

(a) Bullish Option Spreads-These make profits when the asset prices go up. Purchasing an option with a low strike price and selling one with a higher strike price with the same expiration date creates such spreads.

(b) Bearish Option Spreads- A bearish option spread gives a profit when the price of the underlying asset falls. This spread involves selling an option with a comparatively low strike price and buying one with higher strike price for the same expiration date.

5. Butterfly spread

This is a spread position involving options with three different strike prices. This position involves buying a call option with a higher strike price, selling two call options with the mid-strike price and buying another that has a lower strike price. The mid-strike price will be usually close to the spot price. Thus, in this strategy one long option is in-the-money, two short options are at-the-money and one long option is out-of-the-money. In this strategy the investor pays the premium for the two options receives premium on the other two. The net premium paid is very small. Profit potential in this strategy will be very limited, since the short options neutralize the gains on the long options beyond the difference in the strike prices. The risk of losses is also very limited in this case. This option strategy can be made by using call and put option.

6. Calendar or Time Spread

This is also known as horizontal spread. 'This is because different option contracts having the same strike price with different expiration periods are used in this strategy. An options or futures spread established by simultaneously entering a long and short position on the same underlying asset but with different delivery months.

7. Straddles

These are created by simultaneous sale or purchase of the options. These involve buying the put and a call (long straddle) or selling a put and a call (short straddle). This strategy is often used by speculators who believe that the prices of the asset will move significantly in one direction or the other (long straddle), or remain fairly constant (short straddle).

Long straddle- A long straddle is created by buying an equal number of calls and puts with the same strike price and with the same expiration date. This is beneficial if the prices of the underlying assets move substantially in either direction. If prices fall, the put option is profitable, and if prices rise, the call option will yield gains.

Short straddle- This is reverse of the long straddle. Here, the investor sells an equal number of calls and puts for the same strike price and with the same expiration date. This strategy is adopted only when prices are expected to be stable. This strategy yields profits if prices are stable, but leads to losses if future prices move substantially in the either direction, which is just the opposite of the long straddle position.
If the future price is the same as the strike price, both the call and the put option will expire worthless and the investor will retain the total premium received from writing the options.

8. Straps/ Strips

Strips involve a long position in one call and two puts with the same expiration dates and strike prices. A strap involves a long position in two calls and one put with the same expiration dates and strike prices. An investor uses strips when he thinks that there will be a large price movement in the stock, but a fall is more likely'. A strap investor's view is the same about volatility, but considers an increase in the stock price more likely.'

VII. THE CONCEPT OF FINANCIAL ENGINEERING

"Financial engineering" concept is as old as financial transactions, but it seems relatively recent in terms of terminology and specialization. Most definitions of financial engineering are derived from the views of researchers who develop theories, or financial product designers in financial institutions, for this, we find different definitions of the term, according to the angle that could be considered too.From the point of view of financial markets, the term "financial engineering" used to describe the analysis of data collected from the financial market in a scientific way, and allows the use of tools and techniques of financial engineering for financial engineers, and thus a better understanding of the party dealers in the market. This is very important for traders because the accuracy and speed of information essential in making decisions. 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.

REASONS FOR RAPID GROWTH IN 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 Smith (1990:33). Technology has improved dramatically in this period. Government debt has also increased in most countries. Marshall (1992:20) has classified the causes of increasing risk into two: environmental and intra-firm. We use this classification here to analyses the reasons why the increase in risk and major developments in finance, taken together, created the right environment for rapid growth in financial engineering.

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 to the because they impact the firms performance. It includes:-

i. Increase in price volatility: The term "price" here includes the price of money, foreign exchange, stocks, and commodities. The currency floats have meant that the stability of exchange rates is a thing of the past.

Interest rates have been very volatile too, e.g., in June 1982, AA bonds were yielding 15.3 percent. In May 1986 the same bonds yielded 8.9 percent and in April, 1989, 10.2 percent (Brigham, 1990:604). Oil prices are the best example of dramatic commodity price volatility, and the October, 1987 stock crash illustrates the volatility in stock prices.

There was also a major volatility in overall prices, i.e., inflation, over the past three decades. This all-round increase in volatility has led to tremendous increases in the risks which companies face, and enhanced the need for hedging the risks. ii. Globalisation of the world economy and competition: Commerce has grown very rapidly in the past two decades. This has increased the size of markets and greatly enhanced competition (Marshall, 1992:658).

iii. Deregulation and increase in competition: Initially, investment banks were the only ones which could offer various services regarding risk management. Deregulation of the financial markets has brought in new entrants into the financial markets, particularly NBFIs, who have aggressively competed with the traditional banking sector, by introducing new products and services. In return, banks were forced to come out with innovative ways to compete with NBFIs by taking recourse to off-balance sheet transactions.

iv. Advances in technology and communication: Funds can be transferred from ATMs and telephones now. Computers have entered the field of finance in a big way.

v. 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 (Marshall, 1992:665).

vii. Advances in financial theory: Developments in finance theory have contributed immensely to the development of new hedging techniques. The OPM is a case in point.

viii. Tax asymmetries: Taxes differ across industries and countries, over time. Also, some firms have sufficient tax credits/ write-offs which give them an advantage over other firms. For example, zero coupon yen bonds were treated liberally in Japan. In the USA33, the abolition, in 1984, of the withholdings tax on interest payments to overseas investors in the domestic securities of the USA influenced the growth of interest rate swaps (Das, 1989:170).

xi. Standardisation: There has been an increasing standardization of financial instruments, e.g., in futures, options and swaps. This has expanded the market.

xii. Low documentation costs: Many of the new financial instruments require little documentation, and no prospectus, etc. This has made them attractive to companies.

VIII. ROLE OF FINANCIAL ENGINEERING IN "RISK MANAGEMENT

- Part of business unit, helping business unit leaders manage risk – if so, we know what happened. Business unit priorities such as profits, volume, client satisfaction, market share and growth took precedence in many organizations.
- Co-equals with the business unit leaders – if so, who broke the ties and made the final risk decisions? What were the motivations and priorities of the people that decided?
- Final and absolute deciders on risk matters – if so, does that make the Head of Risk the CEO? If the Head of Risk disagrees in a major way with the CEO, how long does he/she stay in the job? Independent oversight – if so, for whom? The CEO? The Board? Do they understand the risks? Do they have time to absorb the details and engage? Will they favor risk, or other priorities and objectives? Financial engineer41 demand structural solutions to corporate risk exposure. Individual are unwilling to bear risk because they are not adequately compensated for doing so.
- Some of the innovation of the concerned subject deals with liquidity and also have risk limiting capability for example collateralized mortgage obligation bond, provide a vehicle by which, direct investment in mortgage or mortgage pass through certificates or instrument like adjustable rate debt are not very price sensitive in the general level of interest rates as equivalent maturity fixed coupon instruments thus only expose their holder to less risk.

During the last two decade financial innovation has been directed to design some sophisticated risk management strategies. Among the instrument introduced are interest rate future and interest rate options, stock index future and stock-index options. Currency future and currency options, over-the-counter contracts such as forward rate agreements and forward exchange agreements and a whole array of swap products including interest rate swaps, currency swaps, commodity swaps and equity swaps. Among the risk management strategies developed or improved over the last two decades are assets/liability management techniques including various forms of duration and immunization strategies better risk assessment and measurement techniques including both the quantification of price risks via volatility measure and graphic representations via risk profiles and the development and improvement of hedging strategies including duration based regression based and dollar value based techniques.

IX. THE APPLICATION STUDIES OF FINANCIAL ENGINEERING

There are three major methods of actually working on the building block approach: (i) to look at the risk and payoff profiles, (ii) to look at time-line cash flow diagrams and (iii) lastly, there is the arithmetic approach recently introduced by Donald J. Smith. The boxed cash flow diagrams approach is also sometimes used (Marshall, 1992: 535).In each of these approaches, the process is essentially the same. First of all a graphical or mathematical view of the current risk exposure is projected. This picture is overpaid with the cash flows associated with the hedging instruments under consideration. Then the residual or net cash flows are examined. Ultimately, by varying the delivery months and the strike prices, etc., the risk exposure is manipulated in the desired manner. To facilitate the calculations and analysis, spreadsheets and special software packages are put to use (Marshall, 1992:540). It is usually possible to achieve the objective using different combinations of hedging instruments. The combination or strategy which is least costly is then accepted (Marshall, 1992: 535). The securities resulting from this process are often given special names, or simply called synthetic securities.We look below at some examples of synthetic securities. This list is only illustrative; the actual range of products, as can well be imagined, is almost infinite. The figures referred to in the following discussion are given in Annexure I to this paper. The detailed method of building or synthesizing the listed securities is not provided, for want of space.

X. PAYOFF PROFILES METHOD

In this method, the risk and payoff profiles of the instrument are drawn, and the combinations of some of the simpler instruments can be seen in this way.

i. Synthetic future: A forward/future can be synthesized by "snapping together" a European call and a European with the same time to maturity and exercise price (Copeland 1988:323).

ii. Swaps with option like characteristics: Swaps can be constructed to have option-like provisions which limit the range of outcomes. These include the floating floor-ceiling and the fixed floor-ceiling swaps (Smith, 1986:254).

XI. TIME-LINE CASH FLOW METHOD

The time-line cash flow diagrams are very intuitive and easy to grasp. Usually, the direction of the arrows represents the direction of the cash flows; the long arrow denotes the principal, and short arrows the exchange of other cash flows. A denotes fixed interest rate and ~ denotes floating interest rate. The following examples illustrate this approach.i. Reverse floater: In a reverse or inverse floater, the coupon payment on an inverse floater decreases as LIBOR increases. It can be synthesized in many ways, (Smith, 1990:64).

ii. Synthesis of a deep-discount dollar bond: (Smith, 1986:257).

iii. Synthetic dual currency bond: (Marshall, 1992:592).

iv. A forward swap: This instrument is also called a delayed start swap, and combines forwards with a swap, or two swaps (Smith, 1990:57).

v. Foreign-pay zero (Marshall,1992:594).

XII. ARITHMETIC APPROACH

The notation of the arithmetic approach is illustrated by: A = B + C, where A, B, and C represent expected cash flows from these securities. The " = " sign represents identical cash flows in terms of amount, currency and timing. A "+" indicates a long position and a "- "indicates a short position (Smith, D.J.). The following examples are based on this approach.

i. Synthetic fixed rate debt: This is given by the following combination (Smith, D.J.:405). Here FRN stands for fixed rate note.

Typical Interest			
-FRN	=	-FRN + Rate Swap	+ Floor
Swap fixed		LIBOR + 0.25%	pay fixed, 4.75%
rate + 0.25%		min. 5% rec.	LIBOR

ii. Asset Swaps: In asset swaps, the cash flow characteristics of the underlying asset are changed. If the usual FRN is taken as the asset, then an asset swap could look like this (Smith, D.J.:406)

		Typical	Interest			
+ FRN	= +	FRN	-	Rate Swap	-	Floor
Swap fixed		LIBOR + 0.25%		rec. fixed,		4.75%
rate+0.25%		min. 5%		pay LIBOR		

iii. Mini-max or "collared" floater: This is basically a typical FRN with the addition of a maximum coupon rate, and is synthesized as follows (Smith,D.J.:407)

Mini-Max		Unrestricted			
+ FRN	= + FRN		+ Annuity	- Cap	+ Floor
LIBOR	LIBOR	0.5%	8.5%	4.5%	
+ 0.5%					
min. 5%					
max. 9%					

iv. Inverse floater: As discussed earlier as a reverse floater, this can be synthesized in many ways, one of which is illustrated below (Smith,D.J.:408)

- Inverse	= -	Two + Unrestricted		- Cap
floater	FRNs	FRN		
16%-LIBOR		8%	LIBOR	16%

v. Participation agreement: The outcome of a participation agreement is that the buyer "has the benefit of a ceiling on LIBOR but makes settlement payments at a constant fraction of the rate differential when LIBOR is below the ceiling" (Smith,D.J.:409). It is synthesised as follows (where NP is the notional principal, NP* is the given amount of interest rate protection, and PR, or the participation rate, is 62.5%):

	Participation				
+	Agreement =	+ Cap	-	Floor	
	10% ceiling	10%		10%	
	NP = NP*	NP =	NP*	NP = .375 NP*	

XIII. CONCLUSION

Financial engineering is one of the basic of our financial system, which is the life blood of efficient and responsive capital and derivative markets. Financial engineering is defined as: design, development, implementation, tools and innovative financial mechanisms, and drafting for creative solutions to the funding problems. In order to consider it successful, it should lead either to reduce transaction costs or to provide improved service lead in sum to fill the special needs of all participants in the financial system. In this context though option trading strategies help the investors in order to manage their price risk they are not efficient in reducing the cost because buying option contracts involves premium, in which if the option is not exercised then the holder will incur purchase cost. Apart from the above perspectives financial engineering provided new financing resources; thus, have provided opportunities to Companies to design instruments which could give them the freedom to address the varying needs of investors group and to lower the cost of capital. Financial engineers often helped upon to develop new instrument to secure the fund necessary for the operation of large scale businesses.In summation, financial engineering is playing an important role as a major discipline within finance.

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